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THE

CYCLOPÆDIA;

OR,

Universal Dictionary

OF

ARTS, SCIENCES, AND LITERATURE.

VOL. VIII.

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THE

CYCLOPÆDIA;

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UNIVERSAL DICTIONARY

OF

Arts, Sciences, and Literature.

BY

ABRAHAM REES, D.D. F.R.S. F.L.S. *S. Amer. Soc.*

WITH THE ASSISTANCE OF

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BY THE MOST DISTINGUISHED ARTISTS.

IN THIRTY-NINE VOLUMES.

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CYCLOPÆDIA:

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UNIVERSAL DICTIONARY

OF

ARTS and SCIENCES.

CHRONOMETER.

CHRONOMETER, from χρόνου, *temporis*, and μέτρον, *menſura*, is a term in *Horology*, which, in its comprehenſive ſignification, may mean any machine which *meaſures time*, of which there have been various kinds, ſuch as *Clepſydræ*, *clocks*, *watches*, *regulators*, and *time-keepers*, or *time-pieces*, but the application of this term has been more particularly confined by mechanicians to two kinds of machines; firſt to ſuch as meaſure very ſmall portions of time only, by ſubdividing the ſecond: and, ſecondly, to ſuch as continue to meaſure long periods, with great accuracy under all the variations of temperature that ariſe out of the changes of ſeaſon and climate.

The former of theſe two kinds of machines was originally conſtructed for philoſophical purpoſes, ſuch as meaſuring the time of the deſcent of a falling body through a given ſpace, of the efflux of a fluid out of a given aperture under certain circumſtances, of the paſſage of a heavenly body along the eye-piece of a teleſcope, of the velocity of ſound compared with that of light, &c.

The deſcription of a machine of this kind is given in Dr. Deſagulier's Experimental Philoſophy, and Dr. Hutton ſays he has ſeen one, that profeſſes to meaſure ſo ſmall a portion as the *fortieth* part of a ſecond, but that it cannot be ſtopped with certainty within the tenth part of the propoſed degree of accuracy. Mr. W. Nicholſon, however, ſays, (vol. iii. p. 50, in a note of his Philoſophical Journal, 4to ſeries.) "that there have been inſtruments made to divide the ſecond into a *hundred* parts; one of theſe, ſays he, made by Whitehurſt, and regulated by a fly, repeatedly meaſured the time of the fall of a leaden bullet, in ſome experiments which I ſaw, with no greater variation than *one-hundredth* part of the ſecond." The adoption of Mr. Atwood's machine has now ſuperſeded the uſe of ſuch a nice meaſure of time in the above experiment, and for all the other purpoſes, the *beat* of a watch, counted by the ear while the eye obſerves the object of experiment, ſeems to be not only the moſt convenient chronometer of any, but is ſufficiently accurate for any purpoſe when the beats are quick, and when their value is known. See our article Beats, in *Horology*.

The ſecond kind of horological machines known by the appellation of chronometers, ſince Mr. Arnold the elder gave this name to his time-keepers, differs from an ordinary watch principally in the eſcapement and balance, and deſerves our more particular notice, inaſmuch as the act of navigating veſſels over the extenſive oceans of the univerſe, is greatly indebted to their accurate meaſurement of time, in all the variations of heat and cold, from the higheſt navigable latitudes to the equinoctial line. In ſteering a veſſel over the trackleſs deep, the great deſideratum is, to know at any given inſtant the relative longitude, or diſtance from the firſt meridian, and the latitude, or diſtance from the equinoctial line; a knowledge of theſe two guides will always ſuffice to direct on what point of the compaſs, where the variation is known, a veſſel is to be ſteered, if no current interfere, in order to gain a given harbour. The latter of theſe two guides, viz. the preſent latitude, can always be obtained, independently of the ſhip's reckoning by the log-line, by an obſervation of any of the heavenly bodies when at its greateſt altitude, or even with ſufficient accuracy by two ſucceſſive altitudes taken at a diſtance from the meridian, provided the intermediate lapſe of time be accurately noted. The other requiſite, the preſent longitude, however, is not ſo readily obtained, the lunar method requiring tedious calculations not generally underſtood, and the occultations of the ſtars by the moon, and eclipſes of the ſun, moon, and Jupiter's ſatellites, not occurring with ſufficient frequency to be of much benefit, even if they could be obſerved with ac-

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curacy and convenience on board a ſhip. The method by a good chronometer is, however, not only ſimple in its application, but at all times readily attainable, and therefore is coming into general uſe. We will premiſe a few obſervations reſpecting the utility of a chronometer at ſea, and the improvements it has ſucceſſively experienced, before we proceed to deſcribe the machine itſelf according to ſome of its more perfect conſtructions.

The earth, it is now generally believed, revolves on its axis, in every part of its annual orbit, in an uniform and equable manner, and, on this account, the period of its rotation has been fixed upon as the moſt proper ſtandard of our meaſure of time, and, indeed, is the only invariable ſtandard with which we are acquainted: this period, according to our mode of reckoning, is divided into 24 equal parts, as the rotation has a reference to the ſun; and each of theſe 24 parts is called an hour, or a *ſolar* hour ſometimes, by way of diſtinction from the *ſidereal* hour, which is a 24th part of a rotation, as it regards a fixed ſtar; hence an hour, or ſolar hour, means one 24th part of the time elapſed ſince any ſpot on the globe paſſed the ſun on the meridian, or ſouth point, in regard to that ſpot: two hours mean twice that ſpace of time; and 24 hours the whole time of a ſolar rotation, which is longer than a ſidereal rotation by 3^{m} 55^{s} 54^{th} of ſolar time, by reaſon of the ſun having advanced apparently 59′ 8″ 10‴ in the ecliptic during a rotation; ſo that a ſolar, being only a relative rotation, is more than a ſidereal or abſolute rotation, by as much as, taken collectively, amounts to an entire rotation in each annual revolution of the earth, to which cauſe the apparent motion of the ſun in the ecliptic is owing: and, to this cauſe, is to be attributed the reaſon why there is a ſidereal more than a ſolar day in each year. But the period of a ſolar rotation of the earth, or any portion of it, may be, and frequently is, reckoned in other terms, implying ſpace paſſed through in a rotation, inſtead of the time occupied by the motion through that ſpace: mathematicians have long been in the habit of dividing a circle into 360 equal parts, one of which is called a degree, or 1°; and, as an equatorial ſection of the earth would be a circle, geographers and aſtronomers have ſuppoſed the equinoctial line divided into 360°, and each degree divided into 60′, (60 minutes) or geographical miles, which minutes are again ſubdivided into 60″ (60 ſeconds), as we divide an hour into 60^{m}, and each of thoſe again into 60^{s}: hence, as the whole 360° of the earth's circumference paſs the ſun's meridian ray in 24^{h}, we know that 15° muſt paſs the ſame in one hour, or 1° in four minutes of time, as alſo 1′ in 4^{s}; conſequently, when we know the time that has elapſed ſince any given ſpot on the globe has paſſed the meridian ſun, we know alſo, by allowing 1° to 4^{m} of time, how many degrees of the equinoctial have paſſed in the ſame time; hours, with their diviſions and ſubdiviſions, and degrees, with their diviſions and ſubdiviſions, being mutually convertible one into the other by direct proportion, or more readily by tables conſtructed on purpoſe. It is neceſſary, however, that we ſhould notice, that there is a difference between a *real* and an *apparent* rotation of the earth as it relates to the ſun, partly by reaſon of the earth's axis being inclined in an angle of nearly 23½° to its annual orbit, cauſing thereby a neceſſary reduction of apparent motion in the ecliptic, or earth's path, to real equable motion in the equator, and partly by the alternate acceleration and retardation of the earth's motion in her orbit at different times of the year, which irregularity requires a correction called the "Equation of the Center:" theſe two cauſes of apparent irregularity in the earth's rotations have their joint effects allowed for, by what is called "Equation of Time," uſually inſerted in a table with this title, and alſo placed in the column of "clock faſt," or "clock ſlow," in the almanacs; the quantity, therefore, correſponding to any given day in the year, in the equation table or almanac, muſt always be added to or ſubtracted from the time ſhown by an accurate chronometer, to make it agree with *apparent*, or what the French (and lately ſome of our Engliſh authors) improperly call *true* time; that time in our opinion being *true*, which is mean, and which correſponds to the real rotations of the earth; for theſe rotations, conſidered by themſelves, are equable, and not affected by the cauſes of thoſe two *apparent* irregularities we have noticed, as ariſing ſolely out of the relative poſitions and ſituations of the earth and ſun.

But we have not to regard only the period of the earth's ſolar rotation; its direction, alſo, muſt be conſidered, which is from that point of the horizon, which we call weſt, to that which is denominated eaſt; thereby cauſing the ſun, which is really a ſtationary body, or nearly ſo, to *appear* to move on the contrary from eaſt to weſt every ſolar day, and the ſtars likewiſe, in the ſame direction, once in every ſidereal day; but theſe latter bodies, being placed at an immenſe diſtance beyond the earth's orbit, have no apparent change of place, and, therefore, require no correction; conſequently, there is no difference at any part of the year between a *mean* or *true*, and an *apparent*, ſidereal day, which muſt have been the caſe, notwithſtanding the immenſe diſtance of the ſtars, if the rotations of the earth had not been uniformly equable. It is on account of this equality among the ſidereal days that aſtronomers have proportioned the pendulums of their regulators to vibrate ſidereal ſeconds, that the right aſcenſion of the heavenly bodies is given in ſidereal time, and that the late Margetts made his chronometers, with great ingenuity, to ſhow at the ſame time both ſolar and ſidereal time, and, conſequently, the ſun's mean right aſcenſion at any time, which is always equal to their difference: and we may add here, that the conſtant variation that is taking place between mean and apparent ſolar time, was the reaſon why a clockmaker in London, whoſe name is unknown, and after him on the continent, H. Sully, Alexander le Bon, Julien le Roy, Enderlin, l'Admiraud Paſſemant, Rivaz, Berthoud, and others, have made equation clocks on different conſtructions, to indicate both mean and equated, or apparent time.

From theſe introductory remarks on time, and its connection with, or rather dependence on, the earth's rotation on its axis, it is eaſy to conceive, that all places on the globe which paſs the ſun's meridian ray ſooneſt, count their 12 o'clock, or noon, earlier than thoſe which follow in ſucceſſion; but the eaſtern parts paſs firſt, and thence have their time more advanced, or earlier than the following more weſtern parts have; and the difference is, as we have ſaid, at the rate of 4^{m} for every degree of diſtance. This diſtance is called *longitude*, by reaſon of the equatorial diameter of the earth being *longer* than the polar diameter, in the direction of which latter, the breadth or *latitude* of the earth is counted both ways from the middle. The longitude may have its reckoning to commence at any aſſignable point on the globe, and all the other parts will be called eaſt or weſt of that point, which is called the firſt meridian, accordingly as they precede or follow it in each rotation of the earth, and the quantity will be either ſo many hours, minutes, and ſeconds of time, or ſo many degrees, minutes, and ſeconds of ſpace, as correſpond to that time. Now, it is very obvious, that, if we could at the ſame inſtant know the time accurately, as counted at each of two different places, ſituated reſpectively eaſt and weſt of one another, the difference of thoſe two times ſo indicated, would be their difference of longitude in time, which, converted into degrees, minutes, and ſeconds, would be their difference of longitude in this denomination, from which, in a known latitude, the actual diſtance of the two reſpective places may, by calculation, be aſcertained. What, therefore, a chronometer has to do, is, *to tell at all times the hour, minute, and ſecond, as counted at the firſt meridian,* whether London, Paris, or any other place, to the time of which it was accurately put previouſly to the commencement of a voyage; for, as the time at any iſland, or place of a ſhip, can be had by means of Hadley's quadrant, or ſextant, or more accurately by means of Troughton's reflecting circle, from a celeſtial obſervation; the quantity that this time exceeds or falls ſhort of the time indicated by the machine, as being the time at that moment at the firſt meridian, will be the iſland's or ſhip's comparative longitude in time, eaſt, if the chronometer is behind, but weſt, if before the time by a celeſtial obſervation. In our Engliſh ſhips, the chronometer is a kind of travelling companion which tells, whenever conſulted, what the exact time is at Greenwich; nor is it indiſpenſably neceſſary that it ſhould keep time exactly with the clock at Greenwich obſervatory, provided the daily gain or loſs, called the *rate,* be aſcertained and applied as a correction accordingly as it accumulates. It is, however, an indiſpenſable requiſite, that the daily gain or loſs ſhould not differ materially from itſelf at different periods, or under the changes of temperature experienced in different climates; and the fulfilment of this condition conſtitutes any portable horological machine, a marine *chronometer,* or time-keeper, whatever may be its conſtruction or price. Any of the other methods of aſcertaining the longitude may be occaſionally put in practice with advantage, as a check upon the ſimple determination by the chronometer; for their operations will detect its daily errors, and aſcertain nearly their amount at the time.

The firſt perſon who propoſed to aſcertain the relative longitude of any place or ſhip at ſea, by means of an horological machine for indicating the time of the firſt meridian, was, as has been aſſerted, Gemma Friſius, about the year 1530; (vide "De Principiis Aſtronomiæ et Coſmographiæ.") This method was deſcribed and recommended in Carpenter's Geography ſo early as the year 1635; but the ſtate in which horological machines was, at that time, prevented his accompliſhing the deſign: the idea, however, once ſuggeſted, was valuable; and ſtimulated ingenious mechaniſts, in times ſucceeding, to attempt the accompliſhment of an object of ſuch national importance. The diſcovery of the iſochroniſm of the pendulum turned the minds of ingenious men to the improvement of clocks; and we find that lord Kincardine tried a marine pendulum clock by Dr. Hooke in the year 1662; and that Chriſtian Huygens, the celebrated Dutch mathematician and mechanician, contrived a time-keeper, actuated by a ſpring, and regulated by a pendulum, which was tried at ſea by major Holmes in the year 1664, and ſpoken of by him in favourable terms. The eſcapement was of the crown-wheel kind, which, from its nature, is almoſt conſtantly under the influence of the maintaining power; but a ſmall weight connected with the crown-wheel, was raiſed every half-ſecond by the maintaining power, and gave an impulſe to the pendulum, which, therefore, was not affected by the irregular tranſmiſſion of the maintaining power through the train of wheel-work: this contrivance was ingenious, and obtained the name of *remontoir.* The pendulum, however, was not only unſteady in its action during the toſſing of a ſhip, but was ſubject to a variation in its length by change of temperature, as well as to a change of weight depending on the parallel of latitude; the latter of which changes, indeed, was afterwards diſcovered. There was, moreover, a pair of cycloidal cheeks of braſs ſo fixed, as that the thread of ſuſpenſion, by being evolved from them alternately at each ſucceſſive vibration, might make the bob of the pendulum deſcribe the involute of a cycloid, which this author firſt proved, was itſelf a cycloid, poſſeſſed of the peculiar property of rendering the vibrations in long and ſhort arcs of equal duration; this cycloidal doctrine was plauſible in theory, but could not be reduced to practice, becauſe it ſuppoſed; 1ſt, the pendulum invariable in length; 2dly, the collection of all the weight to be into one point; and 3dly, the abſence of friction and other kinds of reſiſtance, to which mechaniſm is ſubject. Huygens's contrivances, notwithſtanding, together with the doctrines contained in his "Horologium Oſcillatorium," may be conſidered as having laid the foundation of horological ſcience.

The balance, which had preceded the pendulum, was again reſorted to as a regulator of portable time-keepers; and though it was found incompetent to its office in a detached ſtate, yet, by the aid of a ſlender ſpring to quicken and regulate its ſluggiſh vibrations, it has ultimately turned out to be of eminent utility. It has been conteſted by Huygens and Dr. Hooke, which of theſe two ſkilful mechanicians firſt introduced the ſpring, called uſually the pendulum ſpring, from the iſochronal property which it poſſeſſes, like the pendulum, when of a proper ſtrength, ſhape, and length; and F. Berthoud aſſerts, that though Hooke applied it firſt in a ſtraight form, yet Huygens firſt adopted the ſpiral ſhape, as being more favourable to iſochroniſm; while others are of opinion, with more probability, that Hooke actually applied it in a ſpiral form among the *twenty* ſeveral methods that he ſaid, in his lectures at Greſham college, in the year 1664, might be uſed to anſwer the ſame purpoſe (vide "Lectiones Cutlerianæ," 1673.) Indeed the account of the ſpiral ſpring, adopted by Huygens, was not publiſhed in the Philoſophical Tranſactions, until the year 1675, N° 112, whereas Hooke had diſcovered the iſochroniſm of ſprings, and regiſtered his diſcovery by an anagram compoſed of the Latin ſentence "Ut tenſio ſic vis," in the year 1658.

But whoever was the inventor of the ſpiral form of the ſpring attached to the balance, and making with it a regulator for portable machines, they both ſtill remained ſubject to alterations in their dimenſions by the ſucceſſive changes of heat and cold; for, by the former of theſe oppoſite temperatures, the ſpring became weaker, and the ſize and conſequent momentum of the balance greater, in conſequence of their enlargement, ſo as to produce a very ſenſible loſs in the daily rate of going of a watch with ſuch a regulator; alſo an acceleration beyond a mean rate was ſoon obſerved to be the conſequence of increaſed cold, which, on the contrary, diminiſhed the dimenſions of the metallic parts, and thereby, at the ſame time gave additional ſtrength to the ſpring, and likewiſe reduced the ſize and momentum of the balance. About the ſame period Leibnitz attempted to confine the vibrations of the balance with a ſpiral ſpring, to be of equal extent, by means of an additional ſpring to be applied to the balance wheel, and to be, like Huygens' remontoir, wound up by the maintaining power; but his endeavours, whatever ideas they may have ſuggeſted to Harriſon, Mudge, or Haley, for their auxiliary ſprings, were not crowned with complete ſucceſs. Hautefeuille alſo, in the year 1674, preſented to the Academy of Sciences, at Paris, a balance with a ſtraight ſpring, acting ſomehow inſtead of an eſcapement, but how far it reſembled the ſpring detent of Arnold we know not, nor do we find that it was adopted in practice. This ſociety, notwithſtanding, thought the ſubject of ſuch importance, that, in the year 1720, they propoſed the following queſtion to be determined for a public reward: viz. "What is the moſt perfect method of preſerving on the ſea the equable motion of a pendulum, either by the conſtruction of the machine, or by the ſuſpenſion?" A memoir written by Maſſy, a Dutch clock-maker, obtained the prize, but he had not the ſatisfaction of ſeeing his plan executed. About a year afterwards (1724) Henry Sully, an Engliſh clock-maker, who had ſettled at Paris about eight years previouſly, preſented the ſame academy with a marine time-keeper, made in 1721, and publiſhed a deſcription of it in French, by the title of "Deſcription abrégée d'une horloge de nouvelle invention pour la juſte meſure du temps en mer." Beſides the above, Sully made a ſecond marine time-keeper, which was tried at ſea in 1726, but the inventor died two years afterwards, a martyr to his horological ſtudies, before he had brought his machines to that ſtate of perfection which their object demanded. His pieces had vertical balances carrying cycloidal metallic pieces, round which a thread, or ſlender wire, was wound at the upper end, while the lower end was attached to a lever with an adjuſtable weight to effect the iſochroniſm of the balance, inſtead of a ſpiral ſpring: the horizontal pivots of the balance alſo moved on the angular point included between two large rollers, which method of leſſening friction, we believe, was the invention of this author. He alſo made a marine watch with a ſpiral pendulum ſpring, into which friction rollers, like Mudge's, were introduced, and had he lived longer, chronometry would no doubt have been greatly promoted by his labours.

It was about this period, that jewelling, another eſſential improvement in time-pieces, was introduced, according to Berthoud, by Mr. Fatio, a native of Geneva, who, not meeting with encouragement in France, came over into England, and brought his invention into notice.

The Academy of Sciences at Paris again propoſed a reward for the year 1747: the ſubject was "The beſt method of finding the hour at ſea, whether by day, by twilight, or at night, when the horizon cannot be diſtinguiſhed." The reward was obtained by Daniel Bernouilly's memoir, intitled, "Recherches mechaniques, et aſtronomiques," in which was diſplayed much ſcience, but the author's want of ſkill in mechanical operations prevented his labours being attended with complete ſucceſs.

In the mean time, the changes in the length of the pendulum began to be compenſated, firſt by means of quickſilver contained in a tubular rod, by Graham, and ſoon after by the oppoſite expanſions of different metals, by Harriſon, who, ſtimulated by the Britiſh parliamentary reward that had been previouſly offered to the public for marine time-keepers, applied the ſame principle to a watch to effect a ſelf-regulating kirb (or curb), for limiting the effective length of the ſpiral pendulum-ſpring to correſpond to the ſucceſſive changes of heat and cold, which changes were now known to alter the force of this ſpring, and the momentum of the balance. From this origin we may date the beginning of all the different kinds of compenſation-mechaniſm that have proved permanently uſeful in time-keeping; and if we add to Harriſon's invention of the metallic compenſation, his remontoir, and his addition of a ſecondary ſpring as an equivalent ſubſtitute for the maintaining power during the time of winding up, which is an eſſential requiſite in producing permanent motion, he may be fairly conſidered as the parent of modern chronometry.

The Britiſh parliament had, indeed, before the French academy, offered, ſo early as the year 1714, in the reign of queen Anne, a reward of 10,000l. for any method of determining the longitude within the accuracy of one degree of a great circle; of 15,000l. within the limit of 40 geographical miles, and of 20,000l. within the limit of 30 ſuch miles, or half of a degree, provided ſuch method ſhould extend more than 80 miles from the coaſt: and after this act, two others paſſed in the reign of George II. ſtat. 14 and 26, to promote the ſame purpoſe; but an act paſſed in the preſent reign, in the year 1774, repealing all the former ones, and offering ſeparate rewards to any perſon who ſhould invent a practical method of determining, within certain circumſcribed limits, the longitude of a ſhip at ſea: for a time-keeper, the reward held forth to the public is, 5000l. for determining the longitude to or within one degree; 7500l. for determining the ſame to 40 geographical miles, and 10,000l. for a determination at or within half of a degree. This act, notwithſtanding its abridged limits and diminiſhed rewards, has produced ſeveral candidates ſince Harriſon, who received the whole reward of the firſt act, for parliamentary remuneration, of whom Mudge, the two Arnolds, and Earnſhaw, have had their labours, as will be ſeen hereafter, crowned with partial ſucceſs. Beſides theſe, there have been various other chronometer-makers, whoſe pieces have performed with great accuracy, but whoſe names we omit to introduce here, leſt we ſhould ſeem partial to ſome at the expence of the reputation of others. Indeed, the art of conſtructing chronometers is lately become ſo general, that it is difficult to decide whoſe name ought to ſtand firſt on the liſt of excellent makers, and we hope that the ſpirit of competition for public fame will continue to entitle our Engliſh manufacturers to that preference among naval officers, which the excellence of their workmanſhip entitles them to expect. For, even in a commercial point of view, it was proved to the late Mr. Pitt, when he laid a tax on watches, by the committee of watch-makers convened in the pariſh of Clerkenwell, that a piece of the value of 500l. had been manufactured out of materials which did not, in their native original ſtate, coſt more than *ſixpence!* This repreſentation, we are credibly informed, induced the noble ſtateſman to abandon his plan of taxing an article, the value of which depended ſo much upon ingenuity and labour, and by the manufacture of which thouſands of ſubjects are entirely ſupported: nay, further, on learning that the French and Swiſs could afford to ſell three gold watches for the price of one Engliſh one, the ſame miniſter took off the duty of ſixteen ſhillings per oz. from watch-caſes of this metal, and ſubſtituted only one ſhilling, the price of the trial at Goldſmiths'-hall. We have juſt ſaid that Harriſon obtained the firſt and moſt ample reward for his inventions, but we are not to conclude from thence, that his pieces excelled all others; they were ſpecimens of great ingenuity and proofs of unwearied induſtry, which certainly were not overpaid; but the inventor himſelf was candid enough to confeſs that the balance, balance-ſpring, and compenſation-curb, were not contemporaneouſly affected by heat and cold, but that ſmall pieces of metal were ſooner affected than large ones, and alſo pieces in motion before pieces at reſt; whence he was led to conclude, that if the proviſion for heat and cold could properly be in the balance itſelf, as was the caſe with his gridiron pendulum in clocks, the time-piece might be made much more perfect.

Harriſon's ſuggeſtion of a compenſation-balance, in place of a compenſating curb for the balance-ſpring, found its way into France, and rouſed the attention of the watch-makers of that nation; and, to do them juſtice, we muſt allow that Peter, the eldeſt ſon of Julien le Roy, who was himſelf an eminent watch-maker, had the honour to be the firſt who accompliſhed the ſuggeſted deſideratum, by means of two thermometers, one of mercury, and the other of alcohol, attached to and carried by the balance itſelf, which contrivance effected the compenſation, by bringing a portion of the mercury nearer to, or by removing it farther from the centre of the balance, according to the different ſtates of the atmoſphere. (See the Deſcription under COMPENSATION-*balance.*) A chronometer on this conſtruction was preſented by Peter le Roy to the king of France, on Aug. 5th, 1766, for which the prize of the Academy of Sciences was awarded him on the laſt day of the ſame month: he alſo publiſhed an account to accompany the piece, entitled, "Memoire ſur la meilleure manière de meſurer le temps en mer, &c." in which memoir he aſſerts, a circumſtance very worthy of notice, that he made another compenſation-balance entirely of pieces of different metals; viz. of braſs and ſteel riveted together, like Harriſon's compenſation-curb, but bent into two ſeparate ſemi-circles in ſuch a way, that each, carrying a metallic weight near its extremity, brought it alternately nearer to, or removed it farther from the centre of the balance thus formed, agreeably to the variations of the atmoſpheric temperature; and though the inventor preferred at the time the thermometrical compenſation, yet the metallic one, ſpoken of in the memoir in queſtion, was, no doubt, the archetype of all our preſent compenſation-balances. It might now have been expected that a time-piece, with a movement aided by friction-rollers, or by jewels in the pivot-holes, and with a compenſation-balance regulated by a ſpiral-ſpring, would have performed alike under all circumſtances, but ſtill it was found that, however well the fuſee was ſhapen, and adjuſted to the different intenſities of the main-ſpring, yet ſuch an unequal tranſmiſſion of that power took place, even in the beſt movements, in conſequence of there being alternately favourable and unfavourable poſitions of the acting teeth of the wheels and pinions, and in conſequence of the impediments to free motion occaſioned by the variable denſity of the oil uſed, and by the acceſſion of particles of extraneous matter, that the action of the pallet-wheel upon the pallets then in uſe was found ſufficiently irregular to occaſion an inequality in the impulſes given to the balance, and a conſequent inequality in the magnitude of the arcs of vibration. This inequality in the magnitude of the arcs of vibration would not, indeed, have affected the rate of the going of the chronometer, if all lengths of the regulating-ſpring had been found on trial to be equally iſochronal, but the ſame Peter le Roy diſcovered what Dr. Hooke knew long before, (vide his Poſtſcript to "a Deſcription of Helioſcopes, &c.") that there is a *certain length* in each good uniform ſpring *which only* is iſochronal, or, in other words, which has the property of regulating the balance ſo, that all arcs of vibration, long or ſhort, ſhall be performed in the ſame time. This diſcovery, or rather re-diſcovery, of Peter le Roy, at a time when chronometry had made conſiderable advances towards perfection, was calculated to do away the ſanguine hopes that had been entertained of the good performance of time-pieces on Harriſon's conſtruction, in which the effective length of the regulating-ſpring was conſtantly altering with the variations of temperature; and to this circumſtance principally may be imputed, perhaps, the ſmall number of time-pieces that were manufactured after Harriſon's model, notwithſtanding the large premium which was awarded him. A remedy for the unequal tranſmiſſion of the maintaining power had been, however, adopted by Harriſon, when he introduced the remontoir to produce equable action at the contrate-wheel of his pieces, a contrivance worthy of his genius, whether the idea was original, or borrowed by him from Huygens; but this was a remedy for only one of the two cauſes of irregularity in the momentum of his balance; it might, and probably did, equalize the maintaining power nearly, but would not counteract the iſochronal defect produced in the regulating-ſpring by the compenſation-curb, in all the various arcs of vibration which every piece is liable to experience in their different ſtates of foulneſs.

The obſtacles to equal tranſmiſſion of force in a chronometer, led to the invention of various eſcapements, both on the continent and in England; ſome of which were intended to act iſochronally in concert with the regulating ſpring, and others were ſo conſtructed as to give the impulſe almoſt inſtantaneouſly, and at the moſt favourable inſtant of the vibration of the balance, ſo that the force derived from the maintaining power, to perpetuate the vibrations, might derange the natural iſochronal property of the balance, and its regulating ſpring as little as poſſible.

On conſidering this ſubject, it occurred to the moſt ſcientific artiſts, that the regulating power of the balance and balance-ſpring, which was found to be too much under the dominion of the maintaining power with the common eſcapements, would be the leaſt deranged if the impulſe derived from the maintaining power were momentary, particularly if it were applied at that point of the vibration where the momentum of the balance is a maximum; it alſo occurred, that the momentum of the balance itſelf ought to be as great as practicable, compared with the impulſe given to the pallet-wheel, and likewiſe that a momentum compoſed more of velocity than of weight would be moſt favourable for a balance with ſlender pivots. Theſe, and ſimilar conſiderations, the reſult of much thought and reaſoning, ſuggeſted a great variety of deſigns for new eſcapements, many of which have been brought into practice with an advantage correſponding to the importance of the object; the moſt recent of which promiſes to be of permanent utility in chronometry. Theſe eſcapements have obtained the appellation of *free* or *detached*, from the circumſtance of their being detached from the balance during the greateſt part of its vibration. It has been matter of contention among horological writers, who was really the firſt inventor of a detached eſcapement, but it ſeems now to be pretty generally admitted, that Peter le Roy, whom we have mentioned as the inventor of the firſt compenſation balance, was alſo the inventor of the firſt detached eſcapement. It would lead us far beyond the limits of our preſent article minutely to deſcribe here all the variations in the ſhape and mode of action of the different eſcapements, by Julien and Peter le Roy, Berthoud, and others, that have been made on the continent, as well as of thoſe made in Britain; on which account we ſhall reſume the ſubject under the article ESCAPEMENT, and there give a detailed account of the ſucceſſive eſcapements, as nearly in their order of time as can be aſcertained. In the mean time, the reader will obtain, we preſume, a ſufficient knowledge of the eſcapements at preſent in uſe, from the deſcriptions that are ſubjoined to this article, of ſome of the beſt chronometers of modern makers, where we have given drawings and an account of an entire piece by Brockbank, and of ſuch parts of the pieces of other modern makers as differ from it in conſtruction. We wiſh it, however, to be diſtinctly underſtood, that we diſclaim all partiality to individuals, and give a drawing of Brockbank's chronometer in an entire ſtate, for no other reaſon but becauſe we are unwilling to diminiſh the ſale of the pamphlet containing the drawings and deſcriptions of thoſe by Arnold and Earnſhaw, lately publiſhed by order of the commiſſioners of longitude; and alſo becauſe Meſſrs. J. Brockbank and Co. have been ſo obliging as to allow us to take ſuch original drawings as it is preſumed will ſhew the relative ſituations of the different parts in a favourable point of view, for giving a clear idea of their relative offices and modes of action.

A method having been deviſed of limiting the quantity of impulſe given to the balance, ſo as to be juſt ſufficient to keep it vibrating when put in motion, but not ſufficient to produce motion from a ſtate of quieſcence, as will be ſeen hereafter, and a ſelf-compenſating mechaniſm having been adapted to the balance itſelf, it may now be fairly inferred, that chronometers have arrived nearly at their *ne plus ultra* of perfection, and that they may ſhortly be expected to find the permanent level of their price, uninfluenced by the recommendation of a ſuppoſed ſuperiority ariſing out of the *name* of the *maker*, or rather, as we might ſay, of the *vender;* for it is a fact not to be controverted, that more chronometers have been ſold by one individual than have been or could be made in the ſame time under his own roof. Still, however, the *adjuſtment* of a chronometer for rate, temperature, beat, and poſition, is an object of the utmoſt importance to the due performance of even the beſt machine of this kind that ever was made; and if improvements are yet neceſſary in this delicate but important branch of our manufactures, they are ſuch as ought, and may reaſonably be expected, to conduce to accuracy and expedition in completing thoſe four kinds of operations; operations which have been found to be very troubleſome in ſome of the conſtructions, inaſmuch as one of the adjuſtments, however delicately made, may not only be over or under-done, but may and frequently does derange another adjuſtment previouſly made. Indeed, in the preſent advanced ſtate of chronometry, one maker's excellence is often diſtinguiſhed from that of another by ſome ſlight deviation from his contemporaries' method of ſhaping certain parts, or of adjuſting the balance according to ſome ſecret method peculiar to himſelf, which he does not chooſe to diſcloſe, and for which, perhaps, he cannot give a good reaſon; hence, an important trifle, no way dependent on or connected with ſcientific principles, has been found, in certain inſtances, to lay the foundation for pretenſions to excluſive merit.

We will conclude our narrative of the improvements in chronometry, by pointing out briefly ſome of the diſtinguiſhing features of the different conſtructions of our contemporaries; and leave to the public the exerciſe of their own choice in the ſelection of a particular maker. Without entering more minutely into a detail of the French chronometers in this place, it may be ſufficient to ſtate here generally, that their detached eſcapements have detents, or pieces to ſuſpend the maintaining power for a certain time, moveable on an arbor with pivots, as will be ſeen under the article ESCAPEMENT; whereas the Engliſh detents act by means of ſprings without pivots, which conſequently require no oil, and are alſo of a more ſimple conſtruction.

The late Mr. Arnold took out two patents for improvements in his chronometers, the one in April 1776, and the other in 1782. The former of theſe patents was for the invention and application of compenſation bars in the conſtruction of his balance, together with the invention and application of what he calls the helical, but which is properly the cylindrical balance-ſpring. The ſecond patent was for three different ways of applying the compenſation-bars, for an improvement in the balance-ſpring, particularly in the bending of the laſt coil at the end of it, for his invention and application of the ſpring-detent, and alſo for the cycloidal, or more properly epicycloidal ſhape of the tooth of the balance-wheel. It has been already ſaid, that Peter le Roy was the firſt who applied a metallic compenſation to the balance itſelf, but it does not neceſſarily follow from thence, that Arnold did not alſo invent the one he adopted. We are perſuaded that a man of Mr. Arnold's known integrity and veracity would not make oath, in taking out a patent, of an invention which he did not at leaſt conſider as his own; and we ſhall have occaſion to ſhew, under our article COMPENSATION-*balance*, a variety of different ſhapes given by Arnold to his balances, and actually tried in practice *before* he adopted the one in preſent uſe; ſome of which balances are yet in exiſtence. At all events, Mr. Arnold muſt be allowed the merit of having introduced the compenſation-balance into general uſe, when Peter le Roy preferred the thermometrical tube. The late Mr. Brockbank was the firſt perſon who united the two metals by fuſion; which le Roy had united by pins, that muſt have interfered with the regularity of the flexure by different temperatures. Mr. Brockbank was alſo the firſt who uſed the method of turning an expanſion-rim out of a ſolid compound plate, made by covering the ſteel plate in a crucible of fuſed braſs, and of cutting it into portions afterwards, thereby enſuring the uniformity both of figure and weight, which two properties are equally eſſential in any balance, as the name imports; ſo that if it ſhould be contended that the conſtruction of the compenſation-balance was not invented in this country, at leaſt the practical application of the principle is our own; to which conſideration we may add, that Arnold ſenior invented and introduced the uſe of the ſpring detent, which requires no oil. Mr. Arnold was likewiſe the firſt watch-maker in England who laid much ſtreſs not only on the ſhape, but alſo on the particular length of the balance-ſpring in practice, which Dr. Hooke and Peter le Roy had both ſhewn was neceſſary to be attended to in order to render the ſpring iſochronal under all arcs of vibration, which is an eſſential object of adjuſtment; and which no doubt influenced his choice of the ſhape of the ſpring; and we are informed that he was ſo far ſucceſsful in his attempt to aſcertain the preciſe point for limiting the beſt practical length of ſome of his balance-ſprings, that, after the example of Peter le Roy, to whoſe contrivances, it muſt be confeſſed, he ſeems to have paid great deference, he ſucceeded in making a movement go accurately without a fuſee, by the mere regulation of an iſochronal ſpring, which is an indubitable proof that the irregularities of the maintaining power can have but little influence on the rate of a chronometer with an iſochronal balance-ſpring, eſpecially when it has, moreover, a detached eſcapement. Mr. Pennington affirms that there are many iſochronal points in every ſpring, which diſcovery accounts for the different lengths of the various balance-ſprings that are made of the ſame clue.

The late Mr. Mudge laboured to effect an equalization in the impulſe given to the balance by remontoirs of ſpiral ſprings, acting ſo conſtantly at each vibration, that the eſcapement of his time-keepers could not properly be called a detached one; though the one introduced into her majeſty's watch of his contrivance, and copied by the late Margetts, and by Emery, which gives an impulſe at every vibration, ſufficiently great to produce motion from a ſtate of reſt, may be claſſed among the detached kind

Emery's balance had weights ſliding on its croſſes, and having their poſitions regulated under different degrees of heat by the variable flexure of compenſating bars compoſed of two different metals, in the ſhape of an S, as explained under our article COMPENSATION *balance*, where it will appear that this was one of the varieties invented by Arnold, whoſe workman afterwards went to Emery. The Brockbanks have their chronometers diſtinguiſhed by the poſition of their locking and unlocking ſprings, and alſo by a peculiar method of banking by means of the protruſion of the coils of the balance-ſpring, as will be hereafter explained.

Earnſhaw's chronometers differ from Arnold's in the ſhape and poſition of the detent and ſprings, in the ſhape of the balance wheel, and ſtructure of the balance ſpring and balance, all which will preſently be explained.

Recordon, ſucceſſor to *Emery*, at Charing Croſs, has a compenſation-balance perforated at the circumference with various tapped holes, into which the ſcrews of adjuſtment for temperature and poſition may be ſucceſſively removed, according to circumſtances: this mode of adjuſtment is practiſed by Pennington, and was, we underſtand, originally his contrivance.

Haley, a watch-maker at the corner of Wigmore-ſtreet, Cavendiſh-ſquare, took out a patent on the 17th of Auguſt, 1796, the particulars of which are given in the ſixth volume of the "Repertory of Arts." The principle on which the patent was granted, conſiſted chiefly of a ſecond cylindrical ſpring and ſpring-arbor with pallets, &c. interpoſed between the eſcapement-wheel and the balance to give an impulſe to the balance at each vibration, inſtead of the impulſe uſually given by the force tranſmitted through the train. See Escapements *for Watches*.

Grimalde, in the Strand, who now makes a conſiderable number of chronometers, ſome of which, we learn, have the teſtimony of naval officers in their favour, has informed us, that he places the cock ſo conveniently, and adjuſts for poſition ſo readily, by a particular contrivance, which does not require the cock to be taken off, that it would, we think, contribute to the ſtock of improvements already known, if he would make his method public.

Mr. *Hardy* has lately introduced a new mode of banking, by a lever attached to the exterior coil of an heliacal ſpring, which is thrown out to catch a pin in the balance; and has propoſed a new mode of making the ſpring iſochronal, by making the ſtud moveable on a ſecond ſpring; but experience muſt prove their utility.

We might add a long liſt of the other perſons who make chronometers, not in London only, but at Edinburgh and Liverpool, were we aware that there is any material difference in the conſtruction of their mechaniſm, or methods of adjuſtment, from thoſe, or ſome of thoſe, which we have noticed.

To aid the reſearches of thoſe readers who wiſh to trace more minutely the riſe and progreſs of the art of meaſuring time by mechanical inventions, we ſubjoin a liſt of the principal authors who have, from time to time, written on this intereſting ſubject, viz. Hieronomi Cardani de Varietate rerum; 1557, fol. Baſileæ. Conrandi Daſypodii Deſcriptio Horologii Aſtronomici Argentinenſis; 1578, 4to. Argentorati. Guidonis Pancirolli Antiqua deperdit a & Nova reperta; 1607, 8vo. Ambergæ. L'uſage du Cadran ou de l'Horloge phyſique univerſel par Galilée; 1639, 8vo. Paris. Benedicti Haefteri Monaſticæ Diſquiſitiones; 1644, fol. Antwerpiæ. Horloge magnetique, elliptique ou ovale nouveau, pour trouver les Heures du Jour & de la Nuit, par Pierre Georges; 1660, 8vo. Toul. P. Gaſparis Schotti Soc. Jeſu, Technica Curioſa, ſeu Mirabilia Artis; 1664; 4to. Herbipoli. Chriſtiani Hugenii Zulichemii Horologium oſcillatorium; 1673. Pariſiis. Lectiones Cutlerianæ, by R. Hooke; 1673. London. 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Commiſſioners of Longitude; 1806, 4to. with plates. London. Mr. Dalrymple's pamphlet; 1806. Appeal by Sir Joſeph Banks; 1806. Dr. Maſkelyne's Anſwer; 1806.

CHRONOMETER, or *Time-keeper*, by Harriſon. It was our intention to have given a perſpective drawing of one of Mr. James Harriſon's chronometers, or time-keepers, with a correſponding deſcription, but on an application by our draftſman to the aſtronomer royal to inſpect the interior parts of one of the machines, by the maker in queſtion, placed at the Obſervatory, he was informed that permiſſion to undo any of the covers or other parts of the mechaniſm could not be granted; we muſt therefore ſatisfy ourſelves with a verbal deſcription of the conſtruction, which, indeed, it is preſumed, will be deemed ſufficient, now that preferable conſtructions have been more recently adopted. We might, it is true, have copied the plans given in the ten plates of the pamphlet entitled the "Principles of Mr. Harriſon's Time-keeper," but ſome of them are ſo imperfectly explained, as to be unintelligible to any reader, except perhaps to ſuch as may have had occaſion to examine the original mechaniſm, and therefore would not be ſatisfactory to the public. The following particulars, relating to the dimenſions and other properties of the mechaniſm, apply more particularly to the *fourth* piece made by the inventor, and are extracted chiefly from the pamphlet juſt mentioned. The firſt obſervable diſtinction between Harriſon's train of wheel-work and that of an ordinary watch, is, that the numbers of his wheels and pinions are higher than had been uſual, as will appear from the ſubjoined arrangement, viz.

Firſt or great wheel 96
Center pinion acting
with it - - - 21—120 ſecond wheel, which is concave
Its pinion 18—144 third wheel,
Its pinion 16—120 contrate wheel,
Bal. wheel pinion 12—15 bal. wheel,
2 pallets

If theſe numbers be examined according to our mode of *notation* under the article CLOCK-*Making*, the value of the train will be $\frac{120 \times 144 \times 120 \times 15 \times 2}{18 \times 16 \times 12} = 1800$ vibrations in an hour, or juſt five vibrations in each ſecond. The firſt or great wheel will revolve in $\frac{96}{21}$ of an hour, or make one revolution, along with the fuſee, in $4\frac{4}{7}$ hours, ſo that $5\frac{1}{4}$ turns or ſpirals on the fuſee will maintain a motion of 24 hours, $6\frac{1}{4}$ will actuate the works $28\frac{4}{7}$, and $6\frac{9}{16}$ juſt 30 hours.

The balance-wheel does not differ eſſentially from that in a common watch, but peculiar care is neceſſary in ſhaping the pallets, as will be ſeen more particularly under the article ESCAPEMENT.

The bad effect produced in ordinary watches by an irregular tranſmiſſion of the maintaining power through the train, is here guarded againſt by the introduction of a ſlender ſpring, or remontoir, which is wound up eight times every minute by the maintaining power, or main-ſpring, and which actuates the contrate and balance-wheels, and conſequently impels the pallets with a conſtant impulſe, independently of the maintaining power, the latter being employed for no other purpoſe but for winding up the former as before ſpecified. This ſlender ſpring, which is ten inches long, though it weighs only $3\frac{1}{2}$ grains, is coiled in a ſpring barrel, apparently concentric with the contrate-wheel, and has its outer end attached to a hook in the barrel, with its inner end attached to another hook on the contrate-wheel. In order to make this delicate ſpring anſwer its purpoſe perpetually, two wheels, and as many pinions, in addition to the foregoing train, called the fourth and fifth wheel, and fourth and fifth pinion, are introduced in connection with a fly; as is likewiſe a detent with five arms, reſembling a ſtar, turning on the pivots of a common arbor. The action of theſe parts is not eaſily underſtood, even from a reference to the original drawings, much leſs from a verbal deſcription; but the intelligent reader will form a general idea from being told, that there are eight pins placed equidiſtantly on the plane of the contrate-wheel in a ſmall circle round the arbor; that one of the five arms of the detent acts with theſe ſucceſſively as the wheel itſelf revolves; that a ſecond arm carries a ſmall roller acting againſt a piece of braſs on the fifth wheel; that a third is bent at the end ſo as to catch a pin in the rim of the fifth wheel; and that the fourth and fifth arms are mere counterpoiſes to the other three, to preſerve an equilibrium. The numbers of theſe wheels and pinions appear to be as follow: of the fourth wheel 112, which ſtands concentrically over the contrate-wheel and ſpring-barrel, of its pinion 14, of the fifth wheel 104, and of its pinion 12; and it is to the arbor of this laſt pinion, we preſume, that the fly is attached, though it does not appear evident either from the drawings or deſcription, at leaſt to our apprehenſion. The mode of applying the three effective arms of the detent bears ſome reſemblance to the action of the detents in the ſtriking part of a clock, in which the count-wheel is uſed inſtead of a ſnail, and where the locking and unlocking are alternately effected at meaſured intervals of time. The detached eſcapements, however, have now rendered this complex mechaniſm ſuperfluous, and, indeed, it is manifeſt that the propoſed object, of having a completely detached power to act alike at all times on the pallets, is not thus perfectly effected; for the locking and unlocking eight times in every minute, to be produced by the ſlender ſpring in queſtion, muſt be ſuppoſed to interfere in a certain degree with its regularity of action on the pallets; and if it ſhould be contended, that the eight deductions from the force of the ſpring are regular and periodical in every minute, and that therefore they produce an equable effect, yet the ſame argument may be uſed in favour of a well made train, in which the irregularities in the tranſmiſſion of force from the main-ſpring may likewiſe be periodical, the wheels and pinions not being compoſed of *prime* numbers.

But it was not enough for Harriſon, that nearly an equable force was applied to maintain the motion of the balance, while the balance itſelf and alſo the balance ſpring were ſubject to alterations in their dimenſions by changes of temperature; he well knew that the ſpiral ſpring uſed in watches, had more power when contracted, and leſs when elongated, than a mean power, and alſo that an enlarged balance has a greater momentum than a diminiſhed one, and *vice verſâ*; the mode alſo of effecting an adjuſtment to counteract the conſequent loſs or gain in the rate of going, was well known not only to him, but to all watch-makers, and mechanically applied with ſucceſs, as at the preſent day, by a moveable ſtud to limit the effective length of the ſpring; but this adjuſtment was not a *ſelf-acting* one, an index was required to be moved by a manual operation, which index was connected with the moveable ſtud, and pointed out the quantity of the adjuſtment; it remained for Harriſon to deviſe a mode of action, entirely dependent on the ſtate of the atmoſphere at any moment, which of itſelf, would produce the requiſite adjuſtment; this he did, as we have already ſaid, by riveting together a ſlip of braſs and a ſlip of ſteel, which two metals are of unequal expanſibilities, to the remote end of which compound bar he attached his clip to hold the exterior thread of his ſpring, after the outer end of it had paſſed through and been pinned to a ſtud of braſs attached to the upper plate of the frame; the conſequence proved, what none but a real genius would have foreſeen, that the braſs elongating and contracting alternately in oppoſite temperatures more than the ſteel, produced a curvature in the compound piece, the concave ſide of which was always occupied by the metal leaſt elongated, that is, by the ſteel in hot, and by the braſs in cold weather; hence the compound piece, which carried the ſtud backwards and forwards, was called a *kirb*, a Lincolnſhire word for *curb*, which contrivance is deſtined to curb or command the effective length of the regulating ſpring. The only material objection that experience has pointed out againſt this ſelf-compenſating mechaniſm, is, as we have before obſerved, that ſmall pieces of metal and pieces in motion do not alter their temperature at the ſame time with large pieces and pieces in motion; nor yet ſteel ſo ſoon as braſs, even in ſimilar circumſtances; which conſideration conſtitutes an objection to the uſe of the thermometrical curb; an objection firſt raiſed by Harriſon himſelf, when it was greatly his intereſt to have ſuppreſſed ſuch a ſuggeſtion, as he was a candidate for the parliamentary reward. Vide COMPENSATION-*balance*.

Harriſon had beſides remarked that in an ordinary watch the power which the main ſpring has over the balance, through the medium of the train, compared with the power that the regulating ſpring has over the ſame, is as *one* to *three* generally; this power from the main ſpring, he obſerved, being ſufficient to put the watch in motion from a ſtate of quieſcence, muſt be too imperious for the balance, ſmall and light as it was, to control it; accordingly he propoſed, reaſoning thus *a priori*, to give an additional momentum to his balance, compared with his maintaining power: but momentum was to be attained in three different ways, namely, by additional weight given to a balance of the uſual diameter, by enlarging the diameter without increaſing the weight, or laſtly, by increaſing both in a certain degree: the firſt mode was objectionable on account of the friction likely to be produced on the balance-pivots by a heavy balance; the ſecond was alſo objectionable on account of the reſiſtance of the air it was likely to experience; and therefore he fixed upon the laſt mode of gaining momentum, by partly enlarging the diameter, and partly increaſing the weight of the balance in uſe; by which means he conſtructed a balance over which the force from the maintaining power of the remontoir has not more than *one-eightieth* part of the dominion that the balance-ſpring has. Hence in the time-keeper there is not force enough in the maintaining power to excite motion from a quieſcent ſtate, though there is power enough to overcome all the obſtacles to continued motion, and to keep the piece going, when put in motion.

The balance of the time-keeper before us is deſcribed to be of more than three times the weight of that of a large ordinary watch, and of three times its diameter; for, according to the notes taken by Dr. Maſkelyne, at the time of its examination, its diameter was $2\frac{1}{4}$ inches, and that of the plate $3\frac{8}{10}$; hence a point in its circumference will paſs through 24 inches, or about four times the ſpace of an ordinary watch, in each ſecond, as Harriſon calculates from the arc of its vibration; an advantage which has not been loſt ſight of by ſome of the modern makers of chronometers; and it may be conſidered as an axiom in chronometry, that the perfection of a balance, conſidered ſimply as a regulator, independently of its compenſation-mechaniſm, conſiſts in its having the greateſt poſſible quantum of momentum with the leaſt force from the train, and ſmalleſt quantity of friction and reſiſtance from the air.

Notwithſtanding, however, the above-mentioned contrivances in the conſtruction of the balance, others were ſtill wanting. Harriſon inferred that large arcs were deſcribed in leſs time than ſmall ones, from the circumſtance of the piece going ſlower in a vertical poſition than in a horizontal one, where the vibrations were obſerved to be viſibly longer, before any correction was applied; he therefore wanted, moreover, a compenſation for the errors of poſition. The time-piece, he obſerved, did not go alike when in a vertical poſition, the hours III, VI, IX, and XIII, were ſucceſſively uppermoſt, which defect he remedied by making the relative weights or dimenſions different, at different ſides of the balance, thereby equalizing the arcs of vibration in each vertical poſition. Again, to render the time of an horizontal vibration equal to that of a vertical one, he introduced a contrivance which he calls a cycloid-pin, which, when in contact with the regulating ſpring, quickens its vibrations; but as the longeſt vibrations ſeemed to require ſuch ſecondary aſſiſtance the leaſt, in thoſe the ſpring left the pin for a longer time than in the ſmaller arcs of vibration, and therefore they were leſs affected by it. This cycloid-pin is very imperfectly deſcribed in the account of the plates, and, it appears, was added to the piece ſent on trial to Jamaica, after its return; and it appears by no means certain, that any good end was obtained by its adoption. The idea of uſing adjuſtments for poſition, however, has proved of permanent utility. It may be neceſſary to add here, what will appear extraordinary, that there was no adjuſtment for mean time in Harriſon's time-keeper, the compenſation curb having uſurped its place; but he profeſſed to be able in general to aſcertain its comparative rate of going by his regulator, or gridiron pendulum clock, near enough in three hours; and to apply the daily error in ſeconds to the time indicated, plus or minus, as the caſe might be; of courſe a longer trial was neceſſary for a very nice rate, before a voyage was commenced. Still it was neceſſary in a machine profeſſing to meaſure the conſtant lapſe of time perfectly, that it ſhould not ceaſe to go while the main-ſpring was in the act of being wound up; here was another field for our artiſan's ingenuity; but with a great genius, as with a great warrior, or ſtateſman, difficulties thrown in the way only tend to call forth the reſources of an active and inventive mind; the auxiliary ſpring was the reſult of our inventor's ſagacity, and the fuſee itſelf, which before had been ſhapen to equalize the varying force of the main ſpring in its different ſtates of tenſion, was now made to contain moreover within it a ſecond ſpring, ſo bent in a contrary direction, that the force exerted by the firſt or main-ſpring wound it up to a reſiſting force exactly equal to the power neceſſary to be exerted on the train, before this power began to be tranſmitted further along the train. The contrivance will not be eaſily underſtood by a verbal deſcription, except by men converſant in watch-work; it is thus; a concave ratchet with 55 teeth, is fixed to the inſide of the large end of the fuſee, the concavity of which is ſufficiently large in diameter to admit the ſecondary ſpring-barrel within it, into the cavity of the fuſee; a ſecond ratchet of 75 teeth, at the outer edge, inclined in an oppoſite direction to thoſe of the ratchet 55, and having the ſecondary ſpring-barrel attached to it, is placed contiguous to the great wheel of 96, plane to plane, and revolves on a tubular piece projecting from the plane of the great wheel; it does not appear how the click of the concave ratchet is placed to act with its teeth at the inner edge, but this click is no doubt placed on the plane of the large ratchet of 75, or on the barrel; the inner end of the ſecondary ſpring is hooked to the tubular piece on which the barrel and large ratchet attached to it revolve, and the outer end, as uſual we preſume, to the ſide of the barrel within. There are two clicks to the large ratchet, one on each of its circumferences, which clicks are faſt to the plane of the frame-plate, together with their reſpective ſprings. The parts being thus connected, and the barrel inſerted into the cavity of the fuſee, the effect produced is this; ſuppoſe the key applied to the ſquare of the fuſee arbor to wind the piece up, the inclined teeth of the ratchet ſlide along the end of the click in this retrograde motion of the fuſee, during the act of winding, and no impediment occurs to free motion of the fuſee until the *garde* (or guard,) gives notice of the concluſion of winding; but let the key be withdrawn, and it will be obſerved, that the main-ſpring by its effort to relax, will urge the fuſee, in a direction contrary to the motion of winding, till ſome obſtacle oppoſe its motion; that obſtacle is the click of the concave ratchet, which if fixed in a ſtationary ſituation, would inſtantly arreſt the ſaid returning motion of the fuſee; but we have ſaid the click is fixed to the large ratchet or attached barrel, which contains, we will ſuppoſe, a relaxed ſpring; the returning motion of the fuſee, therefore, goes on, after the ratchet of 55 has caught its click, until the ſecondary relaxed ſpring in the little barrel is wound up as far as the ſtrength of the main-ſpring will wind it; the inner end of the ſecondary ſpring at that inſtant begins to act on the tubular projection of the great wheel, which may be called the barrel arbor, and urges it on as though the click had been fixed to the great wheel, and as though there had been no large ratchet, which Harriſon calls the perpetual ratchet, nor any ſecondary ſpring interpoſed between the firſt ratchet and the great wheel; and thus it is that the power is continually tranſmitted through the medium of an *intenſe* ſpring, after it has been firſt wound up from a ſtate of relaxation. Conceive again the key applied for the ſecond winding as before; the returning motion of the fuſee will now be but little, becauſe the ſecondary ſpring has been already wound up; but the effect of the contrivance here becomes evident; the ſecondary ſpring being previouſly wound up, the two clicks of the large ratchet of 75, to which the ſecondary ſpring-barrel is attached, keep it from relaxing, while the preſſure of the main-ſpring is taken off by the act of winding; the force of this ſecondary ſpring, however, will exert itſelf ſomewhere to return to its natural ſtate, and becauſe the motion of the ſpring is ſtopped at the outer end, by the juſt mentioned clicks preventing the returning motion of the large or perpetual ratchet, the inner end of it will exert its whole force on the pin of the tubular part of the great wheel, conſidered as the barrel's arbor, and will thus impel the great wheel for a limited time with the ſame force with which it was acted upon itſelf, when wound up to the extreme, that is, with the whole force of the maintaining power to which it becomes a temporary equivalent. Thus we ſee four ſprings were uſed by Harriſon, which we are told were all made by Maberley, except the balance-ſpring that required rubbing away till it was found of a proper ſtrength to regulate for mean time nearly; the temper was given to this ſpring and the ſteel pinions by a melted mixture of one pewter and ſixteen lead; and to the balance ſpindle by a mixture of one pewter and twelve lead, the latter of which mixtures, in a ſtate of fuſion, the author ſays, is equal to 567° of Fahrenheit.

The effect of the thermometrical curb was increaſed by rubbing the ſides thinner, and decreaſed by thickening the edge with a burniſher.

The fuſee has 6¼ turns; the pivot-holes are all buſhed with rubies containing pieces of diamond at the bottom of each; and the pallets are of diamond. The fly at the fifth pinion is uſed to regulate the velocity with which the ſpring at the contrate-wheel is wound up every eighth part of a minute by the main-ſpring when unlocked. The dial-work is $\frac{112}{28} \times \frac{96}{32} = 12$, and the ſeconds are concentric by means of a wheel of 104 attached to the contrate-wheel driving another of the ſame number round an outer cannon in the centre.

The firſt time keeper which Harriſon made was in 1726, which Dr. Hutton aſſerts, did not err a ſecond in a month for ten years together; but the firſt time that one was publicly tried, was in a voyage to Liſbon, in the year 1736, which, being placed in a box, hung in gimbols, anſwered his expectation, and corrected the dead reckoning about a degree and a half; in conſequence of which, according to Dr. Mackay, the board of longitude granted him a gratuity, and deſired him to proſecute his labours.

In 1739, he finiſhed a ſecond piece more perfect than the firſt. and in 1749, according to Dr. Mackay, (but according to Dr. Hutton, in 1758,) a third, which was pronounced more ſimple in its conſtruction than either of the former; but his labours did not ſtop here; in 1761, his fourth piece, of which we have given a deſcription as nearly as we could without perſpective drawings, was produced for trial, and Mr. William Harriſon, the ſon, offered to take charge of it, in a voyage to and from Jamaica, which was accordingly performed in this and the following years. Mr. Robertſon, maſter of the Academy at Portſmouth, was fixed upon to take the rate of this piece, which he did, and reported that, on the 6th of November, 1761, at noon, it was 3^s ſlow after having loſt 24^s in nine days on mean ſolar time. The Deptford, in which ſhip the voyage was made, left Portſmouth on the 18th of the ſame month, and arrived at Madeira on the 9th of December following, when it was found that the reckoning was corrected by the time of the piece about a degree and a half. In the run from Madeira to Jamaica the reckoning was corrected 3°: and at the ſeveral iſlands, where the ſhip touched, the known longitudes agreed very nearly with thoſe given by the time-keeper. On Jan. 19th, 1762, the ſhip arrived at Jamaica; the time of mean noon was obſerved, by equal altitudes, at Port Royal, on the 26th of the ſame month, which, according to the piece, was $4^h\ 59^m\ 7^s.5$; but the original error on the 6th of November, 81 days, 5 hours before, was 3^s ſlow, this quantity, therefore, was to be applied as a correction, together with the accumulation of the daily error of $\frac{24}{9}$ in $81^d\ 5^h$, viz. $3^m\ 36^s.5$; this ſum of $3^m\ 39^s.3$ added to the time indicated, which, it has been ſaid, was $4^h\ 59^m\ 7^s.5$, make $5^h\ 2^m\ 47^s$ for the difference of longitude between Portſmouth and Port Royal; which determination was only 4^s of time leſs than the determination at Kingſton of the ſame, from the tranſit of Mercury over the ſun's diſc. This ſmall error in time correſponds to leſs than one nautical mile in the parallel of Jamaica.

The Merlin, on board of which the piece was now put, ſet ſail from Jamaica on the 28th of January, 1762, and experienced ſuch a violent ſtorm in the paſſage, as obliged young Harriſon to remove his piece into an expoſed ſituation; however, the ſhip arrived at Portſmouth on the 26th of March, and on the 2d of April the time of mean noon was found, from equal altitudes, to be $11^h\ 51^m\ 31^s.5$, to which its former error of 3^s, together with the accumulation of the daily error, viz. $\frac{24^s \times 147^d}{9} = 6^m\ 32^s$ being added, make the time of mean noon by the time-keeper $11^h\ 58^m\ 6^s.5$.

From this report it appears, that from Nov. 6th, 1761, to April 2d, 1762, though the piece had experienced many violent agitations at ſea, and had been expoſed to great changes of temperature, the whole error amounted to only $1^{m}\ 53^{s}.5$, or $28\frac{1}{3}$ of longitude on the equator, which quantity, (one ſecond leſs than Dr. Hutton has ſtated), is not quite 18 nautical miles in the parallel of Portſmouth.

Though various objections were made to this trial, principally ariſing from the obſervations by which the longitude of Portſmouth and Jamaica had been aſcertained, yet Harriſon, we are informed, obtained a reward upon it from parliament of 5000l., and was ordered to make a ſecond trial to Barbadoes. But previouſly to the ſecond trial to the Weſt Indies, the Board of Longitude, on the 17th of Auguſt, 1762, wiſhed to place Harriſon's piece in the hands of the aſtronomer royal, at that time Mr. Bliſs, for trial at the Obſervatory, which wiſh was not complied with, by reaſon of ſome alteration to be made, probably by adding the cycloid-pin to aid the regulating ſpring; the ſame wiſh was repeated by the Board at their ſitting on the 4th of Auguſt of the year 1763, which was again not complied with by the jun. Harriſon, by reaſon of his not being yet ſufficiently rewarded; however, on being deſired to ſend the rate of going of his time-keeper, ſealed up, to the ſecretary of the Admiralty, previouſly to his ſailing, he conſented to this requeſt, and propoſed to abide by the ſealed rate on the trial to Barbadoes, which had been propoſed. The annexed is a verbal copy of Mr. W. Harriſon's declaration of the rate of going, or, more properly ſpeaking, of the daily error of the time-keeper, to the Board of Longitude, dated Portſmouth, March 26th, 1764.

"My Lords and Gentlemen,

In obedience to your inſtructions, dated the 9th of Aug. 1763, I humbly certify that I do expect the rate of the going of the time-keeper will be as followeth; viz.

When the thermometer (Fahrenheit's, no doubt,) is at 42° it will gain 3 ſeconds in every 24 hours.

When the thermometer is at 52°, it will gain 2 ſeconds in every 24 hours.

When the thermometer is at 62°, it will gain 1 ſecond in every 24 hours.

When the thermometer is at 72°, it will neither gain nor loſe.

When the thermometer is at 82°, it will loſe 1 ſecond in every 24 hours.

Since my laſt voyage we have made ſome improvement in the time-keeper; in conſequence of which, the proviſion to counterbalance the effects of heat and cold, has been made anew; and for the want of a little more time, we could not get it quite adjuſted; for which reaſon the above allowances are neceſſary. This is its preſent ſtate; and as the inequalities are ſo ſmall, I will abide by the rate of its gaining, on a mean, one ſecond a day for the voyage. I would not be underſtood, that it will always require ſo long time to bring thoſe machines to perfection; for it is well known to be much harder to beat out a new road, than it is to follow that road when made. During the time of this experiment, the mean height of the thermometer ſhall be each day carefully noted down, and certified, which I will lay before the Board at my return. I am, &c.

WILLIAM HARRISON."

After having compared the time-piece with Mr. Short's regulator, in Surry-ſtreet, London, which had its error newly aſcertained by an excellent tranſit inſtrument, Mr. Harriſon junior went on board the Tartar on the 13th of February 1764, and proceeded to Portſmouth, where he again compared it with an aſtronomical clock in Mr. James Bradley's temporary obſervatory. It may not be foreign to our purpoſe to mention here, that the obſervatory juſt ſpoken of, was fitted up for the expreſs purpoſe of obſerving the eclipſes of Jupiter's ſatellites, as well as of keeping the clock in juſt time, in order that, to avoid future objections, the obſervations to be made by Meſſrs. Maſkelyne and Green, at Barbadoes, on the ſame ſatellites, particularly the firſt, when compared with Bradley's, might aſcertain the comparative longitudes of theſe two places, which was accordingly determined to be $3^{h}\ 54^{m}\ 20^{s}$.

Before leaving Portſmouth, which took place on the 28th of March 1764, Mr. Harriſon took the rate of his time-keeper by equal altitudes, employed between the 29th of February and the 26th of March; and on April the 18th found, from comparing his obſervations of the ſun at 4 P. M. at the ſhip, with the corrected time given by it, that the ſhip was at that inſtant only 43 miles eaſtward of Porto Santo, in conſequence of which determination, ſir John Lindſay, the maſter, ſteered accordingly, and ſaw the iſland in queſtion before him at one o'clock the next morning, agreeably to expectation. On the 13th of May, the veſſel arrived at Barbadoes, and on the four following days its error was aſcertained by Meſſrs. Maſkelyne and Green by equal altitudes of the ſun, and alſo by a compariſon with the aſtronomical clock at the obſervatory near Bridgetown; and it was found that the amount of the daily deviations from mean time was only 43' in exceſs, or $10\frac{3}{4}'$ of a degree in longitude. Mr. Harriſon ſet out on his return from Barbadoes in the New Elizabeth on the 4th of June; and, arriving at Surry ſtairs on the Thames, on July the 18th, found, from a compariſon with Mr. Short's clock, the error of which had been aſcertained on the very day, that the whole gain in the 156 days was only 54^{s}, allowing the ſealed rate, of one ſecond gain per day, as a correction: and it has been obſerved, that, if the allowances had been moreover made for the ſtate of the thermometer, as ſtated in the declaration, the piece in that caſe would have been found to have been about 15^{s} only at variance with mean time, and this in the oppoſite extreme. Soon after this very ſatisfactory trial, a committee of ſeven ſcientific gentlemen and mechanicians were appointed by the Board of Longitune for examining the principles of Mr. Harriſon's time-keeper, whoſe report was as follows: viz. "That Mr. Harriſon has taken his time-keeper to pieces, in preſence of us, and explained the principles and conſtruction thereof, and every thing relative thereto, to our entire ſatisfaction; and that he alſo did, to our ſatisfaction, anſwer every queſtion propoſed by us, or any of us, relative thereto; and that we have compared the drawings of the ſame with the parts, and do find that they perfectly correſpond." The committee were the Rev. N. Maſkelyne, Rev. John Mitchell, Rev. William Ludlam, Mr. John Bird, Mr. Thomas Mudge, Mr. Larcum Kendal, and Mr. William Matthews. Mr. Harriſon had then another 5000l. ordered him, with a promiſe that the reſidue of the whole parlimentary reward; which, by the act of queen Anne, was 20,000l., ſhould be given him when a proper perſon could be found to execute his plan with equal ſucceſs. Mr. Larcum Kendal, one of the committee already alluded to, undertook the taſk, and finiſhed a time-piece on the ſame conſtruction, or at leaſt on the ſame principles, which was approved by Mr. Wales, in his voyage in company with captain Cook in the years 1772, 1773, &c. and which Dr. Hutton ſays performed even better than Harriſon's, allowing for an acceleration in its rate. In conſequence of this ſucceſs, the parliament, to which an appeal was made, ordered the reſidue of the propoſed reward to be paid; in addition to which, the gratuities of the Board of Longitude, of the Eaſt India company, and of others, contributed to augment the whole ſum to about 24,000l.

It ſhould ſeem from Dr. Hutton's account, under the article *Longitude* of his Mathematical Dictionary, contrary to Dr. Mackay's authority in his book on the longitude, that the parliamentary rewards were made to the Harriſons by two equal payments of 10,000 l. each; to reconcile which accounts, we applied to Dr. Maſkelyne for authentic information, but, with his uſual reſerve, the Doctor declined giving us any information on the ſubject. The diſcrepancy in the dates of our two authorities, which agree in the whole amount, is not, however, of much importance. The compliment of the 20,000 l. was granted by parliament in the year 1774, and at the ſame time the new act paſſed for regulating the future rewards. For the credit of our ingenious countryman, we ſhould have been happy to cloſe our narrative of Mr. Harriſon's fourth time-piece here, but, as we profeſs to give an impartial detail of all the facts that have come to our knowledge, relative to the different trials made of it, we are under the neceſſity of adding a further notice, which is calculated to detract conſiderably from its merit, that might ſeem to have been already indubitably eſtabliſhed. Though the piece had agreed with the longitudes of Portſmouth, Jamaica, and Barbadoes, to a great nicety, and had alſo accorded very well with the known longitudes of ſome intermediate iſlands, yet it was by no means certain that the reſults would have been ſo exact if taken on intermediate days; or, in other words, a coincidence of the rate with mean time at the end of the voyage, was no proof that there muſt have been the ſame coincidence in every part of it: to put the piece, therefore, to a more rigorous teſt, the Board of Longitude, held April 26, 1766, came to a reſolution to have it examined at the Royal Obſervatory from nearly the beginning of May of that year, to the end of February of the year following; accordingly, Dr. Maſkelyne received the piece from the hands of Philip Stephens, Eſq. now Sir Philip Stephens, who was at that time ſecretary to the Admiralty, on the 5th of May, and, in the preſence of Captain Thomas Baillie, of the Royal Hoſpital, Greenwich; of Mr. John Ibbetſon, ſecretary to the Board of Longitude; and of Mr. Larcum Kendal already mentioned, it was depoſited in a deal box made purpoſely to contain it, with a glaſs cover made ſecure with putty. The box had two locks of different wards, and two keys to each lock; alſo a pane of glaſs in the ſide ſecured with putty; and whenever the piece was afterwards wound up, one of the keys was uſed by Dr. Maſkelyne, or one of his aſſiſtants, Joſeph Dymond and William Bayly, and the other by Captain Baillie, or one of the officers at Greenwich Hoſpital; and the conſtant formality of a written teſtimony was uſed, we are told, not only when the piece was wound up, but alſo when a compariſon of the rates of it and the obſervatory regulator was taken and regiſtered. Dr. Maſkelyne afterwards publiſhed the reſults, under the title of "The original Obſervations of the going of the Watch from Day to Day," in a quarto pamphlet, from which we have extracted, or rather deduced, the ſubjoined notices. The trial commenced on the 6th of May, 1766, and ended on the 1ſt of March, 1767, including a ſpace of 298 days, in which period the piece gained on mean ſolar time 1^{h} 10^{m} 27^{s}.5; this accumulated error, divided by 298, gives 14^{s}.2 very nearly, for the rate, or mean daily gain. On examining the different columns of the pamphlet, and the calculations grounded thereon, to aſcertain the daily errors, both of the regulator and time-piece, as compared with the ſolar tranſits properly equated, we find a daily gain of the piece on mean time, on June 8th, amounting to 30^{s}.2, or more than half a minute; which greateſt deviation was when it was in a vertical poſition with XII. higheſt, and the thermometer at 60°; the barometer being at the ſame time at 29.9; but on ſome other days the piece was, on the contrary, loſing, particularly in January 1767, when the thermometer was down at the freezing point; on one day in particular, the 4th, the daily loſs was as much as 6^{s}.5, when the poſition was horizontal with the face upwards. Dr. Hutton, ſpeaking of this trial, has ſaid in his Dictionary, that "the watch was now found to go faſter than during the voyage to and from Barbadoes, by 18 or 19 ſeconds in 24 hours;" this obſervation, however, is only accurate for the months of May, July, and about the end of October and beginning of November, and that when the poſition was horizontal and face upwards; but, even in this poſition, the temperature, in other months, produced conſiderable irregularity in the daily rate. Whenever the poſition was vertical, or inclined 20° from a horizontal line, the rate depended greatly on the hour of the dial plate that was uppermoſt, independently of temperature: from all which deductions, it is evident, that the time-piece wanted three adjuſtments to be made at the time of its trial at the obſervatory; viz. firſt an adjuſtment for an error of 14^{s}.2 in the mean rate, ſuppoſing the gains to have been equable at equal intervals of time; ſecondly, an adjuſtment for poſition; and, thirdly, an adjuſtment for temperature; and, indeed, we find, according to Dr. Hutton, that Harriſon "had altered the rate of its going, by trying ſome experiments, which he had not time to finiſh before he was *ordered* to *deliver up* the watch *to the Board*." Thus this trial, with all its precautions and formalities, was more calculated, perhaps, to prejudice the public opinion reſpecting the future dependence to be placed in a time-keeper, than to appreciate the intrinſic value of a well regulated and well adjuſted machine; and we cannot forbear adding, as our concluding remark, that Kendal's time-piece, tried and approved by Mr. Wales, was made after Harriſon's model during or after this trial; and that the inventor's ſubſequent appeal to parliament was attended ultimately with the deſired ſucceſs.

CHRONOMETER, or *Time-keeper*, by Mudge. *Plate* XIII. of *Horology*, contains ſo much of the eſſential parts of Mr. Thomas Mudge's time-keeper, as will enable the reader to form a competent idea of its conſtruction and manner of performance. In the "Deſcription of the Time-keeper," publiſhed in 1799, by Mr. Thomas Mudge, Jun. there are nine plates, eight of which are taken up in exhibiting the different plans and ſections of the various parts ſeen in different points of view; they were drawn by Mr. Pennington, the original workman employed by the two Mudges, father and ſon; but inſtead of copying any of the plates, except our figures 6 and 7, which are from his Plate II., we have judged it to be more deſirable to procure original drawings of a time-keeper, from one in the poſſeſſion of the ſaid Mr. Pennington, who now lives at the corner of Orchard Row, Camberwell, and who has obligingly given us his aſſiſtance as well as permiſſion to analyſe the piece. It is not neceſſary to give a particular account of the calliper of Mudge's time-keeper, as it does not differ in any material particular from that of the chronometers by other makers; nor is there any thing worthy of particular notice in the fuſee, different from that of an ordinary watch, except that there is the auxiliary ſpring making with it a *going fuſee* of the ordinary conſtruction. (See the deſcription of Brockbank's *Chronometer*.) The barrel however, which contains the main ſpring, is very ſimilar to Harriſon's, and differs from ordinary barrels. *Fig.* 6, repreſents this barrel with the chain coiled round, as it appears before it is wound up. A is the edge of the upper plate, and B of the pillar plate of the frame; the barrel is compoſed of two diſtinct parts, C and D, which together may be denominated an entire box, of which D is the body or box portion, and C the cover or lid; this lid C, which is attached to the arbor EF, is of itſelf, by Mr. Mudge, called the chain barrel, becauſe the chain is wound round it; and the box part, D, is alſo of itſelf called the ſpring barrel, becauſe it contains within it the main ſpring. A ſection of this *fig.* 6. is ſeen parallel to it in *fig.* 7, where the ſame letters imply the ſame parts; from the latter of which it appears clearly that the portion C of the greater diameter may revolve with its arbor EF, ſeparately from the other portion D. G in both *figs.* 6 and 7, denotes a ratchet-wheel made in form of a rim or broad ring, with its inclined teeth on the outer or convex circumference, and is ſoldered, or ſcrewed, to the lower end of the rim of the box D, in ſuch a way, that a very ſmall portion of the interior, or concave part, projects inwards into the box: this projecting part has a ſhoulder turned away in the lathe from its upper plane, which makes the part within the box thinner than the part without, as may be ſeen in *fig.* 7; the bottom of the box *a a* is detached, and is of a diameter juſt ſufficient to allow it to enter the inſide of the box; it has a correſponding ſhoulder turned in the lathe at the circumference on its lower plane, which ſhoulder reſts on the above deſcribed ſhoulder in the concave projecting part of the ratchet; the uſe of this contrivance is this; the box, with its looſe bottom in it, is placed on the plane of the plate A, and the bottom *aa*, perforated in the centre for the revolving arbor, is ſecured to it by two ſcrews or more, entering from the plate, ſo that though the box may be ſaid to be attached to the plate by its bottom, yet its rim is at liberty to turn along with the ratchet firmly faſtened to it, while the bottom is at reſt ſcrewed to the plate, and the motion of the ratchet will be free or impeded in proportion to the quantity of preſſure which the fixing ſcrews occaſion on the two ſhoulders already deſcribed. The parts being thus arranged, it is eaſy to conceive that a click, ſcrewed to the plate A at any convenient part of it, and taking into the teeth of the ratchet G, will hold the box, or ſpring-barrel, from going in a retrograde direction, as well as if the box itſelf had been ſcrewed to the plate A, but it will ſtill be at liberty to revolve in the contrary direction on the application of any external force to it. Suppoſe now the outer end of the ſpring, hooked as uſual, to the interior ſide of the barrel or box oppoſite D, while the inner end is hooked on a pin in the arbor within the box alſo; the conſequence will be, that the chain, which is coiled round its barrel or lid C, being wound away by the fuſee, in the act of winding, will pull the arbor round, and its force will apply directly to the interior end of the main ſpring firſt, becauſe this is hooked to the arbor, and the coils of the ſpring will follow one another ſucceſſively up to the centre, as the intenſity of the ſpring is increaſed by winding; whereas, in ordinary watches, where the ſpring-barrel itſelf revolves without the arbor, the outer end of the ſpring is firſt acted upon in winding up, and the coils near the centre are laſt affected by the force that winds. When the ſpring requires to be ſet up or down, it is done by turning the ſpring-barrel and ratchet together with the contained ſpring, while the click is raiſed from the teeth of the ratchet, the arbor of the chain-barrel then being ſtationary, or revolving no otherwiſe than according to the ſlow motion which the train regulates. The chain is wound round the fuſee in a direction which actuates the wheels of the train in a backward manner, compared with the motion of an ordinary train, which direction of motion requires an additional wheel in the dial work; for a ſmall wheel of 45 fixed to the arbor of the contrate wheel drives another of the ſame number of teeth in a proper direction for indicating ſeconds, on a ſeparate graduated circle, at a diſtance from the centre of the face; nor is the ſecond, uſually called the centre wheel, placed in the centre of the hour and minute circles, as is common in watches; though oppoſite the centre of the face; but its prolonged pivot bears a minute wheel of 52, driving a ſimilar detached minute wheel, and alſo an attached pinion of 8 driving an hour wheel of 96, both which driven wheels have cannons to carry their reſpective hands round two concentric circles, placed at the other ſide of the centre of the dial. This method of placing the hands allows the contrate and centre wheels to have ſmall pivots. The numbers of the movement publiſhed by Mudge are as follow: viz. the great wheel has 100 teeth, the pinion acting with it 20, the centre wheel or ſecond wheel 120, the next pinion 16, the third wheel 120, the pinion driven by it 15, the contrate wheel 120, the pinion driven by it 12, balance wheel 15, pallets 2; whence it ſeems that the fuſee revolves in $\frac{100}{20}$ or 5 hours, and the contrate wheel in $\frac{120}{16} \times \frac{120}{15} = \frac{60}{1}$, or 60 times in the hour, and the value of the train is, according to our method of eſtimating Harriſon's train, $\frac{120 \times 120 \times 120 \times 15 \times 2}{16 \times 15 \times 12} = 18000$ vibrations in each hour, or five in each ſecond. With this movement a fuſee with $7\frac{1}{5}$ turns or ſpirals in the groove, actuates the piece 36 hours; but there is a face laid down in Mudge's book for a continuance of eight days, the circles for the hours and minutes in which are at oppoſite ſides of the prolonged pivot of the centre wheel arbor, and the hour circle counts up to 24, which is certainly more convenient for aſtronomical calculations, than one with only 12 hours. On ſearching for an account of the train of this conſtruction, we are only informed, by Mr. Mudge, jun. that ſuch of the time-keepers as went eight days, were charged higher than thoſe which continued at one winding only 36 hours; but the numbers of the movement are not given by him; on application to Mr. Pennington, however, we have been favoured with them, which are as follow, viz. great wheel 108, pinion on the centre wheel 12, centre wheel 128, pinion following 12, ſecond wheel of the train, or third of the whole movement 120, pinion driven by it on the next arbor 12, contrate wheel 120, pinion following on the balance wheel arbor 12, crown wheel 15, pallets 2; ſo that the value of the train is $\frac{128 \times 120 \times 120 \times 15 \times 2 = 55296000}{12 \times 12 \times 12 \;\; 1728} = 32000$, on a ſuppoſition that the centre wheel revolves in an hour; but we find from the dial-work, which has what is called *borrowed minutes*, that this wheel revolves in $\frac{112}{63}$ of an hour or in 1.7 hours, therefore $\frac{63}{112}$ of 32000 = 18000 is the true train by the wheels and pinions before us; the hour hand revolves in $\frac{135}{10}$ of $1^h.7 = 24^h$; and the fuſee revolves in $\frac{112}{63} \times \frac{108}{12}$ of an hour, which is = 16 hours; therefore a fuſee with juſt 12 turns will continue to go eight days, as was intended.

Fig. 1. of *Plate* XIII. is a perſpective view of the cock of Mudge's time-piece, ſuppoſed to be detached from the upper plate of the frame: the dotted ſpiral round the centre is the balance regulating-ſpring, to which there is a correſponding one underneath, called the compenſation-ſpring.

Directly over theſe ſprings is placed a ſmaller concentric frame ſupported by three pillars, *a, a, a,* on the principal cock, and bearing four friction-rollers, of which the centres are marked by four points at the extremities of the dotted ſpiral; theſe points are here ſuppoſed to be demitted from the ſame plate to the large cock, as the former is taken off to ſhow the ſpiral-ſpring; the pivot of the balance-arbor runs in the central point where the four rollers nearly meet, and touches the circumference of each, ſo as to produce a rotatory motion in each that leſſens the friction at the pivot; *b b* is a metallic ſliding-piece filed away on the ſide next the centre, to avoid the regulating-ſpring, and placed on the plane of the cock, to adjuſt one of the curb-pins for regulating the piece, which it carries underneath it; the cock has an oblong ſlit in it near the ſcrew at *b*, for the pin to move backwards and forwards during the act of adjuſtment, and the ſlider itſelf has two oblong ſlits, one at the ſaid ſcrew, and the other at one of the little frame pillars, which ſlits not only admit of a longitudinal motion of the ſlider, but alſo keep it in its due line of poſition during the motion of adjuſtment: at *c* is an arbour, ſquare at the end to admit a key, but round below, and has a fine ſcrew at the remote end, which preſſes againſt a ſtud *d* in the cock, where is a third opening for the ſtud, thereby moving the ſlider in conſequence of the part *e*, which is turned up at its end, being tapped to ſuit the ſcrew of the arbor of adjuſtment: on the middle of the ſaid arbor is a nut between *e* and *c*, divided into 30 on its edge, which is pointed to by a fixed line on a ſtationary piece adjoining, through which the arbor paſſes. There is, moreover, a ſcale, *f*, attached to the large cock, to which a line on the ſlider near *e* points as an index of adjuſtment, and moves one ſpace for every entire turn of the ſcrew, which is an addition of Pennington's to the original conſtruction. *g* is an horſe-ſhoe-ſpring placed on the cock to force back the ſlider, when the ſcrew has a retrograde motion. Theſe parts and their uſes, it is preſumed, will be eaſily apprehended from our drawing, without the variety of views which Mr. Mudge has given in his plates. The ſlider is held down to the plane of the cock by the ſcrew near *b* at the curb-pin, and alſo by a collet going over the ſtud *d*, and pinned on. There is a ſecond curb-pin fixed on a detent, or ſtraight piece of ſteel, riveted to the under ſide of the piece *h*, and croſſing the ſlider at right angles; this curb-pin is borne by the interior extremity of the detent, and the adjuſtment is made by the ſcrew and ſtuds *i* ſcrewed into the cock, and fitted ſideways into two notches in the piece *h*; the ſcrew on *h*, which holds the whole down, paſſes through an oblong hole, covered by its head, to admit of the adjuſtment of diſtance. The mechaniſm of this ſecond curb-pin, we fear, will not be very intelligible, as ſome of the parts are neceſſarily out of ſight: *k* is the ſtud of the regulating ſpring, and *l* a piece made purpoſely to cover the ſecond ſcrew of the large cock, which ſcrew, therefore, cannot be taken out for diſmounting the cock until this cover is taken off, and the cover itſelf cannot be removed till the regulating ſpring-ſtud is previouſly taken off: this precaution was neceſſary to prevent the derangement or breaking of the balance regulating-ſpring, one of which would follow, if the cock were diſmounted without the ſtud being firſt unſcrewed; the nature of the precaution is this; the cover *l* moves on its centre, below *b*, as on a pivot, and the round part at the upper end covers one of the two ſcrews of the cock, until the ſtud, embraced by the ſemi-circular fork of the other end, is removed, when the cover *l* then is at liberty: the other correſponding ſcrew for fixing the cock is viſible at the oppoſite projection above *c*. *Fig.* 2, repreſents the ſecond balance-ſpring and mechaniſm of compenſation for the effects of heat and cold, as they appear when the cock in *fig.* 1. is removed from the upper plate of the frame; *a a* is a piece of braſs ſcrewed to the plate by the three ſcrews *d, d, d*; *e* and *f* are two ſimilar compenſation-bars, compoſed of braſs and ſteel ſoldered together, with their poſitions reverſed; that is, the piece *e* has the braſs ſide next to *e*, and the piece *f* has the ſteel ſide next to *f*: theſe compound pieces, ſeen in a detached ſtate in *fig.* 3, with their interior curved ends paſſing each other, are ſcrewed, each by two ſcrews, at their outer ends, to the ſimilar pieces *g* and *g*, which are themſelves ſcrewed to the long piece *a a*, but in ſuch a way that they are adjuſtable, when their fixing ſcrews are not home; the adjuſtment is made by the two ſimilar horizontal ſcrews at *h* and *h*, which fit the ſtuds that appear at *i* and *i* in the oblong apertures of the pieces *g* and *g* left for the ſtuds; and by theſe, together with the narrow apertures, and two other ſmaller ſtuds *k* and *k*, one at each interior end of the ſaid pieces *g* and *g*, is preſerved the parallelism of the motion of adjuſtment: *l l* is a lever or detent, carrying a curb, or piece with two pins at the upper end, a little diſtance from the ſtud *m* of the regulating ſpring, and having a little curve to avoid the balance-verge, together with two ſhort levers or tails, near the rounded projection of the cocks *b* and *c*; this detent is fixed on an arbor, which is pivoted above into the cock *b*, and below into the foot *n* of the cock *c*, which is let down, out of ſight, through an aperture in the plate; the lever of the detent, however, is prolonged back to a conſiderable diſtance behind the cock to the end *q* of the croſs-piece of *a a*, on which is deſcribed a portion of a circle divided into 20 equal ſpaces, to indicate, as a thermometer, the ſituation of the curb at any particular time; which is another addition contrived by Pennington. Now the action of the compenſation-bars in the time-keeper, denominated *blue*, is this; becauſe braſs is more elongated by heat, and alſo more contracted by cold than ſteel, the former will be longer in ſummer and ſhorter in winter than the latter; the conſequence of which will be, (as we have already ſaid, when ſpeaking of Harriſon's compenſation mechaniſm, from which it ſhould ſeem the principle of this is borrowed,) that the metal moſt elongated will become convex in hot, and concave in cold weather; for inſtance, the compound bar *e*, with the braſs ſide next to *e*, will become concave in cold weather on the braſs ſide, and, its remote end being faſt by the ſcrews to the fixed piece *g*, the interior end will move forward to form the curve and preſs below the remote tail-piece of the detent, which detent will therefore move and bring the curb towards *o*, the other compound bar *f* in the mean time becoming convex on the ſide *f*, will make way for the motion of the other tail-piece that points to *e*, by falling back at the ſame rate with which the other bar moves forward; but in hot weather the contrary will take place, i. e. the interior end of the piece *f* will come forwards and preſs on the other remote tail-piece, and the end of the piece *e* will give way for the backward motion of the tail-piece pointing to *f*, the curb in the mean time having its motion in a direction towards *p*: the former of theſe two contrary motions of the curb will ſhorten the ſpiral-ſpring, or, at leaſt, the effective portion of it, as the curb limits its action, and the latter will lengthen the ſame: but it is well known, that a ſhort ſpring has greater force than a long one, *cæteris paribus*; likewiſe, that the altered momentum of the balance retards the rate in hot weather, and *vice verſâ*; hence, the increaſed force of the ſpring in cold weather thus becomes a compenſation for the ſluggiſh motion of the balance occaſioned by the ſame natural cauſe, and the contrary in the oppoſite extreme of temperature. Mr. Mudge junior might ſeem to have been guilty of an error in his "Deſcription, &c." page 169, of this part of his mechaniſm, but he is there deſcribing the time keeper *green*; the compenſation-bars in which were made to act with the tail-pieces of the detent, which point reſpectively *towards* them inſtead of thoſe which point *from* them: the nature of the action of the tail-pieces in *blue*, is, on the contrary, as we have deſcribed, and as is clearly ſeen by the view we have given of the poſition of theſe bars in *fig.* 3. There is an error in the account by Mudge of this part of his mechaniſm, where he aſſerts, that "the natural effect of heat is to leſſen the momentum of the balance: and of cold to increaſe it." We beg leave to obſerve on this, perhaps unguarded, aſſertion, that whatever cauſe enlarges the dimenſions of the balance muſt undoubtedly increaſe its momentum; and that heat has this effect is evident from the curve formed by the ſuperior elongation of braſs compared with the leſs expanſible metal, ſteel. Hence, the ſpiral is ſhortened by the curb in ſummer and lengthened in winter.

In *Fig.* 4 (*Plate* XIII.) *a* is a cock in which the upper pivot of the upper pallet runs; the cock *b* is that in which the lower pivot of the lower pallet runs; *c* is the cock, on the noſe of the potence, on which both thoſe pivots run that are near the axis of the balance-wheel; *d* is the cock in which one of the balance-pivots runs; *e* the cock for the other pivot of the balance-wheel; and *f* the potence ſcrewed to the under ſide of the upper plate, and bearing the ſmall cocks, nearly in the relative poſitions in which they ſtand in the figure; it may be proper to add, that the ſemicircular vertical excavation in *e* is to admit the arbors of the pallets within it, and that the pivot holes on theſe cocks are all jewelled.

Fig. 5 (*Plate* XIII.) exhibits a perſpective view of the balance, on an enlarged ſcale, which is in the original of half an inch diameter, together with the auxiliary ſprings which are ſubſtituted for the maintaining power, the balance-wheel, and the pallets. A B is the balance, and E F its verge, ſhaped like a crank, of which the pivots I and K run in two ſyſtems of rollers, that have each a little frame, one of which has already been deſcribed under our deſcription of *fig.* 1, to which the lower one, placed at K, and ſupported by a pillar fixed to the upper plate, is ſimilar: one of the croſſes of the balance bears a piece, M, to counterpoiſe the crank of the verge, and to keep the balance in equilibrio. C is the ſtud of the regulating ſpring, placed, as we have already ſeen, on the cock of the balance; and D is the ſtud of the compenſation-ſpring, ſcrewed to the upper plate of the frame; theſe two ſprings are both attached by their interior ends to the upper part of the verge above the crank, and have thin helices wound in the ſame direction. The reaſon why the verge has the ſhape of a crank, is, that the little cocks or bearing pieces, repreſented in *fig.* 4, may have room for being fixed in their reſpective ſituations to catch the pivots of the balance-wheel arbor, and of the two pallet-arbors, *c d* and *g h*, which arbors are exhibited in *fig.* 5, without their cocks, in order that the acting parts of the eſcapement may be preſented to view; *a* is a pin, projecting from the upper bend of the crank verge, which in its motion meets with another longer pin, *b*, made faſt to the arbor of the upper pallet, which pallet is ſeen a little curved with a ſmall bend or hook at the outer end, between the letters *c* and *d*: this pallet-arbor has the upper auxiliary ſpring fixed to it by its interior end, the outer end being pinned to the ſtud at H; G is the pallet-wheel with its arbor diſcontinued near the place where the contrate-wheel pinion is fixed. Mr. Nicholſon has given a very good account of the action of Mudge's eſcapement in the 2d volume of his Journal, 4to ſeries, page 57, but has repreſented the ſhape of the tooth in this balance-wheel ſimilar to that in an ordinary watch, which, indeed, Mr. Atwood had done before him in the Philoſophical Tranſactions of 1794; theſe authors have alſo omitted to mention the ſpring of compenſation, which we here notice, becauſe their readers would otherwiſe be at a loſs, from the view of the figure, to know how the compenſation for temperature is effected, or, indeed, whether there is any at all; their object being only the account of the ſprings as they related to the balance and eſcapement. Pennington, who made the drawing for Mr. Atwood's paper, tells us, however, that the ſhape given to the teeth is not of much importance. There is another pin, *e*, at the bottom of the crank, ſimilar to *a* above, and alſo a ſecond pallet-arbor, *g h*, carrying another pin, *f*, and a ſecond auxiliary ſpring, the outer end of which is pinned into the ſtud I: the helix of this ſpring is wound in a direction contrary to that of the upper auxiliary ſpring. We have endeavoured to give ſuch a perſpective repreſentation of the mechaniſm of eſcapement, together with the balance and compenſation, in one figure, as might exhibit to view all the parts of action; and the effect produced when the time-keeper goes, may be thus deſcribed.

There are ſix ſprings employed in the time-keeper: the main ſpring, the ſpring of the going-fuſee, the regulating or pendulum-ſpring pinned at C, the ſpring of compenſation pinned at D, and the two auxiliary ſprings on the two pallet-arbors; let us ſuppoſe all theſe ſprings exactly in their natural ſtate of quieſcence, and that the crank verge, and pins on the two bends of it, are ſo adjuſted as to reſt quietly againſt the pins *b* and *f* of the pallet-arbors: alſo let the two pallets be at liberty, one remaining in the ſpace diametrically oppoſite the acting tooth which reſts againſt the other, which will be the caſe as the number of teeth is an odd number (15); in this ſituation all the arbors will remain at reſt till ſome force is impreſſed on the balance-wheel, provided the piece be ſuffered to lie on a table; now wind up the main-ſpring, and the ſpring of the going-fuſee will be firſt put into a ſtate of intenſity, and then the power will be tranſmitted through the train, with ſome occaſional variations of intenſity, ariſing from the unavoidable friction of the teeth of the train, up to the balance-wheel, which will be impelled forward, till, puſhing againſt one of the pallets, ſay the upper one, it meets with ſome reſiſtance from the auxiliary ſpring on the pallet-arbor; however, the power of the main-ſpring is ſufficient to wind this auxiliary ſpring up till the tooth of the balance-wheel, ſliding on the concave ſide of the pallet, is ſtopped by the little hook at its extremity, which hook of the pallet now acts as a detent, and arreſts the further motion of the pallet-wheel as urged by the main-ſpring; the quantity that the pallet-arbor revolves during this ſhort action of the pallet-wheel, we are told, is about 27°. Now all is at reſt again, and would continue ſo, if no external force were to put the balance in motion: let therefore an impulſe be given to the balance ſufficient to make it move through a ſemi-vibration, which in one of the original machines was 133° with one of its balances, and 119 with another; during this ſemi-vibration, the pin *a* of the crank catches the pin *b* of the pallet-arbor at the 27th degree from the ſtate of quieſcence, and conſequently diſengages the pallet, and goes on winding up the auxiliary ſpring the remaining 106°, the balance-wheel in the mean time running on, on being diſengaged from the detaining pallet, by the impulſe of the main-ſpring, till it arrives at the hook of the lower pallet; but during this unreſtrained motion, it has no connection whatever with the balance; on which account it is that the eſcapement is called a detached one; detached, as it relates to the main-ſpring, except for the moment of unlocking,

locking, which is not more than $\frac{1}{25}$th part of the time of a vibration, but not detached, as it relates to the auxiliary ſpring, which is uſed as a ſubſtitute for the maintaining power; for we have ſeen that the pin in the crank of the balance verge impels the pin in the pallet-arbor all the time that the auxiliary ſpring is wound through a ſpace of 106°. The balance wheel by the impulſe of the main-ſpring having now urged the lower pallet till it is detained by the bend in its extremity, the pin *f* in the lower pallet-arbor has alſo in its turn been moved 27° from the place of reſt, in which ſituation it is now ready to be caught by the pin *e* in the lower bend of the crank verge; at length the balance begins to return from the point at 133°, the extremity of its vibration, and in its turn is impelled by the pin *b*, acting againſt the pin *a* of the crank, during the whole ſemi-vibration of 133°, ſo that it is itſelf impelled 27° more than it impels the pin, and the difference of the continuation of the two alternate impulſes conſtitutes the quantum of maintaining impulſe, that keeps the piece in continual motion; which quantum, in fact, is a deduction from the retarding force in the latter ſemi-arc of vibration, rather than an addition to the impulſive force in the firſt ſemi-arc. The balance-crank in its return on paſſing the point of original quieſcence, has done with the ſpring of the upper pallet, which now remains in the poſition we at firſt found it; but when the crank has paſſed the point of original quieſcence the ſpace of 27°, its pin *e* meets with the pin *f* of the lower pallet-arbor, which is in its turn impelled by the ſaid pin *e*, the ſpace of 106°, exactly as the former one was; the former, or upper pallet, in the mean time being again carried forward 27° by the next following tooth of the wheel; at length this ſemi-vibration is complete, and the balance-crank returns, driven by the pin *f* through the whole 133° to the point of its ſpring's quieſcence as it was before by the pin *b*, and thus the proceſs is finiſhed through two ſucceſſive excurſions; which proceſs may be conceived to continue for months, or even years, without interruption. Some of the balance-wheels were made of tempered ſteel and ſome of braſs, and the acting portions of the pallets of flint, agate, ruby, or ſapphire. The two ſlender ſprings within the crank, which have been juſt deſcribed, are denominated *auxiliary* ſprings, becauſe they *aid* the two other ſprings in the reſpective returning parts of each vibration, and in this point of view may be conſidered alſo as regulating ſprings, but, being only $\frac{1}{20}$th of the ſtrength of each of the others, are too weak of themſelves to perform this office without the addition of the other more powerful ones, one of which has its effective length conſtantly, though very ſlowly, changing by the ſucceſſive changes of atmoſpheric temperature, which is the reaſon why we called it the compenſation-ſpring.

It is of the utmoſt importance that all the four ſprings of the balance ſhould be at their reſpective points of quieſcence when the balance is at reſt, otherwiſe the law of their forces, which is aſſumed to be directly as their tenſions, will not be the ſame in all, and ſome may be accelerating while others are retarding, whereas they ought all, like one ſpring, to accelerate and retard the balance conjointly in every part of the vibration, unleſs, indeed, the large ſprings are found not to be iſochronal, and the ſmall ones have their points of quieſcence ſo placed as to effect a compenſation, which Mr. Atwood, in his ingenious paper of Feb. 27, 1794, in the Philoſophical Tranſactions, has ſhewn to be a feaſible adjuſtment. For inſtance, if the point of quieſcence of each of the auxiliary ſprings, or even of one of them, be placed ſomewhere in the firſt ſemi-arc of vibration of the balance, the acceleration effected thereby will be leſs in this than the retardation will be in the following ſemi-arc; in conſequence of which the time-keeper will go ſlower; but if the point of quieſcence of the auxiliary ſpring be in the latter ſemi-arc of vibration, the contrary will be the caſe, that is, the time-keeper will accelerate its rate; nay, if the quantity of deviation from the exact point of quieſcence be only one degree of a circle, the ſame author has calculated that where the balance is of one inch radius, and of a correſpouding given weight, the daily gain or loſs will be about $19\frac{1}{2}^{s}$, and the quantity increaſes with the diminution of the arc of vibration; ſo that if the arc of vibration were to become 60°, in one caſe the daily loſs would be $44^{s}.33$, and in the other the daily gain would be $43^{s}.6$; which conſideration ſhews the imperious neceſſity of having the points of quieſcence of all the ſprings exactly adjuſted; and alſo that the pins in the pallet-arbors be ſteadily fixed; for an alteration in their poſitions is in fact an alteration in the quieſcent points of the auxiliary ſprings.

If we were to reaſon from theory, we ſhould be diſpoſed, from the conſideration we have given this mechaniſm, to ſay, that the principle upon which it is conſtructed is excellent, inaſmuch as the impulſes given to the balance, and the oppoſitions made to it during its vibrations, are in proportion to the diſtance from the point of reſt at all times, agreeably to the laws of gravity in a pendulum; the diſcontinuance of the retarding force for a ſpace of 27° in each excurſion, deranges as little as may be the ſcale of varying forces by which the regulation is effected; whereas in the other detached eſcapements, where the impulſe from the train is momentary, ſuch impulſe, to be powerful enough to maintain the continual motion of the balance, may be ſuppoſed to partake of the nature of a *jerk*, and to derange the regularity of the ſcale of forces, according to which, the balance-ſpring ought naturally to act; however, in practice it has not been proved that this conſtruction exceeds ſome of the more ſimple ones; but we will not undertake to affirm, that the aſſertion is quite accurate which ſays, that the great number of pivots requiring oil, and the various ſprings that require adjuſtments for time, temperature, power, and poſition render it extremely difficult to obtain a permanent rate. It is ſaid by the younger Mr. Mudge, that his father conceived the idea of making a time-keeper, and had organized his notions reſpecting its conſtruction, ſo early as Auguſt 1771, before he knew the conſtruction of Harriſon's; which ſeems probable, from various obſervations made in his "Thoughts on the Means of improving Watches," publiſhed in 1763, and written ſome time before; but were we diſpoſed to judge alone from a compariſon of the principles of his and Harriſon's time-keepers, we ſhould at leaſt ſay, that there is a remarkable reſemblance, almoſt too great for accidental coincidence; the principle of the compenſation mechaniſm is preciſely the ſame, and the auxiliary ſprings, though greatly different in their mode of acting, the one being before and the other behind the balance-wheel, the one wound up eight times in a minute, and the other once at each vibration, yet the object is the ſame in both, namely, to give a regularly modified impulſe to the balance, which balance again has a great momentum in both conſtructions, in conſequence of its enlarged dimenſions. Mr. Mudge, in a letter dated Plymouth, Oct. 5, 1775, and addreſſed to his excellency count Bruhl, his friend, ſays, "I do not think it difficult to deduce from reaſons, *a priori*, that there is one diameter (of a balance), with a proportionable weight, by which a greater momentum will be procured than by any other; and that you will loſe momentum either by increaſing or diminiſhing that diameter;" he does not, however, give thoſe reaſons, but has recourſe to experiment. The original balance was ſuppoſed to be too heavy in proportion to its diameter, a larger but lighter one was therefore made and tried, but the alterations neceſſary to be made in the cock rendered the trial doubtful, though the opinion entertained was in favour of a diminiſhed momentum being occaſioned by the alteration; a third was then made, one-tenth of an inch bigger than the firſt, and nearly four-tenths leſs than the laſt, "and I find (ſays our author) upon comparing the diameters, vibrations, and weights of the two (laſt made) that the momentum of the leaſt is to the momentum of the biggeſt as 9 to 7$\frac{2}{3}$ nearly." The ſubjoined are the data and calculations on which the above concluſion was founded; viz.

leaſt balance
Inches
Diameter 2.15 × 266° = 571.9 = the velocity
Vibration 266°
Weight 56.5 grains
Then 571.9 × 571.9 = 327069.61 × $56^{gr}.5$ = 18479433 = momentum.

Inches
Diameter 2.47 × 238° = 587.86 = the velocity
Vibration 238°
Weight 45.5 grains
Then 587.86 × 517.86 = 345579.3796 × $45^{gr}.5$ = 15723862 = momentum.

Let it be remarked here, that Mr. Mudge has ſuppoſed all the weight at the circumference of the balanee, and has aſcertained the velocity from the diameter, which we apprehend ſhould have been from the radius or diſtanee from the centre of motion, which mode would not indeed affect the relative, but would double the real velocities; alſo the ſquare of the velocity is multiplied by the weight, contrary to the opinion of thoſe who aſſert that the ſimple velocity ſhould be uſed as a multiplicand for the weight uſed as a multiplier, in order to effect a product equal to the momentum. According to this latter rule, if we take the double velocity as before, the reſpective momenta will be 371.9 × 56.5 = 32312.35 and 587.86 × 45.5 = 26747.33, which reſults are very nearly as 6 to 5.

It does not appear, notwithſtanding the above calculation, what was the relative power derived from the auxiliary ſprings, conſidered as a maintaining power, compared with the regulating power, which we have ſeen was 1 : 80 in Harriſon's time-keeper; nor is it quite certain, though very probable from the account, that the balance, with the greateſt momentum, was uſed in the trials of the going of the firſt time-keeper, on which an application was made for the parliamentary remuneration. Pennington found, from ſome experiments on a time-keeper that ſtopped in a voyage, that the neceſſary force of a main-ſpring ſhould be to the force juſt ſufficient to keep the piece in motion at firſt, as 17$\frac{1}{2}$ to 10$\frac{1}{2}$: i. e. when 10$\frac{1}{2}$ oz. will produce a continuance of motion at firſt, 7 oz. more muſt be added for foulneſs in wear. Theſe were the exact proportions in *green,* though in *blue* they were found ſomewhat different.

Though Mr. Mudge had made and approved his firſt time-keeper, previouſly to Harriſon's having obtained his laſt 10,000l., the complement of his rewards, which ſum was granted by parliament in 1774, yet he was unfortunate enough to omit making application for the trial of his time-keeper till the act had paſſed, which limited the whole reward to 10,000l., or one half of that propoſed by the act of queen Anne, and alſo rendered the limits of trial more circumſcribed; the latter of which circumſtances rendered the attainment of even a portion of the diminiſhed reward more difficult, than the attainment of the whole great reward which Harriſon was fortunate enough to obtain by his indefatigable perſeverance. The act of queen Anne allowed to Harriſon's trial a voyage of only ſix weeks, at the end of which, if his time-keeper was found to have kept time within four minutes of error, or one degree of longitude, he might claim a portion of the reward thereon; but the time ſpecified in the act of 1774 was ſix months, during which, the error was not to exeeed four minutes, for the ſmalleſt portion of the reward. In the four trials made of the time-keepers of Mr. Mudge by Dr. Maſkelyne, from the years 1776 to 1790, the firſt of which trials was of N° 1, in 1776, 1777, and 1778, and the ſecond, third, and fourth of the pieces denominated *blue* and *green* in 1779 and 1780, again in 1783 and 1784, and again in 1789 and 1790, it appeared from the Doctor's reports to the Board of Longitude, that none of the time-keepers had kept time within the limits preſcribed by the act of Geo. III. On the 1ſt of March, 1777, however, the aſtronomer royal reported to the Board, that the (1ſt) watch made by Mr. Mudge had gained only 1^m 19^s in 109 days, in conſequence of which, it was reſolved, that a letter be written to the Navy Board to pay Mr. Mudge 500l. to enable him to finiſh two more watches on a ſimilar conſtruction, which was deemed preferable to any other that had been previouſly tried; but after this, the main-ſpring of this piece broke, and on being replaced, the piece was found, on a trial of 15 months, commencing on Nov. 11, 1776, to have gained daily $8^s.6$ at the end, more than at the beginning of this ſecond portion of the trial. With reſpect to the three trials of the time-keepers, *blue* and *green,* we ſhall have occaſion to ſpeak of them hereafter. Since the publication of the "Narrative" by Mr. Thomas Mudge junior, it is well known what the difficulties were that Mr. Mudge encountered from the oppoſition which the Board of Longitude raiſed againſt him in his appeal to the Houſe of Commons, after his memorial to the Board had been unſucceſsful on the 11th of June, 1791. To inquire into and aſcertain the comparative merits of Mr. Mudge's time-keeper, however, a committee was appointed by the houſe in conſequence of the appeal conſiſting of the following honourable members: viz. Mr. Pitt, Mr. Fox, Mr. Ryder, Mr. Bragge, Sir Gilbert Elliot, Mr. Gregor, Sir George Shuckburgh, and Mr. Windham, of whom Sir George Shuckburgh was conſidered as the friend of the Board of Longitude, and was therefore candidly propoſed by Mr. Windham to witneſs all the meaſures about to be taken. The committee very properly directed their attention, in the firſt inſtance, to two material objects; 1ſt, to appoint a ſub-committee of ſcientific gentlemen, and men of practical ſkill in mechanics, to examine and report their opinion of the principles upon which the conſtruction was founded; and ſecondly, to aſcertain by a compariſon with other chronometers the accuracy which Mr. Mudge's time-keeper had given proof of in its actual meaſurement of time. The ſub-committee nominated was compoſed of the following liſt: viz.

The Biſhop of St. David's, } Scientific Gentlemen.
Mr. Atwood,
Mr. De Luc.
Mr. Ramſden, } Mathematical Inſtrument Maſters.
Mr. Ed. Troughton.
Mr. Holmes, } Watch Makers.
Mr. Haley,
Mr. Howells.

This ſub-committee after due examination made the ſubjoined report to the ſelect committee, viz.

"We whoſe names are underwritten, to whom it hath been referred, by a Select Committee of the Honourable Houſe of Commons, to receive confidentially from Mr. Mudge, a communication of the principles of his time-keeper, and to report thereon, being aſſembled at the houſe of his Excellency Count Bruhl, in Dover Street, on Tueſday the 14th inſtant, did cauſe a time-keeper, which was produced to us as one of the two made by Mr. Mudge, and ſubmitted to trial at the Royal Obſervatory at Greenwich, for twelve months, from June 1789 to June 1790, to be taken to pieces in our preſence, by Mr. Matthew Dutton; and having carefully examined the parts of the ſame, we find a contrivance in it for deſtroying the inequalities of the maintaining power derived from the main ſpring, which as far as we know and are informed is altogether new; and having conſidered the ſame, and put many queſtions concerning it to Mr. Mudge, jun. and Mr. Matthew Dutton, we are of opinion, that the ſaid contrivance is well calculated for producing the deſired effect, and that a diſcloſure of it may conduce to conſiderable improvements in the art of making time-keepers. We moreover declare that we find great ſkill and ability diſplayed in every part of the workmanſhip, as well as much ingenuity in this particular invention. At the ſame time it is our opinion, and we think it our duty to declare it ſo to be, that no judgment can be formed of the exactneſs of any time-keeper by theoretical reaſoning upon the principles of its conſtruction, with ſuch certainty as with ſafety to be relied upon, except it be confirmed by experiments of the actual performance of the machine.

Samuel St. David's,
George Atwood,
Jesse Ramsden,
Edward Troughton,
John Holmes,
Charles Haley,
Dover Street, William Howells,
the 20th of May, 1793. J. A. de Luc."

Notwithſtanding this report and the teſtimonies produced by Mr. Mudge in favour of his three time-keepers, one made in 1774, and the other two in 1777, from regiſters kept by Doctor Maſkelyne, Doctor Hornſby, Count Bruhl, Doctor (now Baron) Zach, of Saxe Gotha, and Mr. Dutton, who had been partner with Mr. Mudge, yet the committee, at a loſs for an unerring rule by which to aſcertain at all times an exact rate to be depended upon in future trials, declared it as their opinion that ſome of Mr. Arnold's chronometers, particularly No. 36 and No. 68, "had gone with a degree of accuracy greater than could be ſhown on any correſponding trial of Mr. Mudge's;" but in another part of the report of the ſelect committee, which is too long to be copied at full length, it is ſaid, alluding to the foregoing report of the ſub-committee that "in virtue of this report, and of ſuch other evidence as the inquiry has furniſhed, your committee have no difficulty in declaring, that they conſider the improvement in queſtion ſufficiently aſcertained, and as likely to conduce to advantages ſufficiently important to attract the notice of Parliament;" then, after the attention of parliament had been directed to the circumſtances of a life, ſpent in hope of benefiting the public, more than of enriching the individual, the report concludes with theſe words; viz. "For theſe conſiderations, joined to thoſe above ſet forth, your committee think themſelves authorized to recommend the petitioner to the attention of the Houſe, conceiving that the circumſtances attending his caſe give him a ſtrong plea to favour; and that the invention of which he is the author, contains an important improvement in the art of conſtructing time-keepers, ſuch as the Houſe might well wiſh to ſecure to the public, as well as to reward the perſon by whom it was produced." Accordingly, in the year 1793, the Houſe of Commons, after the examination of various witneſſes, notwithſtanding the oppoſition of the Board of Longitude, granted to Mr. Mudge, in addition to the 500l. previouſly received by way of encouragement, the further ſum of 2500l. under the act of 1774.

We have ſaid that the ſelect committee were without a certain rule that would apply in all caſes to aſcertain the true rate of a time-keeper at each ſucceſſive period of trial, a ſtandard rate previouſly obtained being in point of accuracy no longer applicable than while the piece conforms to that rate in going. The rule called "Dr. Maſkelyne's method" is this; when the period of obſervation, or trial, continues many months, he takes a mean rate from the going in the *firſt month*, and applies it as the ſtandard to any ſix ſucceſſive months after, mediate or immediate, which method allows of ſix periods in a year of ſix months each, or twelve in a year and half; and when a mean rate taken from the firſt month was thus applied, whether it was additive or ſubtractive, the aggregate amount of the daily errors thus equated, taken on any day of a period, is called *the error* of that day, and the evidences brought againſt the going of Mudge's watches were the *greateſt error*, and alſo the *mean error*, on an average of the whole period. Mr. Mudge, on the contrary, wiſhed the mean rate to be taken on a period of at leaſt ſix months, as Harriſon's had been on ſix weeks, or whole time of trial, and produced as evidence in favour of the going of his watch, the rate taken from a mean of the daily errors during ſix months of the trial, and alſo the greateſt deviation from that rate on any two ſucceſſive or remote days, without regarding the aggregate of the daily errors, or what is called *the error* at any particular part of the trial, it being contended that *the error* would never be very great if the rate were properly taken. In conſequence of theſe different opinions in reſpect to the mode of judging of the performance of a time-keeper, ſome of the members put queſtions to the witneſſes, particularly to Dr. Maſkelyne, tending to aſcertain, whether or not a rate could be taken at ſea as well as by land? and, on being anſwered in the negative, in what time, on touching at any known point of land, the longitude of which is known, a rate could be obtained? to which the Doctor's reply was "a month:" and his reaſon for requiring ſo long a time to get a rate, was, that in a voyage only the rates on the firſt and laſt days can, he ſays, be aſcertained accurately, but by land the ſucceſſive daily errors can be compared together, ſo that if a ſudden change takes place in the rate, the date of that change can thus be aſcertained, which he contends is not the caſe on a trial at ſea. It would ſwell our preſent article too much were we to inſert here all the trials in favour of and againſt Mudge's time-keepers, and alſo of thoſe with which they were contraſted; ſuffice it therefore that we refer the reader, who wiſhes to know all the particulars, to the "Narrative" publiſhed by Mr. Mudge, to Dr. Maſkelyne's "Anſwer to the Narrative," and Mudge's "Reply to the Anſwer." It will ſatisfy the ordinary reader, we preſume, to know the annexed particulars reſpecting the moſt and leaſt favourable trials. In the firſt trial by Dr. Maſkelyne, made during 15 months; from April 20, 1779, to July 17, 1780, the errors obtained by Dr. Maſkelyne's method of the time-keepers denominated *green* and *blue*, eſtimated from eight periods of ſix months each, were theſe; viz.

Of *green* the mean error of eight periods was	11'	1"
The greateſt - - -	16	25
The leaſt - - -	7	20
Of *blue*, the mean error of the ſame periods	22	30
The greateſt - -	36	26
The leaſt . - -	5	53

In *green*, the daily error, or rate, was altered at the end of the trial $11^s.3$ which was in exceſs.

In *blue* the ſame was more in exceſs, viz. 18^s.

This trial was the leaſt favourable to both time-keepers.

The moſt favourable trial of *Green* ſeems to have been from 21ſt July 1783, to 12th Sept. 1784, by Dr. Maſkelyne, in which its mean error on ſeven periods was $3^m\ 8^s$, the greateſt $7^m\ 10^s$, and the leaſt $1^m\ 25^s$, the rate at the end having become faſter by 3^s.

But the moſt favourable trial of *Blue*, ſeems to have been its laſt under Dr. Maſkelyne in the years 1789 and 1790, in which the leaſt error, eſtimated on ſix periods of ſix months each, was $3^m\ 5^s$, and the greateſt $6^m\ 0^s$, the acceleration of the rate being at the end $2^s.5$ per day. The proof in favour of Arnold's No. 36 was, that the greateſt variation in its daily rate on a trial of 15 months by Dr. Maſkelyne was 7^s; that its greateſt error on eleven periods of ſix months each, was $2^m\ 31^s$, and its mean error only 54^s. The proof of Mr. Arnold's No. 68 was from a trial of Mr. Everard, of Lynn, in Norfolk, from which it appeared, from 46 periods of ſix months each, that the mean error was, according to Dr. Maſkelyne's method, only $2^m\ 33^s$, in only eight of which periods the error exceeded 4^m, and that the greateſt variation in its daily rate was 5^s taken on any two parts of its trial. To theſe and other comparative proofs againſt Mr. Mudge's time-keepers, the inventor oppoſed various trials, as we have before ſaid, under Doctor Hornſby, Count Bruhl, Admiral Campbell, and Baron (then Doctor) Zach, as well as ſome under Mr. Dutton, but as the difference in the daily rates, and not the aggregate, or what is called *the error* is chiefly given as the reſult of each trial, we cannot well make a compariſon of reſults compriſed in terms of different denominations.

Mr. Mudge junior, previouſly to his father's death, eſtabliſhed a manufactory for time-keepers, and employed Meſſrs. Howells, Pennington, Pendleton, and Colman, to make them for him; ſome few of which performed in a way that merited the approbation of certain naval officers of great reſpectability, particularly lord Keith Elphinſtone, and lord Hugh Seymour, but the difficulty of making the adjuſtments ſo accurately as Mr. Mudge ſen. had done, and the high price put upon them, about 150 guineas each, (which indeed was too ſmall, as the younger Mudge was a great loſer by the manufactory) induced the Admiralty to decline giving any other than occaſional orders for his majeſty's navy; the chronometers of Arnold and Earnſhaw, which were deemed equally good by the Board of Longitude, being ſold at an inferior price; though Kendal's price for making a time-keeper after Harriſon's model was 400l. We decline accompanying Mr. Mudge through his complaints againſt his opponents, particularly againſt Dr. Maſkelyne, whom he has accuſed of being too partial to his own darling child, the *lunar method*, to do juſtice to any method purely mechanical for anſwering the ſame important purpoſe; a ſerious complaint this, which is corroborated by an aſſertion, that Meſſrs. Harriſon and Arnold ſenior, made ſimilar complaints: but be this as it may, it is a fact that the younger Mudge had only ſold *eleven* time-keepers of his father's conſtruction at the time his book was publiſhed in 1799, though he had others finiſhed, or nearly ſo, and that Barraud and Jameſon, as we are informed, made propoſals to the Admiralty for finiſhing Mudge's time-keepers at the reduced prices of ninety guineas each, though it is well known that they cannot be afforded for this ſum. In juſtification of the Aſtronomer Royal, we will conclude our account of Mudge's time-keeper with the concluding paſſages of his own "Anſwer" to the "Narrative;" "the uſefulneſs of the Board of Longitude is too well known to the public, and acknowledged by all but a diſappointed artiſt, to require my pointing out inſtances in which they have materially ſerved the public and done honour to the nation. Doubtleſs they deſerve commendation in another reſpect for having been careful concerning the diſtribution of the public money. They might indeed have been properly cenſured, if they had given it away to a perſon not legally entitled to it by the act of parliament, or by a partial preference of the leſs deſerving perſon to the more deſerving ones."

CHRONOMETER by *Meſſrs. John Brockbank and Co.* Among other chronometer makers of reputation we have already had occaſion to mention the Brockbanks, of No. 6, Cowper's Court, Cornhill, London, ſome of whoſe chronometers have performed with a degree of accuracy equal to that of perhaps any other maker, though they never applied for any parliamentary remuneration; the original firm of the houſe was Meſſrs. John and Miles Brockbank, the former of whom lately died, and the latter is juſt gone out of the buſineſs, and is ſucceeded by his nephews, Meſſrs. John and William Brockbank, ſo that the firm is now Meſſrs. John Brockbank and Co. On our applying for permiſſion to take one of their chronometers to pieces, in order to give a full deſcription of all its parts, the requeſt was politely and readily granted. *Plate* XV. contains perſpective views of the different portions of the Brockbanks' chronometer, with the exception of the caſe or box, dial-work, face and hands, guard, ſpring-ratchet, and ſuch other ſubordinate parts as are common to an ordinary watch, which may be ſeen more particularly under the article WATCH-WORK. *Fig.* 1, exhibits the upper plate of the frame, ſeen a little obliquely, together with the balance, regulating cylindrical ſpring, and the three different cocks for holding reſpectively the balance verge, upper pivot, the ſtud for the outer end of the balance-ſpring and the mechaniſm for banking. A, B, C, and D, are four circular holes perforated through the plate, juſt large enough to receive the ends of the four pillars, denoted by the ſame letters in *fig.* 2; E is a hole ſomewhat leſs, to receive the end of the ſpring-barrel arbor, and is at the place where the ratchet and click are placed to regulate the main-ſpring, and preſerve its intenſity when regulated: *a* is the compenſation balance, at preſent ſeen in the form of an ellipſe, as placed on its verge; but in *fig.* 3 is ſeen in its true ſhape of a circle, where the eye is ſuppoſed to be perpendicularly over it; *b* is the cylindrical balance ſpring, with its coils equal in diameter to the radius of the balance, having uſually from four to nine folds, attached at its lower extremity to the balance verge, by means of a collet and pin, and at its upper extremity to a ſtud at the extreme end of cock *d*, which is compoſed of two parts, ſcrewed together by two ſcrews, the heads of which appear near *d*; this cock is then ſcrewed to the plane of the upper plate by a ſingle ſcrew, which ſcrew, by the aid of two little ſteady pins, faſt in the cock near the ſcrew hole, one of which is repreſented by a diminutive circle, and inſerted into ſmall holes in the plate, holds the cock firm in its proper ſituation; *c* is the principal cock, the end of which has a jewelled hole that receives the upper pivot of the balance, the correſponding pivot is hid, being ſupported by the crank part of the potence, which is repreſented by D E F in *fig.* 6, and is ſcrewed to the under ſide of the upper plate by a ſcrew at E, aided by three ſteady pins; the pivot hole in this potence is alſo jewelled. The third cock, *e*, is ſeen on an enlarged ſcale in *fig.* 4, where it will be deſcribed by and by. The cock, *c*, alſo appears to be compoſed of two pieces joined together by two ſcrews above the bend, the heads of which appear near *e*, but it is in one piece, and theſe ſcrews fix it more firmly to the plate. The fuſee guard, as in common watches, is placed under this upper plate, and is therefore out of ſight.

Take the upper plate from the frame now, by unſcrewing the four ſcrews that go into the ends of the pillars, a contrivance of Meſſrs. Brockbank's, and *fig.* 2 will be preſented to view, in which are contained the main-ſpring, fuſee, and chain, with the mechaniſm of the perpetual ratchet, ſeen ſeparately in *figs.* 7 and 8, the movement of the piece, and the lower or pillar plate with the four pillars, one of which has indeed been purpoſely left out in the drawing, that it might not intercept the view of the movement. A, C, and D, are the three pillars alluded to in our deſcription of *fig.* 1, and B the place in the lower plate, where the fourth pillar ought to be ſcrewed, or riveted, which we have ſaid is left out of the drawing; E is the ſpring barrel, containing a well tempered main-ſpring, ſtronger than the ſpring of an ordinary watch, becauſe the eſcapement is a detached one, requiring the momentary impulſe given to it to be pretty ſtrong; there is nothing particular in the conſtruction of this barrel, except its ſize, which is proportioned to the ſpring it contains; one of which, for a large box chronometer, has been found equal to ſupport a weight of 11 lbs. or upwards; the chain is alſo of the uſual conſtruction, except that it is ſtronger than is neceſſary in a common watch; it is repreſented as partly wound on the fuſee, and partly on the barrel, which is generally the caſe when a watch or chronometer is going, ſo that, in this ſituation, if ſome obſtacle to motion were not preſented to ſome one of the wheels of the train, before the balance is taken out, the piece would run rapidly down, and be in danger of breaking ſome of the pivots or other delicate parts, on which account a briſtle is uſually put through the croſſes of the third or fourth wheel to prevent ſuch accident, while the balance is taken out, a ſmall obſtacle being ſufficient to arreſt the motion when applied near the top of the train, where the maintaining power is diminiſhed in proportion to the number of wheels and pinions in the train that it has paſſed through; the reaſon of which is more particularly explained under our article Clock Movement, where the obſervations we have made are equally applicable to the movement of a clock, chronometer, or ordinary watch. F is the fuſee grooved in ſuch a way, after being made of the ſhape of the fruſtum of a paraboloid, that the decreaſe of the acting radius is always inverſely proportional to the intenſity of the main-ſpring; by which admirable contrivance the effective power of this ſpring is at all times very nearly alike; the adjuſtment of the varying levers, or points of action, of the fuſee, is made very conveniently by a long lever with a moveable weight, like a ſteel-yard, being inſerted on the ſquare of the fuſee arbor made for the key, as will be explained more particularly in its proper place. (See Fusee and Clock-tools.) The number of turns of the fuſee, it has been already ſaid, depends on the number of hours it is intended to be actuated by the ſpring at one winding up, and this number again depends on the ratio between the great wheel and the centre pinion, as has been mentioned in our deſcriptions of Harriſon's and Mudge's time-keepers. The angular point of the cap, at the ſmaller end of the fuſee, near F, is to catch the ſhoulder of the guard, when the chain has filled all the turns of the ſpiral groove; otherwiſe the chain would wind back again a little way, and the power of the main-ſpring would become too great, or perhaps the ſpring might even break by being over-ſtrained. Concentric with the fuſee at the large end, contiguous to the pillar plate, are the great wheel, two ratchets, and a ſecondary ſpring to keep the chronometer going while it is wound up; this idea, and alſo the mechaniſm proper for effecting ſuch purpoſe, originated, as we have ſeen, with James Harriſon; but the preſent application of his principle is much more ſimple than his was, inaſmuch as the ſpring is ſo conſtructed, as not to require a barrel or box to contain it. The particulars will be more minutely detailed when we come to *figs.* 7 and 8. In the pocket chronometer before us, the great wheel, which is moveable round the fuſee arbor in one direction only, like that of a common watch, has 60 teeth: *a* is the centre wheel arbor, on which is a pinion of 12 leaves revolving in an hour; this arbor is ſtronger than any other arbor in the train above, not only becauſe more power is impreſſed on its pinion than on any other pinion higher in the train, but alſo becauſe the minute hand is borne by it, and alſo motion given to the hour hand from it; the centre wheel fixed on this arbor has 64 teeth, which impel the pinion of eight leaves on the ſecond arbor *b*; the ſecond wheel of 60 teeth is faſt alſo to this arbor, and impels the third pinion of eight leaves faſt on the third arbor, *c*, which is the arbor for the ſeconds hand, which hand moves in a circle of 60 out of the centre of the face, therefore cannot be miſtaken for the minute hand, which is a matter of ſome importance in a chronometer: on this arbor of the ſeconds hand, a contrate wheel is uſually placed in a common watch, for the ſole purpoſe of altering the direction of motion, that the balance or crown wheel may have an horizontal arbor, but here the caſe is different, the balance wheel, or more properly ſpeaking the eſcapement wheel, has a vertical arbor like the reſt of the train; the third wheel therefore is here like the reſt in poſition, and has 80 teeth driving its pinion of eight on the fourth arbor, *d*, which alſo carries the eſcapement wheel with 15 teeth. From this account of the movement, we now know that the fuſee revolves in $\frac{60}{12}$ of an hour, or in five hours, and alſo that, as there are $6\frac{1}{4}$ turns in it, the whole period of continued motion, at one winding up, will be 32 hours; alſo by our former method of eſtimating the value of a train exemplified in Harriſon's and Mudge's trains; we know that

$$\frac{64 \times 60 \times 80 \times 15 \times 2}{8 \times 8 \times 8} = \frac{921600}{512} = 18000$$

are the number of vibrations in an hour, or five in a ſecond; but as it will be ſeen preſently that there are only half as many audible beats as vibrations in this detached eſcapement in a ſecond, this circumſtance would induce any perſon, not previouſly acquainted with it, to conclude that the train is a lower or ſlower one than is uſed in an ordinary watch, though the reverſe, in point of fact, is the truth. In ſome of the beſt box chronometers, the pinions are 10, and the train = 14400, owing to the large ſize of the balance. At *e* is a ſlender ſpring ſcrewed to the pillar plate, and preſſing againſt the tail of a lever or detent, fixed to the arbor, *f*, and reſting like a click in the inclined teeth of the large or perpetual ratchet, the edge of which ratchet wheel is juſt viſible above the large wheel under the fuſee, but is ſeen better in *fig.* 7; the little ratchet and its click are not ſeen in this 2d figure, but is ſeen alſo within the perpetual one in *fig.* 7.

Fig. 3 repreſents the balance detached from its verge and regulating-ſpring after being taken from its collet on the verge; there are three radial arms meeting and uniting at the centre, which carry each a third part of a circle; this circle is at firſt turned in a lathe out of a ſolid compound plate of ſteel and braſs, a circular plate of ſteel of the required diameter being covered with braſs by immerſion in a crucible of this metal melted previouſly by heat, after which it is divided into three equal portions, which will, by theſe operations, be of ſimilar dimenſions and weight when nicely divided; this method of uniting the metals, and of forming the balance in a lathe, was the invention of Mr. J. Brockbank ſenior, though never before publicly known; at the outer end of each of the three radial bars, which are of ſteel, are three ſcrews of adjuſtment for time, and alſo for poſition, at *a*, *a*, and *a*, where the three portions of the compound circle are ſupported by their reſpective radial bars, or ſometimes a little at one ſide. When the chronometer gains conſiderably, each of theſe three ſcrews are ſcrewed back or outwards, to increaſe the momentum of the balance by enlarging its effective dimenſions, but the quantity of adjuſtment muſt be preciſely the ſame in each of the three ſcrews, ſuppoſing the balance previouſly in equilibrio in all poſitions. On the contrary, when there is a conſiderable loſs in the rate, the three ſcrews muſt be alike ſcrewed in a certain quantity, depending on the quantity of the daily error, which a little practice only will determine; but when one of the three ſcrews is ſcrewed in for poſition, each of the other two muſt be ſcrewed half the ſame quantity out, and *vice verſâ*, the taps being the ſame in all. The convex ſide of the rim of the balance is braſs, and the concave ſide ſteel; the ſuperior expanſibility of the former, therefore, will occaſion the remote ends of each of the three expanſion pieces, forming the circle, to approach the centre of the balance in high temperatures, by reaſon of thoſe ends being at liberty, and the oppoſite ends being fixed to the radial bars; but in cold weather the contrary will be the caſe; the braſs, being more liable to contract with cold, as well as more liable to elongate with heat, than ſteel, exerts a natural effort, in low temperatures, to ſtraighten the expanſion bar, and therefore makes the remote end, in each of the three, recede from the centre of the balance; again, the ſame heat that makes the remote end of each expanſion piece approach the centre of the balance, makes, at the ſame time, the radial levers elongate, and conſequently removes the fixed end of the ſame expanſion pieces from the centre a certain quantity, and *the compenſation* conſiſts in a due balance of the two oppoſite and contemporary motions of the oppoſite ends of each of the three expanſion bars. It is found from experience that the momentum of the balance is beſt preſerved in an equable ſtate by loading each expanſion piece with a metallic weight of ſimilar dimenſions, and ſo contrived that they may ſlide along the expanſion pieces, by adjuſtment, till the exact point is found ſuch in each, that the equipoiſe of the whole is not deſtroyed, and yet that the momentum will remain the ſame in the oppoſite extremes of temperature, as well as at a medium. The additional weights are denoted by the letters *b*, *b*, and *b*, which have a groove and a ſcrew each, to fix them to the expanſion rims. If the additional weights of compenſation, *b*, *b*, *b*, were ſcrewed cloſe to the ſcrews of adjuſtment for rate and poſition at *a*, *a*, and *a*, it is evident that, as the radial bars are there elongated by heat, theſe loads would thereby be carried outwards ſo as to increaſe the momentum of the balance ſufficiently to make the chronometer retard, being an effect ſimilar to that produced by turning the ſcrews *a*, *a*, and *a*, back from the centre; alſo if the ſaid weights were fixed at the remote ends of the expanſion rims, which ends move inwards with the greateſt velocity, while their fixed ends are moving but ſlowly outwards, it is equally evident that, if the weights are too large, which are thus made to approach the centre with the greateſt poſſible velocity, the momentum of the balance will thereby be diminiſhed too much, and the chronometer will have an accelerated rate; there is, conſequently, a certain load, which, being fixed in a certain point between the oppoſite ends of each of the three expanſion rims, will render the momentum of the balance leaſt liable to vary in the different degrees of temperature; for if the weight is comparatively ſmall, it muſt neceſſarily be fixed near the end at liberty, but if comparatively large, it muſt neceſſarily be fixed at ſome diſtance from the ſaid end; but until it has been determined in practice, or by experiment, what diameter is beſt for a given weight of a compenſation-balance, with a given eſcapement and maintaining power, it is not eaſy to aſſign the preciſe quantity of each weight, and the correſponding point in its expanſion piece where it ought to be fixed, in order to produce the beſt practical effect, i. e. the greateſt quantum of invariable momentum with the leaſt poſſible friction and reſiſtance from the air. Various experiments, no doubt, have been tried in the adjuſtments of the balance, to effect this purpoſe in the beſt manner, taking into conſideration, moreover, the relative thickneſs of the braſs and ſteel of the expanſion rims; though ſcarcely any thing has yet been publiſhed on the ſubject; to aid the views of thoſe who are thus laudably employed, we preſume to ſuggeſt, that the *ſhapes* of the loading pieces, and of the adjuſtment ſcrews at preſent in uſe, are calculated to meet with too much reſiſtance from the air; and if clock-makers wiſh to avoid ſuch reſiſtance, by a proper ſhape given to their balls or bobs in a pendulum, where the momentum is very great, ſurely the ſame object is worthy of the notice of the makers of chronometers. Mr. Brockbank once uſed weights ſhaped like a double cone, but laid them aſide again, ſuppoſing it to be a matter of indifference. How far our ſuggeſtion may prove uſeful may be proved experimentally by trying the variation of rate of any machine, ſmall enough to admit of being put under the receiver of an air-pump, whilſt it is kept in a complete vacuum, or nearly ſo; this experiment, however, ſhould not be attempted where there is not a ſyphon or other gage, to indicate to the eye the ſtate of exhauſtion during the trial. A gentleman who tried this experiment, informs us, that the variation in the rate of one of Brockbank's chronometers, was only about one ſecond per day minus.

In the balance before us there is a pin ſcrewed into the remote end of each expanſion-piece, exactly oppoſite to as many projecting pieces of metal borne by the radial arms at *c*, *c*, and *c*, which additions might appear to have ſomething to do with the compenſation, but they are only precautionary contrivances, called guard-pieces, to prevent the bending of the expanſion-rims too much inward or outward by any jerk or other accidental cauſe. In the moſt modern of Meſſrs. Brockbanks' chronometers, the load of the expanſion-pieces is ſhaped as at *d*, in *fig.* 3, where a third additional ſcrew is put in the direction of a tangent, to adjuſt for ſmall errors in temperature, where the ſcrews only are moved without the loads, which otherwiſe might be moved too much, ſo as to effect more than the deſired quantity. *Fig.* 4, is the cock of the banking, marked *e*, in *fig.* 1, but on an enlarged ſcale; it is ſcrewed down to the plane of the upper plate by the ſcrew A, and kept immoveable by the ſteady-pin, denoted by a diminutive circle near the ſcrew: B is a ſmall piece of metal borne by a light arm that has a joint, the centre pin of which is ſeen repreſented by a dot on the end of the cock near the ſcrew C; this ſcrew is ſo placed on a ſide-piece faſtened to the cock, that the end of it bears againſt the ſide of the joint-piece, and acts as a reſt to prevent the joint from opening further than the adjuſtment requires: D is a very ſlender ſtraight piece of balance-ſpring, not blued, with one end in the piece B, and the other in the cock, ſo that if any ſlight force is applied on the ſide of piece B, this piece will have a motion on its centre towards D, but will return to its original poſition by the force of the flat ſpring D. E is an erect pin attached to the radial arm, marked *f* in the balance, as exhibited in *fig.* 1, which pin has a triangular head that remains contiguous to the projecting pin in the piece B, and very nearly touches it in the preſent poſition in both figures: now the cylindrical ſpring of the balance may be ſo adjuſted, that the pin E ſhall be a quarter of a circle, or any given number of degrees, from the piece B, when this ſpring is in its quieſcent ſtate. Suppoſe it to be a quarter of a circle; and ſuppoſe the balance put into a forward motion by any accidental external force; if this force ſhould be great, the balance would revolve, perhaps, two whole revolutions in its circle without any obſtacle to ſtop it, which would overſet it, and endanger the teeth of the eſcapement wheel, which would hobble on irregularly; to avoid ſuch effect, Mr. J. Brockbank ſen., having obſerved that the coils of his ſpring enlarge their diameters, particularly near the upper end, when wound up by one entire revolution of the balance, ingeniouſly hit upon the idea of making this protruſion of the coils of his ſpring ſubſervient to the purpoſe of limiting the extent of the vibration of his balance, or of conſtituting the contrivance called the *detached banking*. In an ordinary watch a pin is put into the rim of the balance, which projects ſufficiently to prevent its paſſing two little ſtuds, placed at equal diſtances from the point of quieſcence of the ſaid pin, which ſtuds, therefore, limit the quantity of the whole arc of vibration: this quantity, conſequently, when two ſtuds are uſed, muſt neceſſarily be leſs than a circle, even if the common eſcapement would admit of ſuch a long vibration; and if one ſtud only were placed juſt a ſemicircle each way from the pin's quieſcent point, the limit would then be an exact circle, after deducting the thickneſs of the ſtud; but in a chronometer one entire vibration generally exceeds a circle, when the piece is clean; a circumſtance which conſtitutes one of its excellencies, by augmenting its momentum; hence the contrivance wanted was to allow the balance to vibrate more than an entire circle, and then to ſtop it at a given part of the ſecond revolution: to effect this purpoſe, the late Mr. J. Brockbank invented the mechaniſm already deſcribed in *fig.* 4, which acts thus; when the balance firſt begins to vibrate, the coils of the ſpring do not alter their ſhape, and the pin E of the balance paſſes the piece B attached to the cock untouched, the poſition of B not having been altered by any external force; but when the balance comes round a ſecond time, the protruſion of the coils becomes great enough to ſtrike againſt the piece B, placed near the ſpring; it now yields to the impulſe of the protruding part of the ſpring, and moves towards D, taking its pin along with it; and in this new ſituation it is that the pin of B is preſented to the head of the pin E, carried by the balance, and acts as a banking-ſtud to prevent the further vibration, or, perhaps, we ſhould ſay rotation, of the balance; in the contrary motion of the balance it cannot be overturned, by reaſon of the locking-ſpring not being moved by the backward motion of the lifting pallet. The contrivance before us is certainly an ingenious one, and, we underſtand, anſwers its intended purpoſe very well. The weight of the pin E is, of courſe, counterpoiſed in the adjuſtment for poſition.

Figs. 5 and 6 repreſent the eſcapement-wheel, pallets, and ſprings uſed in the buſineſs of alternately locking and unlocking the teeth of the pallet-wheel, on an enlarged ſcale, and as they would be ſeen by an eye placed over the principal cock, if the upper plate were tranſparent; but they are hid by this plate in *fig.* 1; the wheel, however, may be ſeen on its arbor projected on the fuſee in *fig.* 2, and the pallets may eaſily be conceived to be put under the upper plate, through an aperture in the plate, and to be attached to the lower part of the balance-verge above the lower pivot, which pivot, we have ſaid, reſts on the crank part of the potence DEF, beneath the ſaid plate, which potence is alſo ſuppoſed tranſparent. The ſhorter, or inner ſlope of the tooth is directed, not to the centre of the wheel, but to a point in the radius, about ¼ from the centre, which mode of ſhaping is called under-cutting. The ſame letters of reference apply to both the *figs.* 5 and 6, in which A is the eſcapement-wheel of 15 teeth, (but of 13 in a box-chronometer,) and B the large pallet of poliſhed ſteel, firſt made circular, but afterwards notched, to make way for the teeth in paſſing, and to receive a piece of finely poliſhed diamond, *c*, at that part of the notch where the end of tooth 1 nearly touches it in *fig.* 5; the little dotted piece *d*, like a bird's head, placed on the balance-verge, concentric with the large pallet, but below it, ſo as to be covered by it, is the lifting or unlocking-pallet made of ſteel, ſet with ſapphire: C is a long ſlender ſpring, ſcrewed to the under ſide of the upper plate, carrying a protuberance, *a*, called the locking-pallet, and embracing at its looſe end, by a ſemicircular bend, the verge of the balance, the bent part of which, being hid under the large pallet B, is repreſented by a curve line of double dots: D is another very ſlender ſpring fixed by a pin at *c* into a hole in the end of the bar *c d*, which is elaſtic, and ſcrewed to the potence at *d*; the ſcrew *c* is tapped into a ſtud in the potence, and bears againſt the bar *c d*, and adjuſts the length of D, which reaches a little beyond the curved end of the locking-ſpring, called alſo ſometimes the detent-ſpring; this ſlender ſpring D is denominated the unlocking-ſpring, becauſe the lifting or unlocking-pallet, hitting it on the end, drives it againſt the crooked end of the locking-ſpring, and thereby forcing the pallet *a* from a tooth of the wheel, unlocks the wheel and leaves it under the controul of the maintaining power; laſtly, *b* is a ſcrew, which, ſupported by a little tapped cock, conſtitutes a reſt for the detent-ſpring, when it has returned, in conſequence of its elaſticity, from the ſituation it was driven to by the lifting pallet. The two ſlender ſprings C and D point in the ſame ſtraight line through the centre of the balance-verge; and the action of the eſcapement-mechaniſm is this: ſuppoſe the balance to be at reſt in the firſt place, and the reſpective poſitions of the parts as in *fig.* 6, the circular ſide of the large pallet nearly in contact with tooth 1, and the tooth preceding it; the lifting pallet muſt be as in *fig.* 5, a little ſhort of the end of the unlocking-ſpring D, and tooth 2 reſting on the locking pallet *a*; while every thing remains in this ſtate, the maintaining power is ſuſpended by the tooth 2 being detained by the locking-pallet *a*, and the machine will not have power to put itſelf into motion; but let ſome external force be applied to put the balance in motion, by turning the chronometer ſuddenly round horizontally, or otherwiſe, and, ſuppoſing the motion impreſſed to be in a direction from B towards the lifting-ſpring D, the angular point of the lifting-pallet, moving along with the balance and large pallet B, ſtrikes the extreme end of the locking-ſpring D, and drives it, and alſo the bent end of the locking-ſpring C, againſt which the other reſts, far enough to diſengage the locking-pallet *a* from tooth 2 of the eſcapement-wheel; which wheel, therefore, inſtantly runs on by the impulſe through the train, in a direction towards *b*; but in the mean time the ſapphire face of the pallet, moving with the balance, has got before tooth 1; this tooth, therefore, now ſtrikes the ſaid face of the large pallet and urges it on, we will ſuppoſe, till it arrives at the line joining the centre of the wheel and great pallet, as is repreſented in *fig.* 5; in this ſituation, it will be ſeen, the lifting-pallet has quitted the end of the lifting or unlocking-ſpring, and the locking-pallet *a* is about the mid-way between tooth 2 and tooth 3: during the continuance of this portion of the wheel's impulſe on the face of the large pallet, the extreme end of tooth 1 has ſlided forwards along the plane of the pallet's face, which we have ſaid is ſapphire, and, therefore, produces but little friction; but now, as the tooth 1 advances in its revolution beyond the line joining the centres of the wheel and large pallet, it proportionably returns along the face of the ſapphire, till, at length, it completely eſcapes the pallet, in which ſituation it would run on violently, but by this time the locking-ſpring has returned to the end of ſcrew *b*, and has preſented its locking-pallet to receive tooth 3, which has juſt arrived at this pallet, when tooth 1 drops from the large pallet; the train, conſequently, is again detained, and the balance proceeds in its vibration, together with the large and lifting pallets, in a ſtate completely detached from every obſtacle, except the balance-ſpring, which ſpring, by being wound up, oppoſes its free motion, and, at length ſtops it; the ſtation, however, is but of ſhort duration, as the balance-ſpring conſtantly exerts its power to bring back again the balance; it returns; the back or curved part of the lifting-pallet ſtrikes the end of the lifting ſpring D at the inner ſide, which being very ſlender gives way, and the locking ſpring, not being diſturbed, remains in *ſtatu quo*. The returning force of the ſlight ſpring, D, is exhauſted at the inſtant of its arrival at its point of former quieſcence, and the balance proceeds in its retrograde vibration, by the accelerated force it has acquired on its arrival at this quieſcent point, until the oppoſition of its ſpring renders it again ſtationary for an imperceptible moment, after which the original proceſs, which has been deſcribed, is reſumed, and an alternation of backward and forward vibrations is perpetuated by means of one little impulſe, given by each ſucceſſive tooth of the wheel, as long as the maintaining power continues in a ſtate of ſufficient intenſity. With a given maintaining power and a given eſcapement-wheel, the momentary impulſe given to the balance, in any chronometer of this conſtruction, has its intenſity meaſured directly by the effective length of the large pallet, in any ſituation of the acting tooth; whence the intenſity of the impulſe would be a minimum in the ſituation exhibited in *fig.* 5, in a point lying in the line of the centres, if this ſituation were not the moſt favourable to the tranſmiſſion of the impulſe; but as the wheel here impels the pallet in the direction of a tangent from its point of action, and as this tangent is alſo perpendicular to the face of the pallet, the effect on the balance is here the greateſt, independently of the force from the accelerated velocity. The lifting-pallet makes its ſtroke at that part of the balance's vibration, when it has come within 20° of its original point of quieſcence, and as the ſcale of forces may be conſidered as changing ſoon after this point from an increaſing to a decreaſing one, there will here be very little diſturbance produced in that ſcale; beſides, the continuance of the ſaid ſtroke will be ſmall as well as its force great by being near the point where the velocity is a maximum.

Again, in any chronometer of this conſtruction, the arc of continuance of the wheel's action on the great pallet is inverſely proportional to the diameter of it, compared with that of the eſcapement-wheel; therefore the larger the pallet the ſmaller is the arc of action, and *vice verſâ*: but then, we have ſaid, that the impulſe is proportionably larger or more intenſe; it is probable, therefore, that there is a medium between a large impulſe given in a ſmall arc of action and a ſmall impulſe continuing during a larger arc of action, which medium may produce an effect moſt ſteady and moſt in concert with the varying ſcale of momentum in the different parts of the total vibration. Mr. Earnſhaw has laid much ſtreſs on the circumſtance of his large pallet being of half the diameter of the eſcapement-wheel; but the inference does not appear to have been the reſult of any nice calculations or varied experiments of his; for before him his maſter, the ſenior Mr. Brockbank, uſed a pallet in his pocket chronometer, exactly ſimilar, though it was a trifle leſs in his box one: but Mr. Arnold's large pallet, in general, is much ſmaller, though ſome of his chronometers have had as large pallets as thoſe of either of the other two. Mr. Miles Brockbank informs us, that his brother and he found from experience, that a ſmall pallet does not produce ſo large a vibration as a large one with the ſame maintaining power.

Fig. 7 exhibits a view of the great wheel, and two ratchets with their clicks fitted to the large end of the fuſee, and conſtituting, with it, what is called the *going fuſee*; the conſtruction is more ſimple than that of Harriſon's, which we endeavoured to deſcribe without a drawing, and anſwers its purpoſe equally well. The ratchet, *a*, or ſmall ratchet, is fixed by two ſcrews or pins to an excavation in the large end of the fuſee, the central part being left perforated for the fuſee-arbor to paſs through, and its plane lying in the plane of the end of the fuſee; its click and ſpring, *b*, are ſcrewed to the plane of the large or perpetual ratchet, *c*, which has its teeth inclined in a direction contrary to thoſe of the ſmall ratchet, *a*, and are bedded in a groove turned in the end of the fuſee, between the ſmall ratchet and great wheel; we have ſhewn but one click for the ſmall ratchet, but generally there are two, one at each ſide of it; the click-ſpring of the perpetual ratchet is ſcrewed to the upper plane of the pillar-plate, as ſeen at *e* in *fig.* 2, where it will be ſeen that the click turns on an arbor, and acts as a detent; *e* (*fig.* 7.) is the great wheel, and *fig.* 8 is a horſe-ſhoe ſpring, bedded between the perpetual ratchet and the great wheel, a circular groove being turned in the plane of the large wheel, or it might be in that of the large ratchet, or partially in both, to form a bed for this ſecondary ſpring; the pin, *a*, at one end of the ſpring, is inſerted into a correſponding hole in the bed of the wheel, and the other pin, *b*, into a ſimilar hole perforated through the perpetual ratchet at *f*; this ſpring, thus connected with both the great wheel and perpetual ratchet, would produce no other effect than to attach them together, and make them like one wheel, if the horſe-ſhoe piece were not elaſtic, in which caſe the large ratchet would be ſuperfluous, and the effect produced would be that of an ordinary ſimple ratchet; but the piece in *fig.* 8 is of a ſpring temper, and its elaſticity ſmall enough to be acted upon by the main-ſpring, ſo as to make the two pins, *a* and *b*, at the ends approach each other; and in this ſituation it is that the ſecondary ſpring is ſaid to be wound up, and in which it continues whenever the chronometer is going. When the key is applied to the fuſee-arbor to wind up the piece, the click, *b*, will ſlide over the ſerrated teeth of the ſmall ratchet, *a*, which revolves with the fuſee, and the large ratchet, *c*, would alſo revolve a little way with it, to let down the intenſity of the ſecondary-ſpring, which now exerts its force to remove its ends apart from each other to their natural ſtate as they are ſeen in *fig.* 8.; but the click or detent, held to its teeth by the ſpring *d*, prevents this little motion from *b* towards *a*, which otherwiſe would have taken place from the pulling of the pin *b* inſerted into its little hole; in conſequence of this oppoſition to the great ratchet's temporary motion by the action of its detent, the pin, *a*, at the other end of the ſecondary-ſpring pulls at its hole in the great wheel, and draws it towards *b*, or, in other words, draws the great wheel round in a contrary direction, and with a force equal for a time to that of the original maintaining power by which the two pins were made to approach each other. The reaſon of pin *b*, in *fig.* 8, being made to project both ways acroſs the end of the ſecondary ſpring, is, that the remote end beyond *b* may move in a circular little aperture made through the plane of the great wheel behind *f* in *fig.* 7, which aperture allows the two ends of the ſpring to approach and recede ſteadily, and the length of the aperture is determined by the quantity that pin *b* is drawn by the main-ſpring towards pin *a* before there is an equipoiſe in their intenſities.

Some years ago Mr. Ed. Troughton contrived a jambol or gimbol for preſerving the horizontal poſition of a pocket chronometer at ſea, which is loaded with a weight, turning on the point of a pin, like the card of a compaſs, and continues to be made by Meſſrs. Brockbank and Co. with conſiderable advantage to the going of the chronometer. The order of the adjuſtments is this: firſt the adjuſtment for temperature is made in heat of from 90° to 120° of Fahrenheit, and alſo in as great a degree of cold as can be obtained; ſecondly, the chronometer is cleaned anew, and has freſh oil put on; thirdly, the adjuſtment for rate and poſitions is made; and, laſtly, the rate is taken. There are, beſides the three pallet-faces of ſapphire, eight jewelled holes in the beſt chronometers; viz. two at the balance verge pivots in the cock and potence, two at the pivots of the eſcapement-wheel, and two for each of the two next wheel pivots, called the fourth and third wheels of the movement, beginning with the great wheel as firſt, but the third and ſecond of the train, if we count from the centre or hour-wheel. The pivots are tapering, in the form of a cone, and bear on their ends in action, which ſhape gives ſtrength, without adding to the friction.

It cannot be expected that the beſt chronometers will ever be manufactured at ſo low a price as watches without the compenſation and detached eſcapement; but when, as many different hands are employed in making their ſeveral parts, as are employed in the making and finiſhing of an ordinary watch, we may expect that the price will be proportionably reduced; the loweſt price that we have been informed of, as the price of any good maker for a pocket chronometer, is forty guineas, but in general they cannot be afforded for ſo little when all the adjuſtments are well made, which take up much time as well as patience. At preſent the *movement*, that is, the frame containing the barrel, fuſee, wheels, and pinions, all but the eſcapement-wheel, is made, like the movement of a watch, by the different workmen employed for this purpoſe in Lancaſhire; the motion or dial-work is next added by a workman in London, who has the main-ſpring, chain, face, and hands, from the reſpective makers in town; then the eſcapement-maker and the jeweller are employed to finiſh their departments; and, laſtly, the *maker*, as he is called, finiſhes the adjuſtments, and puts the works into the box, or caſe, or both, as may be required. In the progreſs of theſe different ſtages, or even after the adjuſtments are begun, it is frequently neceſſary to alter, and many times to change certain parts, as the ſprings, compenſation-rims, adjuſtable weights, &c. which neceſſarily enhance the price the chronometer might otherwiſe be afforded for.

The teſtimonies, both public and private, of the accuracy of ſome of Meſſrs. Brockbanks' chronometers in meaſuring time, are ſufficiently numerous to eſtabliſh their credit. Several letters from naval officers and rates were delivered to the Board of Longitude during the time of Mr. Earnſhaw's application for remuneration, which cannot be reſtored without an order from the Board; otherwiſe it would have been in our power to have laid ſome of them before the public. Governor Hunter, in his publication, has given a teſtimony ſo extraordinary, that we cannot, in juſtice, with-hold it; he has aſſerted, that, from the time of his ſetting out from Port Jackſon in New Holland, on a twelve months voyage round a great part of the globe, in the courſe of which he remained ſome time at the Cape of Good Hope, to the time of his return to the ſame port, a time-keeper or chronometer by the Brockbanks was found to have gone ſo well, that the error, at the end of the voyage, did not exceed *one ſecond* of time. This, however, will be conſidered rather as an extraordinary coincidence of the ſtate of the watch at the beginning and end of the voyage, than as a proof that its accuracy was thus great at all the intermediate parts of the voyage. Mr. Gavin Lowe, of Iſlington, has a pocket chronometer, the rate of which was given to Sir Joſeph Banks to be laid before the Board of Longitude, which, we have heard, exceeds, in accuracy, the rate of any other pocket chronometer that has been made, inaſmuch as that the rate in it is not ſenſibly affected by cleaning in the courſe of many years wear. But, as we have ſaid, it is not our intention to preſs upon the public attention the merits of any individual maker excluſively, we ſhall ſatisfy ourſelves with copying only one additional teſtimony in favour of our preſent maker, from the report of lord Hugh Seymour, who tried three of Mr. Mudge's time-keepers againſt one of Mr. Earnſhaw's and one of Meſſrs. Brockbanks' chronometers, in a cruiſe from the 18th of May, 1796, to the 19th of Auguſt following.—The report was this: viz.

"At noon, May 31ſt, the town of St. Mary, on the iſland of that name, bore N. 10° W. diſtance 30 miles. The longitude of the ſhip, at that time, taken from the requiſite tables and corrected by the above bearings, gave 25° 3′ 15″ W. Mr. Mudge's watch, called No. 4, gave 1′ 45″ W. Mr. Mudge's watch, called *green*, gave 1′ 45″ E. Mr. Mudge's watch, called *blue*, gave 9′ 15″ E. Theſe watches were taken from the academy at Portſmouth, May 10. A watch made by Mr. Earnſhaw gave 3′ 45″ W. and one made by Mr. Brockbank gave 15′ 45″ E. of the ſhip's place. The mean of all gave 4′ 18″ E. Theſe two laſt watches were too ſhort a time on board at Spithead to obtain their rate exactly, *but were given a new rate this day*.

"At noon, June 4th, the town of Delgada, on the iſland of St. Michael's, bore N. 5 miles. The ſhip in the longitude of 25° 42′ W. No. 4 at that time gave 11′ 15″ W.; *green*, 5′ W.; *blue*, 5′ E.; Earnſhaw, 2′ 15″ E.; and Brockbank, 1′ 45″ E. The mean of all 1′ 30″ W. of the ſhip's place.

"At noon, July 16th, Cape St. Vincent bore N. 81° E. 4 miles. The ſhip in the longitude of 9° 7′ W. No. 4 at that time gave 3′ 15″ E.; *green*, 10′ 30″ W.; *blue*, 13′ 30″ E.; Earnſhaw, 16′ 30″ W.; and Brockbank, 2′ E. The mean of all 1′ 39″ W. of the ſhip's place.

"At four in the afternoon, Auguſt 12th, the light-houſe of St. Agnes was ſeen bearing N. diſtance 19 miles. The longitude of the ſhip at that time was 6° 26′ W. and ſuppoſing Scilly to be in *that* longitude. No. 4 gave 27′ 30″ E.; *green*, 8′ 30″ W.; *blue*, 18′ 15″ E.; Earnſhaw, 56′ 30″ W.; and Brockbank, 6′ 15″ E. The mean of all 2′ 30″ W. of the ſhip's place.

"At noon, Auguſt 13th, the Start bearing N. 28° E. diſtance 19 miles: the longitude of the ſhip was 4° 5′ 15″ W. No. 4 at that time gave 28′ 15″ E.; *green* 9′ 15″ W.; *blue* 17′ 15″ E.; Earnſhaw 59′ 15″ W. and Brockbank 6′ 45″ E. The mean of all 3′ 9″ W. of the ſhip's place.

"At Spithead, Auguſt 18th, the ſhip in the longitude of 1° 7′ 20″ W. No. 4 gave 30′ 20″ E.; *green*, 12′ 10″ W.; *blue*, 15′ 50″ E.; Earnſhaw, 1° 11′ 10″ W.; and Brockbank, 7′ 20″ E. The mean of all, 5′ 55″ W. of the truth."

From this report it is evident, that, after a proper rate was aſſigned, Meſſrs. Brockbanks' chronometer performed with a degree of accuracy which far exceeded any one of the other four, indeed, we may ſay, which has ſeldom been equalled by any other chronometer.

After being appriſed of theſe and other teſtimonies, we inquired why the Brockbanks never applied to parliament for a public trial of any of their chronometers, with a view of obtaining the premium under the act of Geo. III., and received for information, that, after having been refuſed a private trial at the Royal Obſervatory, and on finding that much trouble was likely to attend the application to the Board and ſubſequent public trials, the idea at one time entertained was given up; which circumſtance is our reaſon for having troubled the reader with lord Hugh Seymour's report at full length.

CHRONOMETER by *Mr. Arnold.* After the minute deſcription of all the parts of Meſſrs. Brockbanks' chronometer, it would be ſuperfluous to repeat here an account of ſuch parts as are common in all the modern chronometers; we therefore propoſe to omit the drawings of the movement and other portions of the mechaniſm contained within the frame of both Mr. Arnold's and Mr. Earnſhaw's chronometers, and beg leave to refer thoſe readers who wiſh to ſee all the individual portions of each of theſe two, to a pamphlet lately publiſhed by the Hon. Commiſſioners of Longitude, which is charged five ſhillings, and in which are contained three plates of each author, together with the deſcriptions of the plates, and the queſtions put by the Board of Longitude relative to each conſtruction, together with the anſwers. This pamphlet is entitled, "Explanations of Time-keepers conſtructed by Mr. Thomas Earnſhaw, and the late Mr. John Arnold," Payne and Mackinlay, Strand, 1806. The movements are made with pinions of 8 or 10, according as they are intended for pocket or box-chronometers, to which the correſponding wheels for trains of 14,400 or 18,000, may be had by inſpection in our tables under our article CLOCK-MOVEMENT, calculated on purpoſe for the workmen who are movement-makers, and who chiefly reſide in Lancaſhire. It may be neceſſary to mention, that Mr. Arnold's box-chronometers have very ſtrong main-ſprings requiring a deeper barrel than is neceſſary for the length of the frame-pillars, on which account there is a cap fixed on the plane of the upper plate, to receive the lower pivot of the barrel arbor, and to hold the click and click-ſpring of the ſtrong ratchet, as placed on the ſquare of this projecting arbor; but there is no occaſion for ſuch addition in the pocket-chronometer. The eſcapement-wheel A, ſhown in *fig.* 1, of *Plate* XIV. of *Horology*, is Mr. Arnold's, on an enlarged ſcale, and, like Meſſrs. Brockbanks', is placed near the lower end of its arbor, within the frame, ſo as to have only a ſmall portion of it ſeen by an eye placed over the cock, when the piece has its natural poſition reverſed: this wheel is what is called a *ſunk* one; that is, it has its teeth, like thoſe of a cylinder-eſcapement-wheel in this reſpect, projecting from the plane of the wheel, as ſeen in *fig.* 2, which repreſents a ſide-view of the ſame wheel. The ſhape alſo of the teeth of the wheel before us differs from that of Meſſrs. Brockbanks' and Mr. Earnſhaw's in another reſpect: the triangular acting part of each tooth, which is raiſed from the plane of the wheel, it bounded by two ſtraight lines and a curve; the curved portion, which acts with the jewelled face of the large pallet B, and which Mr. Arnold jun. in his deſcription calls a *cycloidal curve*, is deſcribed as being generated by the revolution of a ſmall circular piece of metal with a tracing-pin in its circumference, while it rolls on the circumference of a larger metallic circle, as a baſe, and is, therefore, properly ſpeaking, *epicycloidal*; a cycloid being generated by a circle rolling on a ſtraight line: the proportions of the generating circle, and its baſe are ſtated to be as the diameter of the large pallet to that of the eſcapement-wheel; but, by conſulting what we have ſaid on the proper ſhape of acting teeth in an impelling-wheel in our article CLOCK-MOVEMENT, the reader, we preſume, will agree with us, that, to have as little friction as poſſible, the ſmall circle with the tracing-point, called the generating circle, ought to be equal to the *radius*, not the *diameter*, of the large pallet; which pallet may properly be conſidered as a pinion for the ſhort time it is impelled by a tooth of the eſcapement-wheel; in the ſame place, above referred to, it will be ſeen, indeed, that the difference of the curves, generated by a tracing-piece equal to the diameter, and by a tracing-piece equal to the radius of the ſame wheel or pinion, will ſcarcely be ſenſible till the two curves have been carried on farther than is neceſſary for forming a ſmall tooth; ſo that the diſtinction in theory makes no conſiderable difference in practice, which we here mention, leſt an unfavourable opinion ſhould be entertained of the teeth in queſtion: but, what may ſeem to ſome of our readers a curious circumſtance, when the epicycloidal tooth in any wheel is formed by a generating circle of double the ſize it ought to be from theory, the friction of the parts in wear will ultimately produce the curve that ought to have been originally formed by a generating circle of a due ſize, provided the tooth of the wheel acting with it is of a proper ſhape, and of a more durable metal; becauſe, when the teeth of any two wheels that act together are both formed truly from proper generating circles rolling on proper baſes, theſe teeth will roll over one another without, or nearly without friction, and preſerve their original figure unimpaired; but if one of the two ſhall happen not to have the exact curve, the friction in the action will wear away the ſuperfluity of ſubſtance beyond what ought to have been there to conſtitute the true curve; and as a large generating circle gives a fuller tooth than a ſmall one, there will neceſſarily be that ſuperfluity in its ſize which we have ſuppoſed to exiſt, when the diameter is uſed for radius in the generating circle. Thus a ſlight deviation from the true epicycloidal ſhape of the tooth of any wheel will be rectified by its action with a leſs deſtructible body of an exact ſhape for true action, and it will be ſeen, under the article to which we have already referred, that a *ſtraight line*, the particular ſhape of the jewelled face of the large pallet, is one of the varieties of an interior epicycloid generated by any generating circle revolving on the concave ſide of a circle of *twice its diameter* uſed as a baſe of generation.

We made theſe obſervations under an impreſſion that Mr. Arnold's tooth *rolls* over the ſurface of the face of the pallet during the time of its impulſion, in which caſe the friction and deſtruction of the parts of contact would have been the *leaſt poſſible*; but on examining his drawing more minutely, and on adverting to the queſtions put to Mr. Arnold, junior, by the Board of Longitude, we find that the tooth of the wheel always continues to act at the extreme point of the pallet's face, over which angular point, probably rounded a little, the curved part of the tooth *ſlides* inſtead of rolling, by reaſon of every acting part of the tooth coming in ſucceſſion to the ſame point of the pallet. This mode of action does certainly require that the ratio between the generating circle and its baſe ſhould be exactly as ſtated by Mr. Arnold; it being that particular caſe where a wheel drives a lantern pinion with ſmall ſpindles, as may be ſeen by the reference we have more than once given to CLOCK-MOVEMENT. However, we are ſtill perſuaded, that to give an impulſe to the large pallet without friction, would be more deſirable than the method before us, if it is equally practicable. An adoption of the mode we have propoſed would, we think, on mature conſideration, require either the wheel to have more teeth than has been uſual, or the pallet to be larger, to which we ſee no objection, as the arc of action would in either caſe be diminiſhed.

" The ſize of the pallet depends upon the number of teeth in the eſcapement wheel, ſays Mr. Arnold, in his Deſcription of his father's eſcapement. The radius of the pallet ſhould be equal to the diſtance between any two teeth of the wheel, and then their relative motions will be equal. If the wheel has twelve teeth, the radius of the pallet will be thirty degrees, meaſured on the circumference of the wheel, and its diameter ſixty degrees (nearly), meaſured in the ſame manner, which will make it half the ſize of the wheel. If it has thirteen teeth, the pallet will, in diameter, meaſure fifty-five degrees and a half; if fourteen teeth, fifty-one degrees and a half; and if fifteen teeth, which is the number generally applied to pocket time-keepers, it will be forty-eight degrees. The marine (or box) time-keeper is made to beat half-ſeconds, the balance making 240 vibrations both ways in a minute; for if the balance-wheel has 15 teeth, the fourth wheel 80 teeth, and the balance pinion 10 teeth, there will be 120 beats, or half ſeconds, in one minute. It is alſo made with the eſcapement wheel of 12 teeth, the balance pinion having 7, and the fourth wheel 70 (counting from the great wheel); conſequently there will be 120 beats or half ſeconds in one minute, as before. It has been already remarked that the pallet for 12 teeth muſt be half the diameter of the wheel, and for 15 teeth five-twelfths, or fifty degrees.

" The pocket time-keepers, that they may not be diſturbed by motion, have what is called a quicker train, the ſeconds hand making 150 beats upon the dial, or 5 beats in two ſeconds. The eſcapement wheel has 15 teeth, the balance pinion 8 teeth, and the fourth wheel 80; conſequently there will be 150 beats in one minute, the pallet being 50 degrees in diameter, meaſured upon the diameter [ought to be circumference] of the balance-wheel. No mention has been made of the numbers of the teeth in the other wheels and pinions, as they are of little or no importance, and may be varied conſiderably."

We beg leave to differ here from Mr. Arnold, being decidedly of opinion that pinions of 6, 7, and even 8, are by no means ſo well calculated to tranſmit the maintaining power equally, as pinions of 10 and upwards; indeed Camus has demonſtrated in his chapter on the proper ſhape of teeth of "*Cours de Mathematique*," lately tranſlated into Engliſh, that no ſtrong pinion with a number of teeth under 10 will act with a wheel of ordinary ſize, entirely on one ſide of the line joining the centres of the acting wheel and pinion; therefore will not act without much friction; beſides, the more numerous the teeth are in a given wheel, provided the ſtrength of the tooth be ſufficient for its purpoſe, the leſs the teeth take into thoſe of the pinion, and conſequently the leſs the friction, in this ſecond point of view; if pinions of 12 or upwards were to be adopted in watch-movements and clock-movements, the advantage accruing from the adoption would be conſiderable, provided the weight of the wheels, towards the third and fourth wheels, were as little as their requiſite ſtrength will admit.

Mr. Arnold has given four poſitions of his eſcapement wheel in *Plate* III. of his deſcription, delivered to the Board of Longitude; figure one ſhows the wheel locked, and the balance returning in a detached ſtate from its ſecond excurſion; the ſecond figure ſhows the ſituation of the three pallets at the inſtant of unlocking; the third, which is our *fig.* 1, of *Plate* XIV., ſhows the ſituation of the different parts when the impulſe is half given, the jewelled face of the large pallet being in the line that joins the centres of the eſcapement wheel and pallet; and his figure four exhibits the parts at the moment when the impulſe ceaſes to be given by the acting tooth of the wheel. After what we have ſaid of the mode of acting in Meſſrs. Brockbanks' eſcapement, it will eaſily be apprehended what thoſe relative poſitions are from a verbal deſcription; particularly as we have put the ſame letters to the correſponding parts of both eſcapements, to aſſiſt the reader in comparing what we have before ſaid with our preſent deſcription. A is the eſcapement-wheel of Mr. Arnold's marine or box chronometer, made of braſs, and having 12 teeth, with their triangular ends projecting upwards, or rather downwards, when the face is up, from the plane of the wheel; B is the large impelling pallet of ſteel, at firſt made circular, like Meſſrs. Brockbanks', but having its notch terminated by two ſtraight lines pointing to its arbor, in one of which its jewel *c* is fixed; C is the locking ſpring, ſcrewed at its remote end to the under ſurface of the upper plate, and playing in a notch, or ſtraight groove made in the plane of the plate to receive it; its weakeſt part is about C, or between C and the fixing ſcrew, about which point it may be ſaid to turn as on a centre, but having no pivot, it requires no oil; about the middle of this ſpring, C, is a ſecond weaker ſpring, D, attached to it, which, in Meſſrs. Brockbanks', is a detached ſpring lying at the oppoſite ſide of the great pallet, and pointing to its centre; the end of this ſlender ſpring, which is called the unlocking ſpring, comes nearer towards the centre of the large pallet than the ſame end of the ſpring C; the ſaid two ſprings, thus attached together, have a great reſemblance, as they are ſeen in the figure, to a metallic pen in a pocket caſe of inſtruments, when one of the nibs is longer than the other; nearly at one third of the ſpring C, from this interior end, and on the ſide next to the wheel at *a*, is the locking pallet, the acting portion of which is a jewel; this jewelled pallet reſts againſt the heel of the tooth, or neareſt angular point towards the centre of the wheel, and in the act of unlocking is driven *inwards*, to allow the projecting portion to move *behind* it, when the wheel is unlocked; but, leſt the locking ſpring ſhould yield to the preſſure of the wheel when locked at any time, a ſcrew *b*, tapped into a ſtud in the upper plate oppoſite the pallet, *a*, bears againſt the exterior ſide of the locking ſpring, to prevent its falling back beyond a certain limit. In the drawing, the pallet appears to be a continuation of the ſcrew through the ſpring, on account of being placed over, or very nearly over it: the centre of motion of the unlocking ſpring, D, is near the ſcrew we have juſt deſcribed, from which it is free, by being narrower than the locking ſpring, C, and conſequently alſo weaker, when equally thin; the unlocking ſpring, D, therefore, is at liberty to move back towards the ſcrew-head without affecting the poſition of the locking ſpring, C, but when, by an impulſe received, it moves in a contrary direction, it muſt neceſſarily take the locking ſpring along with it, and conſequently the pallet, *a*, attached to this locking ſpring alſo. The lifting, or unlocking pallet in Mr. Arnold's conſtruction, is a ſtraight piece of ſteel, *d*, carrying a jewel, pointing not in a direction nearly oppoſite to the face of the large pallet, as is the caſe in Meſſrs. Brockbanks', but in one vibration follows the face of the large pallet a very little, and in the other precedes it as much: if two lines were drawn along the acting faces of theſe two pallets, which are fixed by friction on the verge of the balance, the angle contained would be very ſmall in the figures given by Mr. Arnold, in conſequence of his locking on the ſecond tooth, but we have not exact data whereby to calculate it, as will be ſeen more particularly in our account of Mr. Earnſhaw's chronometer, which follows, becauſe we are not informed by Mr. Arnold where the unlocking pallet reſts when the regulating ſpring of his balance remains quieſcent. Meſſrs. Brockbanks' eſcapement wheel, like Mr. Arnold's, locks, as we have ſeen, at the neareſt tooth behind the face of the large pallet, whereas Mr. Earnſhaw locks at the third, counting the tooth of action one, as will be ſeen by and by; but, unlike all the others that we have ſeen, Mr. Arnold's locking ſpring receives an impulſe *inwards*, to ſtrike the locking pallet from the tooth of its wheel: we pretend not to aſſert, from theory, that this kind of action is either more or leſs favourable to the eſcapement than when the locking pallet is driven *outwards*; in either caſe, if the face of the tooth is ſuch, that the eſcapement wheel has no recoil during the diſengagement, the total reſiſtance will be nearly ſimilar; for though that part of the tooth, which is neareſt the arbor of the wheel, preſſes on the pallet more than the extreme points would do of the *ſame wheel*, under the ſame circumſtances, in conſequence of which, the preſſure is here greater near the termination of the impulſe given to the locking pallet than at its beginning, yet we do not conceive this to be any diſadvantage, becauſe the locking pallet may thus be ſuppoſed to be unlocked gradually, rather than by a ſudden jerk, which muſt be partly the caſe, when the preſſure of the wheel's tooth againſt the pallet is a maximum at the commencement of the impulſe that detaches the locking pallet. When, however, a compariſon of this kind is made between two eſcapement wheels, we ought to take into the account their relative diameters, the relative maintaining powers as exerted at theſe wheels, the relative ſtrengths of the regulating ſprings, as well as of the locking ſprings, and alſo the relative points in the arcs of vibration where the unlocking pallets ſtrike, compared with the relative points of quieſcence of the balance ſprings; all of which are data, involving a complexity of calculations not entered into, we preſume, by the chronometer maker, when he feels diſpoſed to prefer one conſtruction to another, on views more ſuperficial.

We have already ſaid, that in our *fig.* 1., the wheel is at the middle point of its arc of action, conſequently, the lifting pallet *d* has let go the contiguous end of the unlocking ſpring D, and the pallet *a* has returned to the ſcrew point, to be ready to receive the next following tooth 3.; the direction of motion being ſuch, that the teeth, 1, 2, 3, &c. follow one another in ſucceſſion. In this ſituation, it appears to us, that the heel of tooth 2, which is now moving, is too near the pallet *a* in the figure; for, when the other half of the impulſe has been given, and the tooth 1 has eſcaped the pallet, the tooth 3, which is now nearly two-thirds of a ſpace from the pallet *a*, will have one-third drop before it arrives at it, which muſt be prejudicial to the ſteady motion of the balance. It is eaſy to ſee, that, during this vibration of the balance from D towards *c*, the unlocking pallet *d* muſt have hit the projecting end of D before it paſſed it, and alſo muſt have carried it and the ſpring C, together with the pallet *a*, towards the wheel, until the pallet *d* cleared the extreme end of D; alſo that the impulſe given in paſſing muſt have been of a continuance depending on the quantity that the end of the ſpring D preſents of its length to the paſſing pallet *d*; in the returning vibration, there will be the ſame continuance of the impulſe given by the pallet *d* to the ſame ſpring D in a contrary direction, but then the ſlender ſpring is the only one to be moved, and it yields to the ſlighteſt impulſe, thereby occaſioning no ſenſible derangement in the ſcale of forces by which the regulating ſpring controuls the balance: hence one impulſe received from the maintaining power through the medium of the train, by the face of the great pallet during the angle of its action, or rather of the eſcapement wheel's action on it, is ſufficient to overcome all the friction and reſiſtance the balance meets with, from whatever ſource, and to perpetuate its vibrations. From the preſent poſition of the reſpective parts of action, it is alſo eaſy to ſee, that the impulſe given to the end of ſpring D muſt have taken place a very ſhort time before the tooth 1 caught the face *c* of the large pallet, on which time depends the quantity of *drop* of tooth 1, before it comes into action; which drop ought to be very ſmall, leſt an accelerated force ſhould impel the large pallet with a jerk, and endanger ſome of the finer pivots. Mr. Pennington tells us, that the preſent poſition of pallet *d* is very nearly that in which the balance ſpring ought to be quieſcent, in order that the chronometer may be well in beat, a circumſtance not noticed in Mr. Arnold's account, but a very eſſential circumſtance to be known, when we judge of the fitneſs of the eſcapement for anſwering its purpoſe for a long continuance; for, as the momentum of the balance is always a maximum when it paſſes the quieſcent point of its regulating ſpring, or, in other words, when the force of this ſpring ceaſes to be accelerated, and begins to be retarded, it is acknowledged, we believe, univerſally, that the nearer this point of greateſt momentum the balance is, when the unlocking pallet makes its ſtroke, the leſs is the derangement in the uniformity of the balance's motion, which its regulating ſpring is intended to produce: but, it has been ſaid, that the preſent poſition is that of original quieſcence of the regulating ſpring; and it will be obſerved, that there is an arc of ſeveral degrees contained between the extreme ends of pallet *d*, and ſpring D, if a circle were deſcribed to touch them both; whence, it might be concluded, that the pallet *d* ought to touch the end of ſpring D, when the regulating ſpring is at its quieſcent point, for then the ſtroke would be made exactly at the moment of its having the greateſt momentum: ſuch concluſion might be good in theory, and, indeed, this is the poſition which Mr. Earnſhaw has given in his drawings, when he deſcribes his balance as being in a ſtate of quieſcence; but we ſhall reſerve what we have to ſay further on this important point, till we come to ſpeak more particularly of Mr. Earnſhaw's eſcapement in our following ſection. In the mean time, we will only generally obſerve, that, to put a chronometer, with a detached eſcapement, *into true beat*, the pallet *d* muſt be in the middle of the arc of eſcapement, which we ſuppoſe to be nearly in the poſition of our figure, when the balance-ſpring is quieſcent. Any further notice here on the mode of acting in this eſcapement, we think unneceſſary. *Figs.* 3 and 4, exhibit Mr. Arnold's balance; the former ſuppoſes the eye placed over the centre, and the latter at one ſide in a line paſſing through its plane. The circular bar of metal *a*, *b*, carrying three weights of adjuſtment for poſition, within the expanſion pieces *c*, *d*, in *fig.* 3, we underſtand, were added to the original balance by Mr. Arnold junior; but the generality of his chronometers have not had ſuch addition, being capable of the neceſſary adjuſtment without.

The expanſion rims, which are about the third portion of a circle each, were originally ſoldered together by an intermediate mixture, and bent into the requiſite ſhape by a pair of pliers ſhaped on purpoſe to give the deſired curve regularly; and, in ſome of the *beſt* chronometers, Mr. Arnold informs us himſelf, that he ſtill continues this practice, which is greatly reprobated by Mr. Earnſhaw; we will not undertake to decide the practical queſtion, which, in theory, we ſhould have leſs difficulty to decide; the regularity of weight and ſhape enſured by turning in the lathe, which was at firſt the ſenior Brockbank's practice, and is ſince that of

Mr. Earnſhaw, who formerly worked under him, ſeems to promiſe fairly for anſwering the purpoſe beſt, particularly when two metals only are united by fuſion ; but, it is contended by Mr. Arnold, that the true figure given in the lathe no longer remains when the ring is cut into portions, ſuch as halves or thirds ; for he ſays, the ſeparate parts aſſume, by their elaſticity, an inſtantaneous alteration in their figure, generally becoming portions of a circle of ſmaller radius than that of the original ring, and the ſeparate portions do not always undergo a change exactly ſimilar, owing to circumſtances which cannot be eaſily detected. To ſatisfy our doubts reſpecting this objection to turning an expanſion ring in a lathe, we applied to Mr. Pennington, who is allowed to be inferior to none of his contemporaries in practical ſkill, in all the different conſtructions of modern date, and we find it to be his practice, like Mr. Arnold's, not only to bend his expanſion pieces with pliers, but alſo, to ſolder them previouſly, as he formerly did thoſe of Mr. Mudge's ; and he is convinced that his balances, though perforated in many places to receive various ſcrews of adjuſtment, are as ſenſibly and regularly obedient to the changes of temperature as thoſe of any other maker : it may be proper to add here, that Mr. Pennington has an excellent regulator, with a compenſation pendulum of a peculiar conſtruction ; and that he has lately fitted up a little room with an inſulated brick and ſtone pillar for his tranſit inſtrument ; of which he is fully acquainted with the uſe and neceſſary adjuſtments.

The ſcrews *d*, *d*, in *figs.* 3 and 4, are for rate ; the cylindrical pieces, *c* and *c*, tapped for the ſcrews at the ends of the expanſion pieces, and having little holes at their exterior ends for a fork ſcrew-driver, are for the adjuſtment for temperature ; and the two additional ſcrews, *e* and *e*, are for the adjuſtments for poſition, particularly when the interior ring *a b* is not introduced : theſe laſt ſcrews, *e*, and *e*, when uſed for poſition, will alter the momentum of the balance, and conſequently the rate of going, if one of the two is not juſt as much ſcrewed in as the other is ſcrewed out, when the rate is previouſly adjuſted, unleſs, indeed, there is a difference in their relative dimenſions and weights, which, in this caſe, would interfere with the adjuſtment for temperature.

Mr. Arnold uſes a cylindrical ſpring with his balance, and is very particular in aſcertaining the exact effective length that ſhall produce the ſame rate, whether the arc of vibration be long or ſhort ; the trial of this adjuſtment is made by uſing the main-ſpring greatly relaxed, or let down by its ratchet, and again when it is ſet high, or has its intenſity increaſed ; which alteration is equivalent to an addition or ſubtraction of weight in the maintaining power of a clock in order to increaſe or diminiſh the arc of vibration in a pendulum. When the chronometer is new, or clean if uſed ſome time, the ſemi-arc of vibration varies according to circumſtances from 180° to 230°, making in the whole vibration from a circle to 460° ; but, when the oil grows thick, or when dirt has obtained admiſſion into the upper part of the train, the arc will ſometimes be reduced to 240° ; ſo that, if the long and ſhort arcs were not performed in the ſame time preciſely, an alteration would take place in the rate, which might be conſiderable enough to do away all dependence on an accurate meaſurement of time. The balance-ſpring is uſually made by Mr. Arnold of ſteel wire hardened and tempered, though he ſays that wire hard rolled, or wire made of gold with a mixture of from one-eighth to one quarter of copper, will do ; but the two latter are leſs permanently elaſtic, and the hard rolled wire will ſometimes require to be tapered, at that end which is next the balance ſtud : the beſt length of a balance-ſpring, which is longer in box than in pocket chronometers, lies between 5 and 20 inches to become iſochronal ; but Mr. Arnold does not ſeem to apprehend, that there are various intermediate lengths, as Mr. Pennington aſſerts, which are equally iſochronal. In the box chronometer, which has a heavier balance than the pocket one, and a ſlower train, the weight is taken from the ſupporting pivot of the verge, by an ingenious application of the cylindrical regulating ſpring thus ; when the ſpring is wound round a cylinder, to be blued, the coils are put contiguous, which ſhape would be afterwards preſerved from the elaſtic temper then given to it, if no force were to ſeparate them ; but when one end of the ſpring is attached to the verge collet, and the other to the ſtud, theſe oppoſite ends are forcibly removed from each other to ſuch a diſtance, that the coils are ſeparated from contact, and the effort, exerted to bring them again into contact by their elaſticity, lifts nearly the whole weight of the balance. Formerly, there was a contrivance for banking in Mr. Arnold's chronometers, but the banking pin or lever rubbing between two coils of the ſpring, was found to be injurious, and was therefore laid aſide ; and we do not learn that any other banking has been ſubſtituted. Mr. Arnold lays great ſtreſs on his ſtud being placed ſo as to fix the end of his balance-ſpring at half the diſtance between the centre and circumference of the coils, ſo that the laſt coil, at each end, is made ſo much ſmaller than the reſt, as prevents any protruſion of the large coils, and preſerves the cylindrical ſhape apparently unaltered by the action.

We underſtand, that neither of the two Arnolds ever placed a chronometer for trial at the Royal Obſervatory, for the expreſs purpoſe of applying for parliamentary remuneration ; but we have ſeen, under our account of Mr. Mudge's time-keeper, that Nos. 36 and 68 were tried againſt his, and pronounced to be ſuperior, both with reſpect to their accurate going, and alſo in regard to the ſimplicity and practicability of their conſtruction ; ſo that 1322 l. were given to Mr. Arnold ſenior by the Board of Longitude at different times by way of encouragement, and 1678 l., its complement to 3000 l., were given in December 1805 to Mr. Arnold junior, being at the ſame time that 2500 l. were given to Mr. Earnſhaw, in addition to the 500 l. which he had previouſly received. When the queſtion was difficult to decide, whether Mr. Arnold's or Mr. Earnſhaw's chronometers were moſt worthy of public reward, the Board of Longitude very properly rewarded the labours of both theſe makers.

Mr. Arnold, like Meſſrs. Brockbanks, was deſired to lay before the Board of Longitude ſome of the rates of chronometers made by his father and himſelf, which have not been returned to him, but the public are in poſſeſſion of the certificates of ſeveral rates which Mr. Arnold publiſhed in the year 1791 ; which rates are copied into Mr. Dalrymple's publication, together with ſome additional teſtimonies, which are too long for us to introduce here, and which, therefore, we muſt requeſt thoſe readers to refer to, who wiſh to be informed of all the particulars ſtated in the certificates ; it is ſufficient, for the purpoſes of the general reader, that we have given him the peculiarities of the conſtruction of the chronometer itſelf, together with an hiſtorical notice of Mr. Arnold's inventions, and an account of the mode of action of the eſcapement ; the general merit of chronometers of this conſtruction no diſintereſted perſon, that we know of, has yet denied.

Chronometer by *Mr. Earnſhaw.*—For the ſame reaſon that we have not given the movement and parts of the chronometer contained in the frame of Mr. Arnold, we think it not neceſſary particularly to deſcribe all the parts of Mr. Earnſhaw's that are common to the other modern chronometers. The peculiarities of the conſtruction are confined to the balance, the balance-ſpring, the eſcapement-wheel, and the acting parts of the eſcapement. To theſe parts, therefore, we propoſe to confine our account. Mr. Earnſhaw ſays, that his train is the beſt poſſible, viz. 1800 vibrations of the balance in an hour, which, we have ſeen, has always been the train of the other chronometer-makers, particularly for the pocket ones; his box pieces have 13 teeth each in the eſcapement-wheel, and his pocket ones 15, like thoſe of Meſſrs. Brockbanks'; we are not told what pinions are uſed in the movements; nor is it ſaid, in Mr. Earnſhaw's account delivered to the Board of Longitude, that this is a conſideration of any moment. *Fig.* 5 of *Plate* XIV. is an exact copy of Mr. Earnſhaw's *fig.* 1 of his *Plate* III., which was taken from his model laid before the Board of Longitude on June 7th, 1804, at the ſame time that Mr. Arnold's model was produced; the plate and cocks, being not neceſſary for explaining the mode of action, are in our figure omitted. Mr. Earnſhaw has given ſo minute an account of his eſcapement accompanying the model, that we cannot deſcribe it better than by copying his own words, which are nearly theſe: viz.

"The ſmall wheel M S K is called the large pallet; it is a cylindrical piece of ſteel, having a notch or piece cut out of it at *l h r;* againſt the ſide of this notch is a ſquare flat piece of ruby, or any hard ſtone, *h l*, ground and poliſhed very ſmooth, and fixed faſt into the pallet. The cylinder is ſo placed, with reſpect to the balance-wheel, that it may not be more than juſt clear of two adjoining teeth. E F is a long thin ſpring, which is made faſt at one end, by being pinned into a ſtud, G, and made to bear gently againſt the head of an adjuſting ſcrew, *m:* the other end is bent a little into the form of a hook; to this ſpring there is fixed another very ſlender ſpring at *y*, which projects to a ſmall diſtance beyond it. This ſmall ſpring lies on the ſide of the thick ſpring neareſt to the balance-wheel. The adjuſting ſcrew, *m*, takes into a ſmall braſs cock, at *a p*, which is ſcrewed faſt to the upper plate by a ſtrong ſcrew. Upon the ſpring E F there is fixed a ſemi-cylindrical pin, which ſtands up perpendicular upon it, and of a ſufficient length to fall between the teeth of the balance-wheel A B C D. This pin is called the locking-pallet, and is placed on the oppoſite ſide of the ſpring repreſented to view. Through the centre of the cyliudrical pallet M S K, a ſtrong ſteel axis paſſes, called the verge; the pallet is made faſt to this axis, which alſo paſſes through the centre of the balance, and is made faſt to it; it has two fine pivots at its extremities, upon which it turns very freely, between two firm ſupporting pieces of braſs, ſcrewed firmly, and made as permanent as poſſible, by ſteady pins, to the principal plate. A little above the cylindrical pallet M S K is fixed a ſmall cylindrical piece of ſteel, *i n*, having a ſmall part projecting out at *i*, through which the verge alſo paſſes; this is called the lifting pallet, (and is from $\frac{1}{3}$ to $\frac{1}{2}$ the diameter of the large pallet); it fixes upon the verge like a collar, and is made faſt by a twiſt, ſo as to be ſet in any poſition with reſpect to the large pallet M S K. The end E G of the long ſpring E F being made very ſlender, if a ſmall force be applied at the point *o* to preſs that end out from the wheel A B C D, it eaſily yields in that direction, turning, as it were, upon a centre at G; it is alſo made to ſlide in a groove made in this ſtud, in ſuch a manner that the end *o* may be placed at any required diſtance from the centre of the verge. Having deſcribed the ſeveral parts as they appear in the figure, we next come to their connection or ſituation with reſpect to each other. Let the long ſpring E F be ſuppoſed to be ſo placed, that the end of the ſlender ſpring *y i* may project a little way over the point of the lifting-pallet *i n*, but not ſo cloſe but that the point of the pallet may paſs by the hooked end of the ſpring E F without touching it; the head of the adjuſting-ſcrew *m* is alſo ſuppoſed to bear gently on the inner ſide of the ſaid ſpring E F, or that neareſt to the wheel, and at the ſame time the locking-pallet is ſo placed, that one of the teeth, D, of the balance-wheel may juſt take hold of it. This pallet is not viſible in its proper place in the figure, being covered from ſight by the ſcrew *m*, and part of the ſpring E F; its poſition is therefore repreſented by the dot *k*, on the oppoſite ſide of the wheel, having the tooth A juſt bearing up againſt it. From the above deſcription of the ſeveral parts of the eſcapement, and their connection with each other, it will be eaſy to ſee the mode of its action, which is as follows:

"A force being ſuppoſed to be applied to the balance-wheel, ſo as to cauſe it to move round in the direction of the letters A B C D, one of the teeth, as D, will come againſt the locking-pallet (as repreſented at A, and the locking-pallet by *k*). The wheel is then ſaid to be locked, being prevented from moving forward by this pin. Let the balance be now ſuppoſed to reſt in its quieſcent poſition, and it will have the ſituation repreſented in the figure; the lifting-point *i* of the pallet *i n* will be juſt clear of the projecting end of the ſlender ſpring, the face *h l* of the large pallet M S K will fall a little below the point of the tooth B, and the balance having its ſpiral or helical (meaning cylindrical) ſpring applied to it remains perfectly at reſt in this poſition. Now, as the balance and the two pallets M S K and *i n* are fixed faſt to the verge, it is plain they muſt all move together; let, therefore, the balance be carried a little way round in the direction of the letters M S K; by this motion the end *i* of the lifting-pallet *i n* will be brought to preſs up againſt the projecting end of the ſlender ſpring, and as this ſpring is fixed on the ſide of the ſpring E F, neareſt to the balance-wheel, the point *i* will preſs the two ſprings together out from the balance-wheel; then, as only the point of the tooth D (ſee its poſition at *k*) touches the locking-pallet, when the ſpring E F was at reſt againſt the head of the ſcrew *m*, it will, by the ſpring being preſſed out from the tooth, have ſlipt off (for the locking-pallet which was before ſuppoſed at *k*, will now be at *a*, clear of the tooth A of the balance-wheel); the wheel being now at liberty will move round by the force ſuppoſed to be applied to it; but as the point *i* of the lifting-pallet moves on and preſſes out the ſpring, the point *l* of the large pallet approaches towards the point of the tooth B of the balance-wheel, ſo that when the ſpring E F is ſufficiently puſhed out to unlock the wheel, the point *l* of the large pallet will be got to *d*, and in this poſition the point of the tooth B of the balance-wheel will fall upon it, at the ſame time the point of the tooth D has juſt dropped off from the locking-pallet *m;* the force of the wheel being by this means applied to the top of the pallet *h l*, gives an increaſed momentum to the balance, and aſſiſts it in its motion in the ſame direction, and by the continued motion of the large pallet in the direction M S K; the point of the tooth B, which keeps preſſing and urging it forward, moves up towards the bottom of the face of the pallet towards *h*, until the plain flat ſurfaces of the tooth and pallet come into contact. by this time the end, *o*, of the ſlender ſpring has dropt off from the point, *i*, of the lifting-pallet, and the two ſprings have returned again into their quieſcent poſition, the ſpring, E F, gently bearing againſt the head of the adjuſting ſcrew, *m*, and the locking-pallet in a poſition to receive the next tooth, C, of the balance-wheel. When the two ſurfaces of the tooth and pallet are thus in contact, the greateſt force of the wheel is exerted upon the pallet, and of courſe upon the balance moving with it. The tooth ſtill preſſing againſt the face of the pallet, and the pallet moving in the direction MSK, it at laſt drops off, leaving the balance at perfect liberty to move on in the ſame direction in which it was going. Juſt as the point of the tooth B, which has been preſſing the large pallet round, is ready to leave it, the next tooth, C, of the wheel is almoſt in contact with the locking pallet *m*, ſo that the inſtant the tooth B drops off, the wheel is again locked, and the action of that tooth upon the balance is finiſhed. As the balance moves with the greateſt freedom upon its pivots, the force of the tooth has given it a conſiderable velocity, ſo that the balance ſtill keeps moving on in the ſame direction, after the preſſure of the tooth is removed by ſlipping off from the pallet, until the force of the pendulum-ſpring (which is not repreſented in the figure) being continually increaſed by being wound up, overcomes the momentum of the balance, which, for an inſtant of time is then ſtationary, but immediately returns by the action of the pendulum-ſpring, which exerts a conſiderable force upon it in unwinding itſelf. As the balance returns, the point *i* of the lifting pallet *i n* paſſes by the ends of two ſprings, EF, γ *o*, and, in paſſing by, puſhes the projecting end, *o*, of the ſlender ſpring in towards the balance-wheel, until it has paſſed it; after this, the projecting end *o* again returns and applies itſelf cloſe to the hooked end of the ſpring EF, as before. The ſpring γ *o* is made ſo ſlender, that it gives but little reſiſtance to the balance, during the time the point *i* of the lifting pallet is paſſing it, and of courſe cauſes but little (if any) decreaſe in its momentum. During the time the point *i* of the lifting pallet is paſſing in the ſmall ſpring γ *o*, the long ſpring EF remains ſteadily bearing againſt the head of the adjuſting ſcrew *m*, as the hooked end at *o* juſt lets the end of the lifting pallet paſs by without touching of it. As the ſpring has now been continually acting upon the balance, from the extremity of its vibration in the direction MSK, it has given it the greateſt velocity, when the point *i* of the lifting pallet is paſſing the end *o* of the ſlender ſpring; for at this inſtant the ſpring which was wound up by the contrary direction of the balance, is now unwound again, or in the ſame ſtate as it was in its quieſcent poſition at firſt, and of courſe has no effect upon the balance at all in either direction; but the balance, having now all the velocity it would acquire from the unwinding of the ſpring, goes on in the direction SMK, until the force of this ſpring again ſtops it and brings it back again, moving in the ſame direction as at firſt, with a conſiderable velocity. By this return of the balance, the point *i* of the lifting pallet comes up again to the projecting end *o* of the ſlender ſpring, puſhes back the long ſpring EF, and unlocks the wheel; and another tooth falling upon the face of the pallet *h l* gives freſh energy to the balance; and thus the action is carried on as before."

In this quotation we have given the original letters of reference, but as the balance and cocks are left out in our *fig.* 5, the direction of the balance has been indicated by the letters referring to the large pallet, which, being placed on the ſame verge, has the ſame motion. We have added two dotted lines in the large pallet to ſhew that the direction of the lines, bounding the notch in the circumference, is towards a point in the radius of it, equally diſtant from its centre and circumference; alſo we have added two ſimilar dotted lines from two ſeparate teeth, to ſhew that the undercutting or ſloping of the interior ſide of the tooth is likewiſe directed to a point equally diſtant from the centre and circumference of the wheel, which point is at double the diſtance from the centre compared with the point guiding the undercutting ſlope in Meſſrs. Brockbanks' chronometers; for the interſecting dotted lines form tangents to the dotted circle deſcribed with half the radius of the wheel. The locking ſpring points directly to the balance arbor, but is laid in ſuch a way as not to be an exact tangent to a radial line drawn from the centre of the wheel to the locking pallet, the angle formed at the pallet being ſomewhat leſs than a right angle, in order, as Mr. Earnſhaw ſays, "that the wheel may have a tendency to draw the ſpring into it," for ſafe locking. The eſcapement wheel, balance, balance-ſpring, pallets and ſprings for locking and unlocking are at the outſide of the upper plate, and are preſented to view when the cock is taken off. We hardly underſtand Mr. Earnſhaw's reaſoning, when he ſays that his ſcape wheel "unlocks in a ſimilar circle which the wheel makes, which renders it a perfect dead ſcape," and that "Mr. Arnold's is locked on the other ſide of the wheel, and in the act of unlocking the ſpring moves in towards the centre of the wheel, which is a different direction to that which the wheel takes, and produces a recoil." In the firſt place we are at a loſs to conceive how the pallet on the detent-ſpring and the point of a tooth in the wheel can move in a *ſimilar circle*, to ſize, or direction of motion, unleſs the radii are alike, and the centres of motion coincident; and in the next place, we ſee no reaſon to conclude that a pallet carried *directly from* the centre of the wheel's motion ſhould be conſidered in the ſame direction as that of a tooth in the wheel, any more than a pallet carried *directly towards* the centre of the ſame, in the act of unlocking; in both caſes, if the detent ſpring is a tangent to the tooth of the wheel that holds the pallet, the motion *in* or *out* will be at right angles to the circumference of the wheel, and if the tooth is conſiderably undercut there muſt neceſſarily be a recoil in both caſes. The only correction for this is, to make the angle formed by the detent ſpring and radial line of the wheel at the reſting pallet, to be as much leſs than a right angle, as the angle of undercutting is; accordingly Mr. Earnſhaw ſays he has made this angle a little leſs than a right angle, but then he has undercut his tooth much more than the difference, and therefore, as appears to us, there muſt be recoil, or a little backward motion in the ſcape wheel, in the act of the detent pallet's eſcaping; whereas Mr. Arnold's locking pallet reſts againſt a ſtraight line directed towards the centre, which is alſo the direction of the pallet's motion in unlocking, conſequently there can be no ſenſible recoil in his eſcapement. In our deſcription of Mr. Arnold's eſcapement the reader may recollect that he was referred to this place for ſome further account of the proper *adjuſtment for beat* in a chronometer of the modern inſtruction, we here reſume the ſubject with an obſervation of Mr. Earnſhaw himſelf which we have already quoted; "let the balance, ſays he, be now ſuppoſed to reſt in its quieſcent poſition, and it will have the ſituation repreſented in the figure," alluding to the figure which we have copied: we preſume not, merely upon the ſtrength of our theoretical reaſoning, to aſſert, that the adjuſtment for beat is improper, if the balance ſpring is quieſcent when the face of the lifting pallet *i* is in contact, or nearly in contact with the end of the unlocking ſpring *i* γ, but we are aſſured by workmen well qualified to judge, and who give ſcientific reaſons for the aſſertion, that the lifting pallet is not only about 24° on one ſide of the requiſite point of poſition, but is actually at the wrong ſide of the unlocking ſpring; the reaſon given us is this, whenever a chronometer is in *true beat*, the quieſcent point from which the excurſions of the balance commence is in the *mean point* of the angle of eſcapement; this is obviouſly the caſe in the anchor eſcapement of a pendulum clock, and requires a neceſſary adjuſtment when the clock is at firſt fixed up; and a little conſideration will prove that an attention to this adjuſtment, though not equally obvious, is equally deſirable in a chronometer. What is called the angle of eſcapement differs from what is called the angle of action, or angle of impulſe, in a chronometer; the former is included in the arc comprehended between the point where the unlocking ſpring lets go or eſcapes the face of the lifting pallet, and the point where the impelling tooth of the wheel drops off or eſcapes from the face of the large pallet; but the ſecond, or arc of impulſive action, is comprehended, between the point where the impelling tooth commences, and the point where it terminates its action; this ſecond arc is ſmaller than the former, and is always contained in it; the two have indeed one common termination, but each has a ſeparate commencement; for the wheel muſt neceſſarily be unlocked before its action on the large pallet can begin, and the unlocking takes place previouſly to the unlocking or lifting pallet's quitting the end of the unlocking-ſpring: if we ſuppoſe that the ſlender ſpring *i q* bends back, the ſpace of 4°, more or leſs, before the unlocking-pallet *n i* quits it, after the wheel is unlocked, this quantity will conſtitute the difference between the arc of eſcapement and the arc of the wheel's action, provided there be no drop of the impelling-tooth on the heel of the large pallet after the wheel is unlocked, and before the action commences; but if we ſuppoſe the ſaid drop to be alſo 4°, then will the whole arc of eſcapement exceed the whole arc of action on the pallet by 8°. Admit now that the eſcapement-wheel and large pallet have their diameters to each other as 2 : 1, which is the ratio Mr. Earnſhaw in general adopts, and that this wheel have 13 teeth, which is the number in his box-chronometer; then $\frac{360°}{13} = 27°.7$ nearly, is the diſtance between the points of two ſucceſſive teeth; admit alſo that there be a ſecond drop of 2° from the tooth to be locked to the locking-pallet after the arc of action is finiſhed; then the ſum of the two drops, $4 + 2 = 6°$, that precede and follow the arc of action, being ſubtracted from 27°.7, or whole diſtance between the two neareſt teeth, leaves 21°.7 meaſured on the circumference of the wheel for the total arc of action on the pallet; but the wheel is double the diameter of the pallet, therefore, the ſame quantity is $21°.7 \times 2 = 43°.4$ meaſured on the circumference of the large pallet, and the arc of eſcapement exceeds the arc of action, on our ſuppoſition, by 8°, conſequently, $43°.4 + 8° = 51°.4$ will be the arc of eſcapement: now it will be ſeen, on referring to the plate, that Mr. Earnſhaw has placed his lifting-pallet in the figure within leſs than 4° of one of the two extremities of the arc of eſcapament, and on that ſide of the unlocking-ſpring *iγ*, towards which this ſpring bends at the inſtant of the lifting-pallet's final eſcape; and yet he ſays that this is its ſituation when the balance-ſpring is in a ſtate of quieſcence; let us try what will be the conſequence of ſuch a poſition; the chronometer will meaſure time very well, and the impulſe of the lifting-pallet, we allow, will be given at the moſt favourable inſtant, namely, at the inſtant of the ſpring's quieſcence, or point of the balance's greateſt momentum, which, it is evident, was Mr. Earnſhaw's reaſon for fixing his lifting-pallet ſo; but then, which is our objection, as one excurſion of the balance from the point of reſt muſt neceſſarily be 47°.7 (51°.4 — 4°) before it clears the arc of eſcapement, and as the excurſions muſt be ſimilar to the right and left, when the balance vibrates freely, the whole arc of vibration can never be diminiſhed to leſs than 95°.4, in this caſe, without the chronometer's ſtopping, which, as the chronometer has not the power of commencing motion of itſelf, is a very ſerious objection to the preſent poſition of the lifting-pallet; it may, indeed, be ſaid, in reply, that the chronometer muſt be very dirty before its arc of total vibration becomes ſo much diminiſhed as to be little more than a quarter of a circle, but this is not the only predicament in which the ſtoppage will take place; any ſudden check, or quick horizontal motion given to the vibrating balance, that makes it return even once before it has exceeded this limit, will bring it to reſt; that is, nearly the ſame effect will be liable to be produced as if the arc of the eſcapement had been almoſt double the preſent quantity with a pallet of ½ the diameter of the wheel, which is Mr. Earnſhaw's cogent objection to Mr. Arnold's conſtruction. In making this compariſon with a double arc of eſcapement, we, of courſe, ſuppoſe the point of the lifting-pallet's quieſcence to be in the middle point of the arc of eſcapement, as Mr. Arnold's appears to be in his figure, which we have copied, and which ſituation we now proceed to ſhow, is moſt favourable to the continuance of the chronometer's going without interruption with any given pallet. We propoſe to place the lifting-pallet's face exactly in the middle point of the arc of eſcapement, which is not a theoretical propoſition of ours, but we have examined chronometers adjuſted ſo for beat, and have found that, when the balance is drawn round a trifle beyond either extremity of the eſcapement-angle, they have the power of commencing motion within a limit very little exceeding the eſcapement-angle, which, in Mr. Earnſhaw's box-chronometer, we have ſhown, may be about 51°.4. Hence the chance is almoſt two to one in favour of that chronometer's avoiding ſtoppage by dirt or accident, which has its quieſcent lifting-pallet in the middle of the arc of eſcapement, compared with that which has the ſame pallet at one end of the ſame arc.

The only objection which carries the ſemblance of argument againſt our mode of adjuſtment for beat, an adjuſtment we believe too generally overlooked, is, that the impulſe of the lifting-pallet is not at the moment of the balance's greateſt momentum, but about 24° before the momentum is a maximum, allowing the pallet to be quieſcent at the middle of the arc of eſcapement, which we contend for; our reply is, that the momentum is ſo nearly a maximum at 24° from it that the difference produces no ſenſible bad-effect on the balance, compared with the probable effect from ſtoppage when the adjuſtment for beat is nearly as bad as poſſible. Indeed, Mr. Atwood has calculated, and his calculations ſeem to have been verified by practice, that when, in the caſe of Mr. Mudge's time-keeper, the quieſcent point of his auxiliary ſpring is at one ſide of the quieſcent point of his ſtronger ſpring, the effect produced is a daily gain or daily loſs in the rate, accordingly as the diſtance from coincidence of the reſpective points of reſt fell on the right or left hand ſide of the quieſcent point of the ſtrong regulating ſpring, and the daily gain or loſs thus to be effected is ingeniouſly propoſed, in our author's excellent paper in the Philoſophical Tranſactions of 1794, to be uſed as an adjuſtment for rate, or even as a compenſation for want of iſochroniſm in the balance-ſpring. The deduction from the momentum of the balance, occaſioned by the impulſe of the lifting-pallet, being ſomewhat analogous to the want of adjuſtment in the quieſcent point of Mr. Mudge's auxiliary ſpring, might indeed produce a ſlight loſs in the daily rate, if the ſcrews of adjuſtment for rate did not compenſate ſuch loſs; but when it is conſidered that the impulſe from the wheel ſucceeds the deduction from the momentum almoſt inſtantaneouſly, and that the deduction we ſpeak of is preciſely the ſame in each vibration, the uniformity of the going of the chronometer will not be ſenſibly altered thereby.

Let us ſee, in the next place, what will be the arcs of action and of eſcapement in Mr. Earnſhaw's pocket chronometers, in which the eſcapement-wheel has 15 teeth; $\frac{360°}{15} = 24°$ is the diſtance between two contiguous teeth, from which ſubtract, on our former ſuppoſition, 6° as the ſum of the preceding and following drops, and the angle of action will be 18°, or 36° meaſured on the circumference of the large pallet, if it be half the ſize of the wheel; but the angle of eſcapement will be greater than the angle of action by 8°, therefore $36 + 8 = 44°$ is the whole arc of eſcapement, ſuppoſing, as before, the data for the drops to be accurate. This angle of eſcapement turns out to be leſs, on our ſuppoſition, than that with only 13 teeth in the eſcapement by 7°.4, and therefore will admit a lifting-pallet ſmaller than the box chronometer has, in order to have the ſame angle of eſcapement, or the ſame liability to ſtop by dirt or accident; it being ſelf-evident that the ſame ſubtending line, conſidered as a chord, will meaſure more degrees on the periphery of a ſmall circle than on the periphery of a larger. This compariſon of the two arcs of eſcapement ſhews, that the arc in queſtion depends not entirely on the relative diameters of the eſcapement and large pallet, as Mr. Earnſhaw ſuppoſed, when he objected to Mr. Arnold's proportions, but on their relative diameters conjointly with the number of teeth in the wheel, the latter of which has been overlooked by Mr. Earnſhaw, but particularly inſiſted on by Mr. Arnold. However, we agree perfectly with Mr. Earnſhaw, that in any wheel with a given number of teeth, a large pallet for receiving the impulſe of the wheel will require a ſmaller arc of action as well as a ſmaller arc of eſcapement, than a pallet that has a ſmaller diameter, under any given adjuſtment for beat, which is a conſideration worthy of general notice.

On counting the teeth in Mr. Earnſhaw's eſcapement-wheel, which we have copied, we were ſurpriſed to find only 12 teeth in it, particularly as we are informed, in his deſcription, that his numbers are 13 and 15 reſpectively; we can only account for this circumſtance by ſuppoſing that the draftſman miſtook the number; which we here notice, leſt the reader ſhould ſuppoſe the fault to lie in our figure excluſively.

Fig. 6 of *Plate* XIV. repreſents Mr. Earnſhaw's balance, which, like Mr. Arnold's, has only two compenſation pieces, and thoſe much ſhorter than his, being little more than a quadrant each: *a* and *a* are the ſcrews of adjuſtment for rate, ſcrewed in to make the chronometer go faſter, and out to make it go ſlower. The ſliding pieces *b* and *b* have each a circular groove, turned in a lathe or turning-frame, deep enough to form a bed for the expanſion bars, in order that the interior ſide ſcrews *c* and *c* may preſs againſt the edges of the expanſion pieces, and retain the ſliding pieces in any given ſituation. *Fig.* 7 is a lateral view of this balance and verge without the pivots, which Mr. E. ſays ſhould be conical except very near the ends, which ſhould be cylindrical; and ſhould run in a "jewel hole as ſhallow as poſſible, ſo as not to endanger cutting the pivot; and the part of action of the hole ſhould be made quite back, with only a very ſhallow chamfer behind to retain the oil." The ſliding pieces *b* and *b* are the weights of adjuſtment for temperature; in making theſe weights, a braſs ring is firſt made in the lathe, and is then cut through into fourteen equal parts in a clock-engine, by an operation ſimilar to that of cutting a wheel into fourteen teeth, ſo that each piece is the fourteenth part of a circle, after deducting the thickneſs of the cutter, which is not mentioned. One of the weights in a box chronometer, is about twenty grains generally. The expanſion rims are turned out into a ring from a circular compound plate, which is made after the method of Meſſrs. Brockbanks, by fuſing the braſs in a crucible, containing the ſteel circle, held in a horizontal poſition during the time of fuſion. The conſtruction is very ſimple, but, as it appears to us, if the adjuſtments for poſition were made by means of the ſcrews of rate, and weights for temperature only, one adjuſtment would derange another, and that, for poſition would be very difficult to make nicely, as there is no tangent ſcrew, or other contrivance, to move the weights *b* and *b* by gradual ſlow motions. As though to get rid of this objection, which was too obvious to be overlooked, Mr. E. conceives that the cauſes of a difference in the rate in different poſitions, are large balance pivots in part, but principally the badneſs of the balance-ſpring; his words reſpecting the latter cauſe, are theſe; "much difficulty has fallen to the lot of watch-makers in the endeavour to make time-keepers go nearly the ſame in the different poſitions: I have had my ſhare of this, but it is now over; by far the greateſt part of this difficulty ariſes from the balance-ſpring not being properly made. But if the ſpring is made as I ſhall deſcribe hereafter, you have only to make the balance of equal weight, and it will go within a few ſeconds per day in all poſitions alike; and if it vibrates not more than one circle and a quarter, by applying a ſmall matter of weight to that part of the balance, which is downward, when in the poſition that it loſes moſt, (it) will correct it with great accuracy."

The Board of Longitude not knowing what this "ſmall matter of weight" implied, nor how it is to be attached to the balance, were induced to put the following queſtion, viz. "When the weight is wanted to adjuſt the watch in the poſitions of 3 and 9, by what means do you obtain that weight, in the manner your balance appears to be made; if you know any thing more that is material concerning the making time-keepers go nearly the ſame in different poſitions, communicate it."

Anſ.—"To adjuſt the watch in the poſitions of 3 and 9, (ſays Mr. E.) I fix on to one of the compenſation-weights that is downwards, when in that poſition that it loſes moſt, a ſmall piece of braſs, not larger in diameter than a common pin-head, and nearly as thin as foolfcap paper. I fix it on with a very ſmall particle of *bees wax*, not larger than the common dot of an *i*: that is, if the watch is gaining on mean time. But if the watch is loſing, I then take out the balance, and with a drill drill out a ſmall matter from that compenſation-weight, that is uppermoſt when in the poſition that the watch loſes moſt; this I have found to correct it without ſo many ſcrews and fans as I have ſeen in ſome time-keepers." After having read the above anſwer, we were almoſt induced to examine whether the balance itſelf might not alſo be fixed to the verge-collet by bees wax inſtead of ſcrews, but we recollected that in the drawing there is a little ſcrew-head at each ſide of the centre of the balance, which appear to be uſed for this purpoſe. Mr. E. we truſt, will pardon the obſervation.

The rule for adjuſting the balance for temperature is this; put the watch into about 85 or 90 degrees of heat by the common thermometer, mark down exactly how much it gains or loſes in 12 hours, then put it into as ſevere a cold as you can get, for 12 hours, and if it gains one minute more in 12 hours in cold than in heat, move the compenſation weights farther from the arm of the balance about $\frac{1}{8}$ of an inch; and if it gains one minute more in 12 hours in heat than in cold, move the weights $\frac{1}{8}$ of an inch nearer to the arm of the balance, and ſo on in the like proportion, trying it again and again, till you find the watch go the ſame in whatever change of heat and cold you put it. Of courſe this adjuſtment precedes the adjuſtment for poſition, ſo that moſt probably the poſition, whatever it is, during theſe trials, is always the ſame, a circumſtance not ſpecified. The total vibration at firſt is confined to a circle and a quarter, which quantity, it is ſaid, will produce the moſt ſteady performance; but we are not informed what the banking is that limits the greateſt vibration, nor indeed whether there is any banking at all, which we have been informed there is not in general.

Mr. Earnſhaw's greateſt difficulty in the progreſs of his labours ſeems to have been to find out what he calls the *inviſible properties* of the balance-ſpring, and to render it not exactly iſochronal, but ſo nearly ſo, that its deviation from iſochroniſm may compenſate for a *relaxation* in the ſpring, real or imaginary, ariſing from conſtant uſe, which is *ſuppoſed* to affect the permanency of the rate. After complaining bitterly of much diſappointment in his firſt labours, our author ſays, "I found, in the courſe of reaſoning on bodies, that watch-ſprings *relax* and *tire* like the human frame, when kept conſtantly in motion; and this may be proved by the following experiment: let a watch, that has been going a few months, go down, let it be down for a week or two, or more, then ſet it going, and if it be a good time-keeper, ſo as not to be affected by the weather, it will go ſome ſeconds per day faſter than it did when it was let down, but it will again loſe its quickneſs in a gradual manner, gaining leſs and leſs, till it comes to its former rate. Therefore, finding that iſochronal ſprings would not do, and likewiſe having made ſprings of ſuch ſhape as would render long and ſhort vibrations equal in time, (which) conſtantly loſe (loſt) the longer the watch went; I then made them of ſuch ſhape as to gain in the ſhort vibrations about five or ſix ſeconds per day more than the long ones; this quantity could only be found by long experience; and the way I proved this, was to try the rate of the watch with the balance vibrating about $\frac{1}{3}$ of a circle, then tried its rate when vibrating a circle and a quarter, and if the ſhort vibrations go ſlower than the long ones, that watch will loſe on its rate, and if they are equal, it will likewiſe loſe, but that only from *relaxation;* and if it gains in the ſhort vibrations more than five or ſix ſeconds in 24 hours, it will in the long run gain on its rate, but if not more than that quantity, and if the time-keeper is perfect in heat and cold, and every other part, the above properties will render it deſerving of the name of a perfect time-keeper: and this is a principal cauſe of my time-keepers excelling all others; and this is the principal cauſe of ſome of my time-keepers going better than others; though by me, the ſprings of them being made to accord more exactly to the above proportions; and this is the cauſe which has enabled me to foretel what my time-keepers would do, which Dr. Maſkelyne, Mr. Croſley, and others can teſtify. The above effect is produced as follows: I find the common *relaxation* of balance-ſprings to be about five or ſix ſeconds per day on their rates in the courſe of a year; therefore if the ſhort vibrations are made, by the ſhape of the ſpring, to go about that quantity faſter than the long ones, and as the ſpring relaxes in going by time, ſo the watch accumulates in dirt (dirt accumulates in the watch more properly), and thickening of the oil (takes place), which ſhortens the vibrations, the ſhort ones then being quicker compenſated (compenſates) for the evil of relaxation of the balance-ſpring." (See Mr. Earnſhaw's "Explanation," pages 8 and 9.)

The Board of Longitude having put the following queſtions on this ſubject, "Explain what you mean by this? and how it is performed?" Mr. E. replied: "All watch-makers know how to draw and taper balance-ſprings, though they did not know how much they were to be tapered to that certain degree which could only anſwer the purpoſe of a complete time-keeper. I perform it in the following manner: take a length of balance-ſpring-wire, ſay about twelve inches for box time-keepers, and draw it between two ſmooth potence files, beginning from the end about $\frac{1}{6}$ of its length, make one draw, the next about $\frac{2}{6}$, and ſo on, advancing $\frac{1}{6}$ every draw till you come to the top, preſſing the files juſt ſo hard together as will make them bite or take hold of the ſpring; do the ſame with two oil-ſtones, only give 12 ſtrokes inſtead of 6, which will take off all burrs which the file left on." ("Explanation," p. 29 and 30.) We are further told, that when the ſpring is *tired* with long continuance of work, its vigour may be reſtored by *reſt.*

Theſe ſprings, that have the inviſible properties deſcribed, "are made of ſoft ſteel, rolled hard, and not hardened and tempered with heat and cold, that proceſs not being at all neceſſary." Their length varies in box chronometers from 12 to 20 inches, and in pocket ones from 5 to 7, like Mr. Arnold's, and the ſhape is cylindrical, with the two extreme coils, each about half the diameter of the other coils, agreeably to the ſpecification in one of Mr. Arnold's patents. The thickneſs of the ſteel in the expanſion-pieces of the balance is about $\frac{8}{1000}$ of an inch, and that of the braſs twice, or nearly three times as thick; the diameter of the balance without the weights and ſcrews $1\frac{1}{8}$, and with them $1\frac{3}{8}$ inch; the total weight of it with weights and ſcrews 3 dwts. 10 gr. The mainſpring barrel is $1\frac{3}{16}$ inch, and the depth $\frac{1}{2}$ inch, and the ſpring in it has from $4\frac{1}{2}$ to 5 turns. The weight of each of the two balance ſcrews is from 5 to 6 grains; and the figure which the expanſion pieces aſſume when cut from the original compound ring is ſuffered to remain unaltered, on a ſuppoſition that bending by any mechanical means will injure the regularity of their obedience to the changes of temperature; the locking and unlocking ſprings are made as weak at the bending parts as are practicable to afford the neceſſary reſiſtance, as a detent, to the eſcapement-wheel; they are brought to ſhape by filing, then ſmoothed with a piece of ſteel and oil-ſtone powder, and laſtly hardened and tempered. The pallets, which are of ſteel, have each a jewel ſet in them, and thoſe on the verge of the balance are twiſted round and ſet to their ſituations reſpectively by the friction of their central holes. In his laſt anſwer to the queſtions of the Commiſſioners of Longitude, when aſked, "How ſhould the lifting and large pallet be placed with reſpect to each other?" Mr Earnſhaw's words were, "the ſmall lifting-pallet muſt be moved round to ſuch poſition that when the wheel is unlocked the face of the large pallet ſhould be juſt within the compaſs of the wheel-tooth which is to act on it;" but, what appears to us remarkable, no queſtion was aſked by the Board, nor any particular notice taken, that we can find, either by Mr. Arnold or Mr. Earnſhaw, reſpecting the relative poſitions of the lifting-pallet and the quieſcent point of the regulating ſpring, excepting in the inſtance of Mr. Earnſhaw, that we have had occaſion to notice; which notice, we truſt, will benefit not only him, but moſt of the other makers of chronometers, with the detached ſpring-detent eſcapement.

The mention of this eſcapement brings to our recollection a patent which was ſaid to have been taken out for the invention of a detent ſpring in the name of Wright, a Quaker in the Poultry, and which was, till lately, conſidered to be

Mr. Earnſhaw's patent, but which was never actually taken out, as we have been lately informed from good authority; what part of the ſpring conſtituted the pretended invention, and how it differed from Mr. Arnold's ſpecification, we are not informed; the only difference that we are aware of is, that one ſpring-detent unlocks inwards, and the other outwards; but Meſſrs. Brockbanks' have always unlocked outwards, though they have not the two ſprings inſerted into one another, as Meſſrs. Arnold and Earnſhaw have: neither do we ſee any good reaſon for preferring one of the three conſtructions to either of the other. They have all been found to anſwer the deſired purpoſe; and the three makers, who have ſeparately ſold each a thouſand chronometers or thereabouts, have turned out of their hands ſome machines that have performed but indifferently, as well as others, that have done them great credit, as well as the navy great ſervice.

“ Two time-keepers, ſays Dr. Maſkelyne, in his preface to the “ Explanations,” publiſhed by order of the Commiſſioners of Longitude, conſtructed by Mr. Thomas Earnſhaw, were tried three ſeveral times at the Royal Obſervatory, by order of the Commiſſioners of Longitude, for a twelvemonth or more at a time between 1798 and 1802, as candidates for ſome of the great rewards held out by the act of parliament of the 14th of his preſent Majeſty; but were adjudged not to have gone within any of the limits preſcribed by the act, and, therefore, not thought proper to be ſent to ſea, to undergo the ſubſequent trial required by the act. However, as they appeared to have gone with ſufficient exactneſs, in the two laſt trials, to be of conſiderable uſe in navigation, the commiſſioners, on the 3d and 17th of March 1803, reſolved unanimouſly to grant to Mr. Earnſhaw the ſum of 2500 l. in addition to 500 l. which they had given him before.” Sir Joſeph Banks baronet, however, entered *a proteſt* againſt this *unanimous* reſolution, to which Dr. Maſkelyne has replied in a private pamphlet; which, therefore, we cannot further notice; but Mr. Earnſhaw, elated, probably, with his ſucceſs, publiſhed an advertiſement in the public papers by no means calculated to conciliate his very reſpectable opponent; in reply to which, Mr. Dalrymple, a gentleman well known to the world as a geographer, has recently written a pamphlet for public circulation, which we here notice, as impartial by-ſtanders, that we may ſet the author right in ſome of his obſervations, which we conſider as the produce of his zeal for his friend's cauſe, rather than of his mature judgment. The pamphlet we allude to, is intituled “ Longitude;” the author of which, ſpeaking of the effects of heat and cold on the balance-ſpring, and the mechanical means uſed by Harriſon and others, ſays thus: “ Various modes of correction were practiſed; but, as *all* theſe were by *conſtraint*, checking the natural effects of heat and cold on the ſpring, they were found ineffectual. Mr. Arnold, imitating the ſimplicity of nature in her operations, ſo conſtructed *his balance*, that *heat* and *cold* ſhould *enlarge* or *diminiſh* it, in the *ſame degree* as they operate on the *ſpring* of a *watch*, ſo that the *effect* muſt be *uniform*; the balance, by becoming *larger* or *leſs*, exactly counteracting the effect of *heat* and *cold* on the ſpring.” (page 13 and ſeq.). What Mr. Dalrymple's term *conſtraint* here means, we do not exactly conceive; our opinion of Mr. Harriſon's curb, or kirb, is, that its inward and outward motion alternately affected by changes of temperature, limited the effective portion of the ſpring to the *ſame dimenſions*, in point of length, under all circumſtances; which limit in the length of the ſpring *conſtrained* it, to be ſure, to become an uniform regulator, or very nearly ſo: but that the *enlargement* of the balance ſhould counteract the effects of *heat*, or the *leſſening* of it ſhould counteract the effects of *cold*, is to us a new doctrine, juſt the reverſe of what we have been in the habit of propagating; we beg leave to repeat, on this occaſion, that the expanſion pieces of the balance are intended to preſerve the effective diameter of it unchanged by heat or cold; the ſame heat which elongates the radial arms brings the expanſion weights nearer to the centre, and preſerves the momentum unaltered; which effect produced on the diameter of the balance is a *conſtraint*, as much as the alternate lengthening and ſhortening of the balance-ſpring is, by artificial means, ſimilar in principle, and alike in oppoſition to the direct effect of natural cauſes. Of the ſame nature is the following opinion, in p. 80: “ Before I quit the ſubject, I muſt obſerve, that the confidential committee, to whom Mr. Mudge's time-piece was explained, repreſented the *eſpecial merit* of it to be in “ a contrivance for deſtroying the *inequalities* of the *maintaining power* derived from the *main-ſpring*.” Before that time, the late Mr. Arnold had *entirely* deſtroyed the *inequalities* proceeding from the *main-ſpring*; this was demonſtrated by an *experiment*, in preſence of ſeveral perſons, at Mr. Aubert's houſe in Auſtin Friars,” &c. The experiment here alluded to, was that of the iſochronal length of the balance-ſpring, which made the long and ſhort arcs of vibration to be performed in the ſame times, or, in other words, which compenſated the great inequalities of the maintaining power where no fuſee was uſed; ſo that the contrivance did not “ entirely deſtroy the inequalities” proceeding from the main-ſpring, but allowed them to be as great as poſſible, and then compenſated thoſe *increaſed inequalities* by the iſochroniſm of the regulating-ſpring, as we have before ſtated. It appears to us, that the author in queſtion, at the time he made thoſe ſeveral obſervations on chronometry, had not given himſelf time to form a diſtinct apprehenſion of the difference between cauſe and conſequence.

Nearly of a ſimilar kind does Mr. Earnſhaw's reaſoning appear on the tapering of the balance-ſpring, where he ſays, “ if a man is to go four miles in the ſame time as he has gone one mile, he cannot do it with the ſame power; no, he muſt have impelling force to quicken his motion, or he will be four times as long in doing it. Therefore, inſtead of the ſpring being equal in all its parts, it muſt be made to increaſe in thickneſs to the outer end,” &c. (Page 8, of the “ Explanations.”) Mr. Earnſhaw ſeems here to have forgotten, that in every uniform ſpring, of whatever ſhape, the law of its action, as aſcertained long ago by Dr. Hooke, is “ ut tenſio ſic vis,” *i. e.* the impelling force is directly as the tenſion, or diſtance from the point of reſt; and if he knows any thing of the law of accelerated forces, he will find, on conſideration, that there is no occaſion to apply two ſeparate cauſes to produce an exact effect, when one of them, ſingly, is competent to the purpoſe; if, indeed, more than a due effect is to be produced, then an auxiliary cauſe may be had recourſe to, but ſtill we muſt look to the primary cauſe, for regularity as well as for the continuance of the effect, particularly as, in the caſe before us, the primary cauſe is the natural one, and the auxiliary one only artificial. The ſpring of uniform thickneſs will produce a ſcale of accelerated velocities ſimilar to that produced by the uniform action of gravity alone. Another of Mr. Dalrymple's remarks is this; “ The *ſpiral ſpring* was found to be another ſource of irregularity; as, by action, it changed its elaſticity, and its *power* was not the *ſame* in all parts of the *volute*;” (p. 14, “ Longitude”): and he ſtrengthens the force of this obſervation by adding Mr. Arnold's well known reply to the committee of the Houſe of Commons, when they aſked him, What objections are there to the common ſpiral-ſpring? which reply was, "that it is never a ſpiral but when it is at reſt." Our reply to theſe remarks is this, that no ſpring can act at all without motion, and, conſequently, without change of figure; nor would any ſpring anſwer the purpoſe of a regulating-ſpring, if its power or elaſtic force were the ſame at every degree of tenſion, as both Mr. Earnſhaw and Mr. Dalrymple ſeem to have perſuaded themſelves is uſually the caſe. The beauty of the law of a ſpring's tenſion is, that it does not depend on the ſhape, provided its dimenſions be uniform: indeed Mr. Earnſhaw himſelf has found out from practice, that "the only advantage attending the cylindrical ſhape is, that it is rather eaſier (more eaſily) made; a ſaving of about one hour of time." Mr. Earnſhaw has particularized ſix advantages which his eſcapement has over Mr. Arnold's, in p. 12 of his "Explanations;" but, as the reader will probably think we have detained him too long, we refer him to the original information, in reading which, he will now be able to form an opinion for himſelf as to the real exiſtence of thoſe advantages; indeed, when all reaſoning on the ſubject is at an end, that particular conſtruction of a chronometer will no doubt ultimately prevail in practice, which ſhall be found to perform the beſt, and at the ſmalleſt expence.

We might have added to our article an account of different chronometers by French makers, but, as a chronometer differs from an ordinary watch principally in the *compenſation-balance* and *eſcapement*, their properties and peculiarities of conſtruction deſcribed under theſe two heads will be amply ſufficient, after what we have here ſaid on the ſubject: and, with reſpect to our preſent article, which has grown upon our hands to a greater length than we intended it ſhould, the reader, however he may differ from us in ſome particulars, will at leaſt acknowledge, that we have, in general, taken the liberty of thinking for ourſelves, and have, moreover, freely expreſſed thoſe thoughts, uninfluenced by the authority of names, even of thoſe to whoſe aſſiſtance we are indebted; which we conceive to be the only way of doing juſtice to an intereſting ſubject, that has never before gained general circulation in the Engliſh language.

CHRONOMETER.—*Exemplification of its uſe in determining the longitude of a ſhip or place.* The reader, it is preſumed, has already obtained a general idea of the utility of a chronometer in aſcertaining the relative longitudes of any two places, from what we ſaid on this ſubject in our hiſtory of the improvements in chronometers; but if he is in poſſeſſion of one of thoſe delicate and valuable machines, and wiſhes to avail himſelf of its uſe, either at ſea or on ſhore, in determining practically the longitude of the place he is at, compared with his firſt meridian, he will ſtand in need of further and more particular directions, than we have before given, to enable him to effect the requiſite determination with accuracy. The two moſt eſſential things in uſing a chronometer, are, firſt, to be able to aſcertain its mean daily rate of going, and to apply it to the time indicated at any place and inſtant afterwards; and, ſecondly, to be able to determine by obſervations on ſome of the heavenly bodies the exact hour, minute, and ſecond, at the ſaid place and inſtant of obſervation, becauſe the difference between the corrected time indicated by the chronometer, as the time at the firſt meridian, and the equated time obtained by calculation from the obſervations, will be the exact difference of longitude in time, between the place of obſervation and the firſt meridian, to the time of which the chronometer is ſuppoſed to have been previouſly put. But each of theſe two requiſites may be obtained by various means; and as ſome of thoſe means may be in the poſſeſſion of one reader, and ſome of another, we cannot better acquit ourſelves, than by giving in ſucceſſion ſome of the principal methods, uſed by different eminent men, of effecting the ſame purpoſe, each of which methods may have ſome advantage peculiar to itſelf, which under certain circumſtances may render it moſt deſirable, or, at leaſt, moſt practicable. There are, however, certain preparatory operations which are alike neceſſary to aſſiſt the reader, whom we ſuppoſe to be previouſly unacquainted with them, to perform the calculations he will have to go through. We propoſe, therefore, to ſelect from the various authors, who have recently written on this ſubject, and to arrange in ſucceſſive order, thoſe problems in nautical aſtronomy, which we deem neceſſary in order to render our propoſed exemplification, not only eaſy by the gradation we adopt, but alſo ſufficiently comprehenſive, by including the different methods, to anſwer the deſired purpoſe of practical application. It would lead us beyond our bounds to enter here into an account of the different inſtruments made uſe of in celeſtial obſervations, together with their various adjuſtments and modes of uſing, which are explained under their reſpective heads in the different parts of this work; we muſt, therefore, beg leave to refer the reader to thoſe heads, accordingly as he finds himſelf at a loſs for the requiſite explanations and directions. There are, however, a few ſmall tables not generally met with in books of navigation, which are neceſſary companions for a tranſit-inſtrument, when the ſtars are obſerved, and which the obſerver, who takes a rate by his tranſit-inſtrument, ſhould always have at hand: we therefore think it deſirable to prefix them here, that the reader may not only apply them in peruſing for his amuſement the ſubſequent problems, but may always have them under his eye whenever he may have occaſion hereafter to conſult our directions in practice.

TABLE I.

(From Profeſſor Vince.)

For converting Sidereal into Mean Solar Time.

Hours.	Min. Sec.	Minutes.	Sec.	Seconds.	Sec.
1	0 9.83	1	0.16	1	0.00
2	0 19.66	2	0.33	2	0.01
3	0 29.49	3	0.49	3	0.01
4	0 39.32	4	0.66	4	0.01
5	0 49.15	5	0.82	5	0.01
6	0 58.98	6	0.98	6	0.02
7	1 8.81	7	1.15	7	0.02
8	1 18.64	8	1.31	8	0.02
9	1 28.47	9	1.47	9	0.02
10	1 38.30	10	1.64	10	0.03
11	1 48.13	11	1.80	11	0.03
12	1 57.96	12	1.97	12	0.03
13	2 7.78	13	2.13	13	0.04
14	2 17.61	14	2.29	14	0.04
15	2 27.44	15	2.46	15	0.04
16	2 37.27	16	2.62	16	0.04
17	2 47.10	17	2.78	17	0.05
18	2 56.93	18	2.95	18	0.05
19	3 6.76	19	3.11	19	0.05
20	3 16.59	20	3.28	20	0.05
21	3 26.42	30	4.91	30	0.08
22	3 36.25	40	6.55	40	0.11
23	3 46.08	50	8.19	50	0.14
24	3 55.91	60	9.83	60	0.16

TABLE II.

(From Profeſſor Vince.)

For converting Mean Solar into Sidereal Time.

Hours.	Min. Sec.	Minutes.	Sec.	Seconds.	Sec.
1	0 9.86	1	0.16	1	0.00
2	0 19.71	2	0.33	2	0.01
3	0 29.57	3	0.49	3	0.01
4	0 39.43	4	0.66	4	0.01
5	0 49.28	5	0.82	5	0.01
6	0 59.14	6	0.99	6	0.02
7	1 8.99	7	1.15	7	0.02
8	1 18.85	8	1.31	8	0.02
9	1 28.71	9	1.48	9	0.02
10	1 38.56	10	1.64	10	0.03
11	1 48.42	11	1.82	11	0.03
12	1 58.28	12	1.97	12	0.03
13	2 8.13	13	2.14	13	0.04
14	2 17.99	14	2.30	14	0.04
15	2 27.85	15	2.46	15	0.04
16	2 37.70	16	2.63	16	0.04
17	2 47.56	17	2.79	17	0.05
18	2 57.42	18	2.96	18	0.05
19	3 7.27	19	3.12	19	0.05
20	3 17.13	20	3.28	20	0.05
21	3 26.98	30	4.93	30	0.08
22	3 36.84	40	6.57	40	0.11
23	3 46.70	50	8.21	50	0.14
24	3 56.55	60	9.86	60	0.16

TABLE III.

Dr. Maſkelyne's Thirty-ſix Stars.

1806.	Mag.	Mean R. A. in Sidereal Time.	Annual Variation.	Mean Declination.	Annual Variation.	Mean Refraction.
		h m s	s +	° ′ ″	s	′ ″
γ Pegaſi	2	0 3 15.40	3.069	14 6 24.90	+ 20.20	0 44
α Arietis *	2 3	1 56 15.66	3.347	22 32 24.98	+ 17.47	0 32
α Ceti	2	2 52 8.88	3.115	3 19 22.40	+ 14.75	1 4
Aldebaran *	1	4 24 48.00	3.426	16 6 31.40	+ 8.00	0 40
Capella	1	5 2 22.62	4.415	45 47 5.88	+ 4.57	0 6
Rigel	1	5 55 13.11	2.876	8 25 59.32 S.	− 4.92	1 38
β Tauri	2	5 14 2.17	3.781	28 25 52.56	+ 3.91	0 24
α Orionis	1	5 44 40.23	3.243	7 21 38.16	+ 1.49	0 55
Sirius	1	6 36 36.06	2.653	16 27 21.54 S.	+ 4.21	2 20
Caſtor	2	7 22 11.92	3.853	32 18 3.76	− 7.06	0 20
Procyon	1 2	7 29 8.17	3.142	5 42 51.48	− 8.53	0 58
Pollux *	2	7 33 25.43	3.688	28 29 2.58	− 7.93	0 24
α Hydræ	2	9 18 3.08	2.946	7 49 19.70 S.	+ 15.10	1 36
Regulus *	1	9 58 1.65	3.212	12 54 41.74	− 17.19	0 45
β Leonis	1 2	11 39 9.14	3.067	15 39 25.24	− 20.04	0 41
β Virginis	3	11 40 35.27	3.125	2 51 32.42	− 20.22	1 4
α Virginis *	1	13 14 59.29	3.147	10 8 29.80 S.	+ 18.80	1 45
Arcturus	1	14 6 48.83	2.728	20 11 59.41	− 18.79	0 35
1 α Libræ	6	14 39 58.66	3.296	15 10 42.66 S.	+ 15.19	2 11
2 α Libræ	2	14 40 9.99	3.297	15 12 26.84 S.	+ 15.21	2 11
α Coronæ	2 3	15 26 28.63	2.545	27 22 34.54	− 12.49	0 25
α Serpentis	2	15 34 43.17	2.945	7 2 48.60	− 11.70	0 56
Antares *	1	16 17 32.06	3.658	25 59 4.92 S.	+ 8.43	4 11
α Herculis	2 3	17 5 48.33	2.731	14 37 26.48	− 4.48	0 43
α Ophiuchi	2	17 25 55.91	2.776	12 42 47.88	− 3.03	0 46
α Lyræ	1	18 30 22.08	2.027	38 36 36.34	+ 2.91	0 12
præcedens α Aquilæ *	3	19 37 1.91	2.846	10 9 6.72	+ 8.38	0 50
α Aquilæ *	1 2	19 41 18.83	2.925	8 22 2.64	+ 9.11	0 53
β Aquilæ	3 4	19 45 46.85	2.944	5 56 1.28	+ 8.57	0 58
1 α Capricorni	4	20 6 53.03	3.336	13 5 39.70 S.	− 10.80	2 0
2 α Capricorni	3	20 7 16.83	3.339	13 7 58.36 S.	− 10.81	2 0
α Cygni	1 2	20 34 49.06	2.038	44 35 33.84	+ 12.56	0 7
α Aquarii	3	21 55 48.75	3.081	1 15 15.66 S.	− 17.36	1 15
Fomalhaut *	1 2	22 46 54.18	3.343	30 38 26.30 S.	− 19.10	6 38
α Pegaſi *	2	22 55 6.12	2.973	14 9 59.32	+ 19.43	0 43
α Andromedæ	2	23 58 22.89	3.070	27 58 34.24	+ 19.99	0 25

Note. In the column of declination, S. means ſouth, and where there is no S. the declinations are all north; alſo, that the ſtars marked with aſteriſks are thoſe from which the lunar diſtances are computed in the Nautical Almanac.

TABLE IV.

For reducing the Sun's Longitude, as given in the Nautical Almanac for Noon at Greenwich, to any other Time, or to Noon under any other Meridian.—Taken from W. Wales, F.R.S.

2d Arg. Time from Noon.		1ſt Arg.	Hourly Motion of the Sun.										2d Arg. Degrees of Long.
		′ ″ 2 23	′ ″ 2 24	′ ″ 2 25	′ ″ 2 26	′ ″ 2 27	′ ″ 2 28	′ ″ 2 29	′ ″ 2 30	′ ″ 2 31	′ ″ 2 32	′ ″ 2 33	
h	′	′	′	′	′	′	′	′	′	′	′	′	°
0	20	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	5
0	40	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	10
1	00	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.5	15
1	20	3.2	3.2	3.2	3.2	3.3	3.3	3.3	3.3	3.4	3.4	3.4	20
1	40	4.0	4.0	4.0	4.0	4.1	4.1	4.1	4.2	4.2	4.2	4.2	25
2	00	4.8	4.8	4.8	4.8	4.9	4.9	5.0	5.0	5.0	5.1	5.1	30
2	20	5.6	5.6	5.6	5.6	5.7	5.7	5.8	5.8	5.9	5.9	5.9	35
2	40	6.4	6.4	6.4	6.4	6.5	6.6	6.6	6.7	6.7	6.7	6.8	40
3	00	7.2	7.2	7.2	7.3	7.4	7.4	7.5	7.5	7.6	7.6	7.6	45
3	20	8.0	8.0	8.1	8.1	8.2	8.2	8.3	8.3	8.4	8.4	8.5	50
3	40	8.8	8.8	8.9	8.9	9.0	9.0	9.1	9.2	9.2	9.3	9.3	55
4	00	9.6	9.6	9.7	9.7	9.8	9.9	9.9	10.0	10.1	10.1	10.2	60
4	20	10.4	10.4	10.5	10.5	10.6	10.7	10.8	10.8	10.9	11.0	11.0	65
4	40	11.2	11.2	11.3	11.3	11.4	11.5	11.6	11.7	11.7	11.8	11.9	70
5	00	12.0	12.0	12.1	12.1	12.2	12.3	12.4	12.5	12.6	12.7	12.7	75
5	20	12.8	12.8	12.9	12.9	13.1	13.2	13.2	13.3	13.4	13.5	13.6	80
5	40	13.6	13.6	13.7	13.8	13.9	14.0	14.1	14.2	14.3	14.4	14.4	85
6	00	14.3	14.4	14.5	14.6	14.7	14.8	14.9	15.0	15.1	15.2	15.3	90
6	20	15.1	15.2	15.3	15.4	15.5	15.6	15.7	15.8	15.9	16.0	16.1	95
6	40	15.9	16.0	16.1	16.2	16.3	16.4	16.5	16.7	16.8	16.9	17.0	100
7	00	16.7	16.8	16.9	17.0	17.2	17.3	17.4	17.5	17.6	17.7	17.8	105
7	20	17.5	17.6	17.7	17.8	18.0	18.1	18.2	18.3	18.5	18.6	18.7	110
7	40	18.3	18.4	18.5	18.6	18.8	18.9	19.0	19.2	19.3	19.4	19.5	115
8	00	19.1	19.2	19.3	19.4	19.6	19.7	19.8	20.0	20.1	20.3	20.4	120
8	20	19.9	20.0	20.1	20.2	20.4	20.5	20.7	20.8	21.0	21.1	21.2	125
8	40	20.7	20.8	20.9	21.0	21.2	21.4	21.5	21.7	21.8	21.9	22.1	130
9	00	21.5	21.6	21.7	21.8	22.1	22.2	22.3	22.5	22.6	22.8	22.9	135
9	20	22.3	22.4	22.5	22.7	22.9	23.0	23.2	23.3	23.5	23.6	23.8	140
9	40	23.1	23.2	23.3	23.5	23.7	23.8	24.0	24.2	24.3	24.5	24.6	145
10	00	23.9	24.0	24.1	24.3	24.5	24.7	24.8	25.0	25.2	25.3	25.5	150
10	20	24.7	24.8	24.9	25.1	25.3	25.5	25.7	25.8	26.0	26.2	26.3	155
10	40	25.5	25.6	25.8	25.9	26.1	26.3	26.5	26.7	26.8	27.0	27.2	160
11	00	26.3	26.4	26.6	26.7	27.0	27.1	27.3	27.5	27.7	27.9	28.0	165
11	20	27.1	27.2	27.4	27.5	27.8	27.9	28.1	28.3	28.5	28.7	28.9	170
11	40	27.9	28.0	28.2	28.3	28.6	28.8	29.0	29.2	29.4	29.6	29.7	175
12	00	28.6	28.8	29.0	29.2	29.4	29.6	29.8	30.0	30.2	30.4	30.6	180

We have not met with this uſeful little Table in any other Book but in Mr. Wales's Pamphlet, entitled, "The Method of finding the Longitude at Sea by Time-keepers." London, 1800.

PROBLEM I.

To reduce apparent to mean time.

Rule, (from W. Wales, F.R.S.) If the time at Greenwich be not given, turn the longitude of the place into time; and add it to the time at the given place, if the longitude be weſt, but ſubtract from that time, if the longitude be eaſt, and it will give the time at Greenwich.

Take the equation of time from page II. of the Nautical Almanac, for the noon preceding the time when it is wanted, and alſo the difference between it and the equation for the day following; and ſay, as 24^h is to this difference, ſo is the time at Greenwich to a fourth number; which muſt be added to, or ſubtracted from, the equation for the preceding noon, accordingly as the equation is increaſing or decreaſing.

Note. In every operation, where one time is to be taken from another, add 24 hours to the time you ſubtract from, if the time which is to be taken from it be the greater, and the remainder muſt be reckoned from the noon of the preceding day. When one time is added to another, if the ſum exceed 24 hours, take 24 hours from it, and the remainder muſt be reckoned from the noon of the following day.

Example 1, (from Mr. Kelly.) What is the equation of time at noon at Bombay, on the 16th Nov. 1805, the longitude of Bombay in time being $4^h\ 50^m\ 32^s$?

Equation of time for noon, at Greenwich ſub.	$15^m\ 1^s.9$
24^h is to $4^h\ 50^m\ 32^s$ as 10.8 (daily diff.) is to	+ 2.2
Equation of time for noon, at Bombay	$15^m\ 4^s.1$

Example 2, (from Mr. Kelly.) What is the equation of time at Port Royal, on July 11, 1805, at $20^h\ 23^m$?

Time at Port Royal - - - -	$20^h\ 23^m\ 0^s$
Longitude of Port Royal in time	5 7.2
Time at Greenwich, July 12th -	1 30.2
Equation of time, July 12th, at noon add	5′ 5.6
24^h is to $7^s.5$ (daily diff.) as $1^h\ 30^m\ 2^s$ is to	+ 0.5
The equation of time ſought	5. 6.1

If it be required to convert mean time to apparent, a contrary proceſs muſt be uſed; that is, the equation of time muſt be applied with a contrary ſign: but in order to perform this problem with perfect accuracy, an allowance muſt be made for the proportion of the equation itſelf, as the table is computed for apparent noon.

PROBLEM II.

To find the ſun's longitude for any given time and place from the Nautical Almanac.

Rule, (from W. Wales, F.R.S.) Take the ſun's longitude for noon at Greenwich from page II. of the Nautical Almanac for the given day, and its hourly motion from page III.

Enter Table IV. with the ſun's hourly motion at the top, and the longitude of the given place in time in the left-hand-ſide column, or in the right-hand column if given in degrees, and take out the correction which ſtands under the former and oppoſite the latter: this correction being added to the ſun's longitude for noon at Greenwich, if the longitude of the place be weſt, or ſubtracted from it, if the longitude be eaſt, will give the ſun's longitude for noon at the given place.

Example 1. What was the ſun's longitude at noon on the 15th of October, 1793, at Lima in Peru?

Sun's longitude for noon at Greenwich	6^s 22° 34′8
Hourly mot. 2′ 29″ and long. 77° W. give	+ 12.7
Sun's long. for noon at Lima	6 22 47.5

Example 2. What was the ſun's longitude at noon on the 27th of November, 1793, at Calcutta?

Sun's longitude for noon at Greenwich	8^s 5° 46′6
Hourly motion 2′ 32″ and long. 88° E. give	− 14.9
Sun's longitude for noon at Calcutta	8 5 31.7

When the time is for any hour before or after noon, a ſecond ſimilar reduction will be neceſſary in addition to the reduction for longitude, which will be additive if the time be after noon, but ſubtractive if it be before.

Example 3. What was the ſun's longitude at Port Royal on May 4th, 1794, at $5^h\ 30^m$?

Sun's long. for noon at Greenwich -	1^s 14° 9′9
Hourly mot. $2^m\ 25^s.1$ & long. W. $5^h\ 7^m\ 2^s$	+ 12.4
Hourly mot. $2^m\ 25^s.1$ and $5^h\ 30^m$ P. M.	+ 13.3
Sun's long. at Port Royal at $5^h\ 30^m$	1 14 35.6

PROBLEM III.

To find the ſun's declination for any given time and place from the Nautical Almanac.

Rule, (from W. Wales, F.R.S.) Take the ſun's declination out of the Nautical Almanac for noon at Greenwich on the given day, if the given time be leſs than twelve hours, but for the day following if it be more.

Enter Table VI. of the *Requiſite Tables* with the time from the neareſt noon at the top, and the day of the month in one of the ſide columns: under the former, and oppoſite to the latter ſtands the correction of the ſun's declination on account of the time.

If the ſun's declination be wanted for noon at any other place than Greenwich, enter the table with the longitude of the given place at the top, and the day of the month in one of the ſide columns, againſt which, and under the longitude, ſtands the correction of the ſun's declination on that account.

If the declination be wanted at any other place than Greenwich, and at any other time but noon, both corrections muſt be applied; and they muſt be added to, or ſubtracted from, the declination for noon at Greenwich, according to the directions which ſtand at the top of the column, where the day of the month is found.

Example 1. Find the ſun's declination for $21^h\ 17^m$ apparent time at Greenwich, May 4, 1793?

May 4th at $21^h\ 17^m$ is $2^h\ 43^m$ before noon on the 5th.

Sun's declination for noon, May 5th	16° 27′ 34″ N.
$2^h\ 43^m$ before noon gives - -	− 1 59
Sun's declination, May 4th, at $21^h\ 17^m$ =	16 25 35 N.

Example 2. What was the ſun's declination on the 14th of October, 1793, at $7^h\ 43^m$ in longitude 83° eaſt?

Sun's declination, October 14th, at noon	8° 25′ 26″ S.
$7^h\ 34^m$ after noon in Table VI. give	+ 6 54
83° Eaſt longitude in Table VI. give	− 5. 3
Sun's declination at $7^h\ 34^m$ in long. 83° eaſt	8 27 17 S.

PROBLEM

PROBLEM IV.

To convert ſidereal into mean ſolar time, and the contrary.

Rule. Collect the numbers expreſſing the acceleration of ſidereal on mean ſolar time out of our Table I. when ſidereal time is given to be changed, but the numbers out of Table II. when mean ſolar time is given; then in the former caſe ſubtract the amount from the time given, but in the latter add the ſaid amount, and the difference or ſum, as the caſe may be, will be the time converted into that of a different name.

Example 1. Let it be required to convert $10^h\ 16^m\ 30^s$ of ſidereal time into a correſponding quantity of mean ſolar time?

The work is this:

From Tab. I.	10^h———1^m	38^s30	acceleration of ſidereal on mean ſolar time.
	16^m———0	2.62	
	30^s———0	0.08	
Amount	1	41.00	

then $10^h\ 16^m\ 30^s - 1^m\ 41^s = 10^h\ 14^m\ 49^s$ the correſponding quantity of mean ſolar time.

Example 2. Let it again be required to convert $10^h\ 14^m\ 49^s$ of mean ſolar time into a correſponding quantity of ſidereal time?

The operation is thus:

From Tab. II.	10^h———1^m	38^s56	retardation of ſolar compared with ſidereal time.
	14^m———0	2.30	
	49^s———0	0.14	
Amount	1	41.0	

Then, $10^h\ 14^m\ 49^s + 1^m\ 41^s = 10^h\ 16^m\ 30^s$ which is the correſponding quantity of ſidereal time agreeably to Example 1, to which this is the converſe.

PROBLEM V.

To compute the ſun's right aſcenſion for a given hour at any given place.

Rule, (according to the Requiſite Tables.) Take the ſun's right aſcenſion in time from page II. of the Nautical Almanac for the given day, and ſee how much it differs from that of either the preceding or following day, which call the *daily variation* in right aſcenſion in time; with this as an argument, enter Table XXIII. at the top, and with the *time from noon*, or the *difference of longitude*, or both ſeparately and ſucceſſively, as a ſecond argument for the ſide of the page, enter the ſame Table, and the interſection or interſections will give the quantity or quantities to be added to the right aſcenſion for noon at Greenwich, if the time be after noon, or the longitude weſt, but to be ſubtracted if the time be before noon, or the longitude eaſt.

Example 1. Required the right aſcenſion of the ſun at Bombay, on the 1ſt of January 1794, at $3^h\ 36^m$?

Sun's Right Aſc. Jan. 1, 1794, at Greenwich, per Nautical Almanac -		18^h	49^m	38^s
Ditto, on Jan. 2 - -		18	54	2.8
Daily variation - - -			4	24.8
Then ☉'s R. Aſ. at noon at Greenwich being - - -		18	49	38
Reduction for $3^h\ 36^m$ with $4^m\ 24^s.8$	+		0	40
Reduction for long. of Bombay $4^h\ 30^m\ 32^s$ E. - -	—		0	50
Right Aſc. required - -		18	49	28

Example 2. Let it be required to aſcertain the ſun's right aſcenſion at 7 o'clock, civil time, in a ſhip, the longitude of which is 8° 30′ or 34^m E., on April the 20th, 1794?

☉'s R. Aſc. on April 19, 1794 -		1^h	50^m	6.2^s
Ditto, — on Do. 20, 1794 -		1	53	49.6
Daily variation - -			3	43.4
Then R. Aſc. on April 20, 1794		1	53	49.6
Reduction for 5 hours before noon	—		0	46.5
Reduction for 34^m E. -	—		0	5.7
Right Aſcenſion required -		1	52	57.4

Inſtead of Table XXIII. of the Requiſite Tables, publiſhed by the Board of Longitude, Table XVIII. of Dr. Mackay may be uſed in the ſolution of this problem.

PROBLEM VI.

To aſcertain mean ſolar time by a ſidereal clock or watch: and alſo ſidereal time, from a ſolar clock or chronometer, on any given day in the year.

Prefatory Remark. A ſidereal clock or watch goes faſter than a ſolar one by $3^m\ 55^s.91$ of ſolar time, and conſequently ſhows one day in the year more than a ſolar clock or chronometer does, the ſidereal day being meaſured by the earth's abſolute rotation as it is referred to a fixed ſtar, and the ſolar by the earth's ſynodic rotation, as it relates to the ſun in motion. But the right aſcenſions, or angular diſtances from the firſt point of Aries, of all the heavenly bodies, when they are given in time inſtead of degrees, are given in ſidereal time; therefore a clock ſo regulated as to gain $3^m\ 55^s.91$ per day, if it does not vary in its rate, will always ſhow the right aſcenſion of any ſtar, as it paſſes the middle wire or hair of a tranſit inſtrument, well fixed in the meridian, and levelled, provided the hands of the clock be put to $24^h\ 0^m\ 0^s$ at the inſtant that the point $12^s\ 0^\circ\ 0'\ 0''$ of the equator, or firſt point of Aries, is paſſing the ſaid wire or hair. Hence a ſidereal clock, as Mr. Kelly has obſerved in his Appendix to his "Nautical Aſtronomy," may with propriety be called a *right aſcenſion clock*, and is that which is uſually fixed in obſervatories, and known by the appellation of an *aſtronomical clock*. The writer of the preſent article is in poſſeſſion of a chronometer, by the late Mr. Margetts, which indicates both mean ſolar and ſidereal time, and conſequently the ſun's mean right aſcenſion, which is their difference on any day; the manner in which both theſe kinds of times are indicated by the ſame machine will be explained under the article DIAL-*work*.

Rule. When ſidereal time is given on any day to find the correſponding ſolar, take the ſun's right aſcenſion for the noon of that day and place, by the laſt problem, and ſubtract it from the ſidereal time given, after borrowing 24^h if neceſſary, and the remainder will be the ſidereal time elapſed ſince the laſt apparent noon; to this remainder apply the acceleration of ſidereal on mean ſolar time, from Table I. as already directed in Problem IV., and then the ſidereal time will be converted into mean ſolar time that has paſſed ſince apparent noon, to which apply the equation of time *at noon*, and then there will be the mean time elapſed ſince mean noon, that is, there will be the mean ſolar time. On the contrary, when mean ſolar time is given, the correſponding ſidereal time is found by reverſing this operation.

Example 1, (from Mr. Kelly.) Required the mean time on the 8th of September, 1805, when the ſidereal clock was at 15^h 20^m 7^s?

	h	m	s
Time per ſid. clock - -	15^h	20^m	7^s
⊙'s R. Aſc. at noon -	11	5	59 .6
Sid. time elapſed ſince ap. noon	4	14	7 .4
Accel. of ſid. on ſol. time from Tab. I.	—	0	41.63
Mean time elap. ſince ap. noon	4	13	25.77
Equation of time at noon -	—	2	24 .0
Mean ſolar time -	4	11	1.77

Operation reverſed. Example 2, (from Mr. Kelly.) Required the time by a ſidereal clock at 4^h 11^m $1^s.77$ of mean ſolar time, on the 8th of September, 1805?

	h	m	s
Mean ſolar time given -	4^h	11^m	1.'77
Equation of time at noon, add here	+	2	22
Mean ſolar time ſince appar. noon	4	13	25.77
Retardation of ſolar compared with ſidereal time from Table II. -	+		41.63
Sidereal time ſince apparent noon	4	14	7 .4
Sun's right aſc. at apparent noon	11	5	59 .6
Time by ſidereal clock -	15	20	7

Theſe examples ſuppoſe the clock to be at Greenwich, but if the ſidereal time or ſolar time given is for any other meridian, the ſun's right aſcenſion, and alſo the equation of time, as given in the Nautical Almanac, muſt be previouſly reduced to the noon of that meridian, by the reſpective foregoing problems.

Problem VII.

To take the tranſit of a celeſtial object.

Rule. Place the tranſit inſtrument in the meridian, and ſee that all the adjuſtments are properly made, then when the object to be obſerved approaches the meridian, elevate the teleſcope to the required altitude by means of the graduated circle and ſpirit level at the end of the axis. The ſun or ſtar will ſoon appear in the field of view, apparently moving from the weſt to the eaſt, when the teleſcope inverts the object. If there are five wires, or cobweb hairs, which are better, in the focus of the eye-glaſs, which is uſual, mark the time of the tranſit over each ſeparate wire or hair, as in the ſubjoined examples, and uſe a coloured glaſs over or under the eye-glaſs if the ſun be the object, and the day clear; but if there is but one wire or hair, a ſimple tranſit can only be obtained.

Example 1, (from Mr. Kelly's Appendix to his "Nautical Aſtronomy.") On the 8th of September, 1805, the following tranſit of the ſun was taken at the obſervatory in Finſbury Square, with a tranſit inſtrument of five wires, and a ſidereal clock; to find the error of the clock.

1 Wire.	2 Wire.	Mer. Wire.	4 Wire.	5 Wir.	
m. s.	m. s.	h. m. s.	m. s.	m. s.	
3 53.	4 22.5	11 4 52	5 20.5	5 50	⊙'s 1ſt limb.
7 58.5	7 30	11 7 00	6 31.5	6 2	⊙'s 2d limb.
11 51.5	11 52.5	22 11 52	11 52	11 52	*
		† 51.5			
		52.5			
		52			
		52			
		5 | 260 0			
		2 | 22 11 52			
		11 5 56 mean of the whole.			

* The order of this row of figures is reverſed, by which the mean of each column is moſt readily obtained.

† The hours are inſerted in the middle column only, and the other columns may be ſuppoſed to contain them.

	h	m	s	
Hence the ⊙'s centre paſſed the meridian at -	11^h	5^m	56^s	per clock.
And per Naut. Alm. ⊙'s R.A.	11	5	59.6	
Clock ſlow	0	0	3.6	

The obſervation might have been made with the middle wire only, by adding the *time of the ſun's ſemi-diameter paſſing the meridian* (p. 3, Naut. Alm.) to the time when the ⊙'s firſt limb paſſed the third wire; or, by ſubtracting it from the time of the ⊙'s ſecond limb paſſing it; thus,

	h	m	s	
⊙'s 1ſt limb paſſed mer. wire	11^h	4^m	52^s	per obſervation
Times of ⊙'s ſemi-diameter paſſing mer. -		1	4	per Naut. Alm.
	11	5	56	

Or, if 1^m 4^s be taken from 11^h 7^m, the time of the ſecond limb's paſſing the meridian wire, the reſult will be as before.

Example 2. On the evening of the ſame day, the tranſit of α Lyræ was thus obſerved:

	h	m	s	
Firſt wire	18^h	29^m	7^s	per ſidereal clock.
2d ditto		29	43	
Mer. ditto		30	19	
4th ditto		30	55	
5th ditto		31	31	
	5	151	35	
Star paſſed mer. wire	18	30	19	App. R. A. per clock.
Mean R. A. of α Lyræ	18	30	20.05	per Table III.
Corr. for preceſſion and aberra.			+ 2.04	per Tables in the Greenwich obſervations.
Ditto for nutation, &c.			+ 0.66	
	18	30	22.75	App. R. A. per Tables.
Clock ſlow	0	0	3.75	

PROBLEM VIII.

To find the rate which a watch goes at by obſervations of the ſun's, or of a ſtar's tranſit over the meridian.

Rule, (by W. Wales, F.R.S.) *for the ſun.* Obſerve, with a tranſit-inſtrument, properly adjuſted, the time when the ſun paſſes the meridian of the place every day at noon, (as in the laſt problem) or as often as opportunities offer. The equation of time muſt then be taken from the Nautical Almanac, (as in Prob. I.) and, if it be marked additive, it will be the ſame as the time by the watch when the ſun's centre was obſerved to paſs the meridian, if the watch be right. If they differ, that difference is what the watch is too faſt, or too ſlow for mean time: and it is too faſt, if the time by the watch be greater than the equation of time; and too ſlow, if the time by the watch be leſs. If the equation of time be ſubtractive, take it from twenty-four hours, compare the obſerved time when the ſun's centre was on the meridian with the remainder, and the difference between them will be what the watch is too faſt, or too ſlow; accordingly, as the time by the watch is the greater or the leſs. Theſe obſervations, when the voyage is expected to be of a conſiderable length, ought to be continued for a month at leaſt: indeed, the longer they are continued, in all caſes, the better; but in this the obſerver muſt be governed by circumſtances. They muſt always, however, be continued as near as poſſible to the time when the ſhip is expected to ſail, that there may be as little chance as poſſible left for the watch to alter its rate of going after the obſervations are cloſed.

The times by the watch, when the ſun's centre was obſerved on the meridian, muſt be written one under another, in column two, againſt the days of the month when they were obſerved in column one; and it is the day that began at the inſtant when the ſun's centre was on the meridian, which is to be ſet before the obſerved time, and not the day which ended then, as is the cuſtom with ſeamen. The equation of time, or its ſupplement to 24 hours, according as it is additive or ſubtractive, muſt be ſet in a third column, againſt the obſerved times of noon, and the difference between them in a fourth, with the ſign + or —, according as the watch is too faſt or too ſlow for mean time; which difference is had by taking the third column from the ſecond, after borrowing 24, if neceſſary. This is all that is neceſſary to be done till all the obſervations are made.

When the ſhip is ready to ſail, add a fifth column to your paper, take the difference between what the watch was too faſt or too ſlow on the firſt day of obſervation, and what it was too faſt or too ſlow on the ſecond, and put it in the fifth column, oppoſite the ſpace which is between the two numbers of which it is the difference. Take alſo the difference between what the watch was too faſt or too ſlow on the ſecond day, and what it was too faſt or too ſlow on the third; between what it was too faſt or too ſlow on the third, and what it was too faſt or too ſlow on the fourth, and ſo on. Place theſe differences alſo in the fifth column, oppoſite the ſpaces which are between the two numbers of which they are, reſpectively, the difference. Thoſe differences will be the gain or loſs of the watch in the 24 hours, which they reſpectively ſtand againſt. And it muſt be obſerved, that the watch is gaining if it be too faſt for mean time, and the numbers in the third column increaſe; or, if it be too ſlow, and the numbers in the third column decreaſe; but the watch is loſing if it be too faſt for mean time, and the numbers in the third column decreaſe; or if it be too ſlow, and the numbers in the third column increaſe.

Remark. By making daily obſervations in the manner here recommended, it will be ſeen whether the watch alters its rate of going while it is under trial, which is abſolutely neceſſary to be known; becauſe, if it does, all thoſe obſervations muſt be rejected which were made before the alteration happened, and thoſe only retained which were made afterwards.

If no material alteration happened in the rate of the watch's going, during the time of trial, take the difference between what the watch was too faſt or too ſlow on the firſt day of obſervation, and what it was too faſt or too ſlow on the laſt, if they be of the ſame kind, that is, both too faſt, or both too ſlow; but add them together, if the watch was too faſt in one inſtance, and too ſlow in the other; this difference, or ſum, muſt be divided by the number of days which elapſed between the firſt and laſt day's obſervations, and the quotient will be the number of ſeconds and decimal parts that the watch gains or loſes in a day. And it is manifeſt, that if the watch be faſter at the end of the trial, than it was at the beginning, it is gaining, and if it be ſlower, it is loſing.

If any conſiderable alteration happened in the rate which the watch went at, inſtead of taking the difference between what the watch was too faſt or too ſlow, on the firſt and laſt days, take the difference between what the watch was too faſt or too ſlow on the day after that, when the alteration in its rate happened, and what it was too faſt or too ſlow on the day when the laſt obſervation was made, and divide by the number of days which elapſed between them. The following examples will make this very plain.

Example 1. Suppoſe the obſerved times when the ſun's centre paſſed the meridian of Barbadoes, in the month of December, 1793, were as follow; what was the loſs or gain of the watch on mean time?

Note. The days of the week are here denoted, as in the original, by the planetary characters, where ☉ is Sunday, ☽ Monday, ♂ Tueſday, and ſo on.

1793.	Obſ. Times of ☉'s Tranſ.	Mean Time of app. noon.	Watch too faſt.	Daily gain.
	h. m. s.	h. m. s.	h. m. s.	s.
☉ Dec. 1	3 50 34.0	23 49 41.7	+ 4 0 52.3	
☽ — 2	3 51 2.1	23 50 5.4	+ 4 0 56.7	+ 4.4
♂ — 3	3 51 30.6	23 50 29.7	+ 4 1 0.9	+ 4.2
☿ — 4	3 51 59.2	23 50 54.6	+ 4 1 4.6	+ 3.7
♃ — 5	3 52 26.2	23 51 20.1	+ 4 1 6.1	+ 1.5
♀ — 6	3 52 54.0	23 51 46.1	+ 4 1 7.9	+ 1.8
♄ — 7	3 53 21.9	23 52 12.6	+ 4 1 9.3	+ 1.4
☉ — 8	3 53 50.3	23 52 39.5	+ 4 1 10.8	+ 1.5
☽ — 9	3 54 18.9	23 53 6.9	+ 4 1 12.0	+ 1.2
♂ — 10	3 54 47.7	23 53 34.6	+ 4 1 13.1	+ 1.1
☿ — 11	3 55 16.4	23 54 2.6	+ 4 1 13.8	+ 0.7
♃ — 12	3 55 46.7	23 54 31.0	+ 4 1 15.7	+ 1.9
♄ — 14	3 56 48.7	23 55 28.6	+ 4 1 20.1	+ 2.2
☉ — 15	3 57 19.8	23 55 57.7	+ 4 1 22.1	+ 2.0
☽ — 16	3 57 51.3	23 56 27.0	+ 4 1 24.3	+ 2.2
♂ — 17	3 58 22.2	23 56 56.5	+ 4 1 25.7	+ 1.4
☿ — 18	3 58 53.4	23 57 26.2	+ 4 1 27.2	+ 1.5
♃ — 19	3 59 24.6	23 57 56.1	+ 4 1 28.5	+ 1.3
♀ — 20	3 59 56.3	23 58 26.0	+ 4 1 30.3	+ 1.8
♄ — 21	4 0 27.9	23 58 56.0	+ 4 1 31.9	+ 1.6
♂ — 24	4 2 3.4	0 0 26.1	+ 4 1 37.3	+ 1.8
☿ — 25	4 2 33.6	0 0 56.0	+ 4 1 37.6	+ 0.3
♃ — 26	4 3 5.0	0 1 25.8	+ 4 1 39.2	+ 1.6
♀ — 27	4 3 36.1	0 1 55.4	+ 4 1 40.7	+ 1.5
♄ — 28	4 4 08.0	0 2 24.9	+ 4 1 43.1	+ 2.4
☉ — 29	4 4 40.2	0 2 54.2	+ 4 1 46.0	+ 2.9
☽ — 30	4 5 11.5	0 3 23.3	+ 4 1 48.2	+ 2.2
♂ — 31	4 5 41.9	0 3 52.2	+ 4 1 49.7	+ 1.5

Here it appears that the watch went conſiderably faſter the firſt three days than it did afterwards; I therefore reject theſe three days, ſays Mr. Wales, and take the difference between $4^h\ 1^m\ 4^s.6$, what the watch was too faſt on the fourth, and $4^h\ 1^m\ 49^s.7$ what it was too faſt on the 31ſt, and find it $45^s.1$, which I divide by 27, the number of days elapſed, and the quotient, $1^s.6704$, is the *daily rate*, or quantity which the watch gained on mean time in one day. If the inſtrument be not pretty exactly in the meridian, the obſerver will, however, by this method, not only get the abſolute quantity of time, which the watch is too faſt, or too ſlow, wrong; but will, if there be any conſiderable change in the ſun's declination, while the watch is under trial, determine the rate of its going erroneouſly alſo. On this account it will be better to find the rate of the watch by obſerving the tranſits of a fixed ſtar; the computations being ſtill more ſimple than they are when the ſun is made uſe of, as will be ſeen in the annexed example.

Example 2. Suppoſe the times by a chronometer when the ſtar Aldebaran paſſed a tranſit-inſtrument placed nearly in the meridian of Madras, were as follow: it is required to find how much the watch gained or loſt on mean time?

Rule for a ſtar. In column one put down the days of obſervation; in column two the obſerved times of the tranſit; in column three the differences of each pair of ſucceeding times contained in column two; in column four $3^m\ 55^s.91$, the difference between a mean ſolar and ſidereal day; and in column five the differences between the numbers contained in column three and column four with the proper ſigns, which will be the daily errors in ſolar time; and laſtly, the amount of theſe errors divided by the number of days elapſed will give the mean rate.

The operation according to the Rule.

1794	Obſ. Times of the ✳'s Tranſ.	Difference.	Diff. bet. m.ſol. and ſid. day.	Watch gains or loſes on mean Time.	Remarks.
	h. m. s.	m. s.	m. s.	s.	
♀ Jan. 3	9 22 17.42				
♄ — 4	9 18 20.73	3 56.69	3 55.91	—0.78	
☉ — 5	9 14 24.36	3 56.37	3 55.91	—0.46	
☽ — 6	9 10 28.05	3 56.31	3 55.91	—0.40	
♂ — 7	9 6 31.48	3 56.57	3 55.91	—0.66	
☿ — 8	9 2 33.87	3 57.61	3 55.91	—1.70	
♃ — 9	8 58 36.53	3 57.34	3 55.91	—1.43	
♄ — 11	8 50 45.07	7 51.46	7 51.82	+0.36	In 2 days
☉ — 12	8 46 49.46	3 55.61	3 55.91	+0.30	
☿ — 15	8 35 0.17	11 49.29	11 47.73	—1.56	In 3 days
♃ — 16	8 31 4.62	3 55.55	3 55.91	+0.36	
♀ — 17	8 27 8.21	3 56.41	3 55.91	—0.50	

Here it may be obſerved, that the ſum of all the chronometer's gainings is $4^s.50$, and the ſum of all its loſings is $2^s.01$; the difference between them is $2^s.49$, which being divided by 14, the number of days the chronometer was under trial, will give $0''.178$ for the rate or daily gain of the watch.

The rate which a watch goes at is obtained this way with much leſs trouble than by any other; but the *abſolute time* is not given by it, nor, of courſe, how much the watch is too faſt or too ſlow, for mean time, at the meridian it is tried under, which may be found by ſome of the following problems.

PROBLEM IX.

To find the rate of a chronometer by compariſon with a good ſolar or ſidereal clock, the rate of which is known, and occaſionally corrected.

Prefatory Remark. Though the rate of a chronometer, as aſcertained from a ſucceſſion of tranſits of a heavenly body, be moſt to be depended upon, yet it will not always happen particularly in a changeable climate, that a ſufficient number of obſervations can be gotten within the limited time allowed for fixing a rate; it will, therefore, be very convenient to compare the going of the chronometer with that of either a ſolar or ſidereal clock, that has a compenſation pendulum and good eſcapement, and to aſcertain in the mean time the rate of the clock itſelf by occaſional obſervations of the ſun or ſtar, it being generally allowed that a good clock is more ſteady in its rate than any chronometer which has yet been made, provided its adjuſtments be perfect. It may be adviſeable to try the chronometer, in the firſt place, in different poſitions, by ſhort compariſons of 12 hours each with the clock; and if any conſiderable change of rate takes place during ſuch ſhort compariſons, it muſt neceſſarily be put into gimbols, or otherwiſe be ſent back again to the maker for new adjuſtment for the different poſitions.

Rule

Rule for a ſolar clock.—Place the chronometer in the poſition it is likely to preſerve in a voyage, and put its hands with thoſe of the clock, and have a ſheet of paper ruled into as many columns as the compariſon will require; for a ſolar clock ſeven columns will anſwer the purpoſe, but for a ſidereal clock there will be more required. Put titles to the different columns, and, after an interval of each 24 hours, make the requiſite compariſons, and enter them as they ſtand in the ſubjoined example, reſerving columns four and five to be filled up afterwards; then after as many days' compariſon as the time will allow, complete the calculations in theſe two reſerved columns thus; take a mean of the obſerved differences between the time of the clock and mean time determined occaſionally by a tranſit inſtrument, which will be the clock's mean daily rate, particularly if the obſervations are taken after equal intervals; then add or ſubtract, as the caſe may be, the clock's daily rate to or from the reſpective numbers in column three, and fill up column four with the ſum or differences, or both, if the caſe ſhould ſo be; in the next place, take the differences between each couple of the ſucceeding lines of column four, and fill up therewith column five, annexing — or +, as the difference may be; laſtly, take the difference between the plus and minus amounts, or the ſum, if there is but one kind, and divide it by the number of days elapſed on trial, and the quotient will be the daily error, — or +, which error is denominated the *rate*.

Example. Let it be required to aſſign a rate to a chronometer from the compariſons made in the columns 1, 2, and 3, of the annexed table?

Days of Trial.	Clock afterme an Time.	Chrono. diff. from Clock in 24 h.	Do. from mean Time in 24 h.	Daily Rate of Chron.	Mean State of Thermometer.	Mean State of Barometer.
	s	s	s		o	
1	— 6.5	+ 8.5	+ 2.2		54	29.8
2		+ 8.8	+ 2.5	+ 0.3	55	30.0
3		+ 9.4	+ 3.1	+ 0.6	57	30.2
4		+ 7.5	+ 1.2	— 1.9	56	30.4
5		+ 9.0	+ 2.7	+ 1.5	53	29.6
6		+ 10 4	+ 4.1	+ 1.4	53	29.4
7		+ 10.5	+ 4.2	+ 0.1	54	29.6
8	— 8.0	+ 11.3	+ 5.0	+ 0.8	55	29.7
9		+ 11.5	+ 5.2	+ 0.2	54	29.8
10		+ 10.4	+ 4.1	— 1.1	56	30.0
11		+ 10.0	+ 3.7	— 0 4	57	30 4
12		+ 8.4	+ 2.1	— 1.6	58	30.4
13		+ 7.6	+ 1.3	— 0.8	57	30.6
14		+ 7.4	+ 1.1	— 0.2	56	30.5
15	— 4.5	+ 7.2	+ 0 9	— 0.2	57	30.4

$3\,|\,\underline{19^{\circ}}$
Rate of clock } $-\,6^s.3$ on an average of 15 days.

— 6.2 Total loſs.
+ 4.9 Total gains.
— 1.3 Diff. in 15 days.

Then $\frac{-1^s.3}{15} = 0^s.087$ minus is the daily rate of the chronometer taken from a compariſon with the clock for 15 ſucceſſive days, which rate muſt be added to the time ſhown by the chronometer on any ſucceeding day, after it has been multiplied by the number of days elapſed ſince the laſt day of the compariſon. This rate might ſuffice for a ſhort voyage, immediately undertaken, if the chronometer had been tried and approved previouſly; but if not previouſly approved on a voyage, it ought to have a longer trial. If a chronometer could be made ſo perfectly as to meaſure time preciſely alike under all circumſtances, a very few days would at any time ſuffice for aſſigning to it its rate. Had not the rate of the clock in this example been taken at equal intervals, it would have been more accurate to have taken a mean between $-\,6^s.5$ and $-\,8^s$ for the mean rate to be applied for the firſt portion, and a mean between 8^s and $4^s.5$ to be applied to the ſecond portion of the trial; particularly as there is a conſiderable variation in the rate of the clock. The ſame reſult might otherwiſe have been obtained by aſſigning a daily rate to the clock by interpolation for each ſeparate day firſt, and then by applying each ſeparate day's rate to each ſeparate compariſon in column three, to obtain column four, and from that the daily rates of the chronometer in column five; but this method is attended with more trouble, and is only neceſſary when the clock's rate is taken at unequal intervals, and is found to vary conſiderably. Whenever it happens that the compariſon is not made exactly at the inſtant of the 24^h being elapſed, the interval, whatever it is, muſt be reduced to 24^h by proportioning the difference in the going of the two machines correſponding to the ſaid interval. By the preſent rule alſo the going of one clock may have its rate aſſigned by a compariſon with that of another.

Rule for a ſidereal clock.—When the clock ſhows ſidereal time, and the chronometer ſolar, their difference in 24^h of ſolar time ought to be $3^m\,55^s.91$ of ſolar time, but in 24^h of ſidereal time, $3^m\,56^s.55$, provided the machines performed with perfect truth; one or other of theſe two ſtandard numbers, therefore, muſt be uſed as the meaſure of the daily error, accordingly as the interval is a ſolar or a ſidereal day. In making the compariſons previouſly to the calculations being entered upon, it is not neceſſary to have more than five columns; one for *the day of the month*, a ſecond for *time per watch*, a third for *the time per clock*, a fourth for the *barometer*, and a fifth for the *thermometer;* which form being ſo ſimple requires no fac ſimile. But the calculations, grounded on the data in the ſaid five columns, require many more columns, for which we ſhall not give any previous directions, but inſert Dr. Maſkelyne's two methods of arrangement, extracted from "The original Obſervations of the Going of Mr. Harriſon's Watch from day to day," as publiſhed by the Board of Longitude; which methods will be better underſtood from the forms of his tables, than from any verbal rules of ours, which muſt neceſſarily be complex.

Example, (from "The original Obſervations"). Let it be required, from the data contained in columns 1, 2, and 3, of the ſubjoined tables, to determine the rate of Mr. Harriſon's time-keeper, taken on an average of the 11 days trial contained in the table?

Firſt Method.—Calculations of the going of Mr. Harriſon's Watch from Day to Day.

	Interval of Compariſons.	Watch loſes of Clock.	Watch loſes of Clock, in 24^{h} of Watch.	Clock varies from ſidereal Time per Day.	Watch loſes of ſidereal Time of 24^{h}. of Watch.	Watch gets on mean Time per Day.	Mean ſtate of Thermometer.	Mean ſtate of Barometer.
	The watch in a horizontal poſition, with the face upwards.							
1766.	h. m.	m. s.	m. s.	s.	m. s.	s.	Deg.	Inch.
May 6 to 7	23 30	3 33	3 37.53	+1.34	3 38.9	17 .6	54	29.9
7 8	24 4	3 37	3 36 .4	+1.22	3 37.6	18 .9	57	29.7
8 9	23 52	3 34	3 37 .2	+1.17	3 36.4	20 .1	55	29.5
9 10	24 4	3 36	3 35 .4	+1.13	3 36.5	20 .0	54	29.3
10 11	23 57	3 36	3 36 .4	+1.16	3 37.6	18 .9	49	29 5
11 12	24 1	3 36	3 35 .9	+1.12	3 37.0	19 .5	50	29.6
12 13	24 9	3 37	3 35 .6	+1.05	3 36.6	19 .9	51	29.6
13 14	23 49	3 33	3 34.76	+1.02	3 35.8	20 .7	52	29.8
14 15	24 8	3 37	3 35.79	+1.02	3 36.8	19 .7	52	30.1
15 16	24 2	3 36	3 35.70	+0.80	3 36.5	20 .0	54	30.2
16 17	24 9	3 38	3 36.64	+0.58	3 37.2	19 .3	56	30.1
						11)209 .56		
						19.509		

By a mean of 11 days' compariſons, from May 6th to May 17th, the watch being in a horizontal poſition with the face upwards, gets at the rate of 19^{s}.509 per day upon mean time.

Dr. Maſkelyne's explanation. "The firſt column ſhews the days of the month; the ſecond, the interval of time, according to the watch, between the atteſted compariſons of the watch each day with the tranſit clock; the third column contains the quantity of minutes and ſeconds which the watch loſes of the clock in the ſaid interval; the fourth column ſhews how much the watch ſhould loſe of the clock in 24 hours of the watch, according to the proportion expreſſed in the ſecond and third columns; the fifth column gives the daily gaining or loſing of the tranſit clock with reſpect to ſidereal time, as deduced from the obſerved tranſits of the fixed ſtars over the meridian, the ſign + being ſet down in caſe of the clock's loſing, and — in the caſe of its getting. This correction, applied to the numbers of the fourth column, produces the ſixth column, or the loſing of the watch from day to day; with reſpect to ſidereal time, in 24 hours of the watch. The ſeventh column gives the daily gaining of the watch upon mean time, and is found by taking the difference of the preceding column and 3^{m} 56^{s}.5 ſidereal time, gaining ſo much upon mean ſolar time in 24 hours of mean time; or rather more exactly, in 24 hours of the watch, which generally correſponds to leſs than 24 hours of mean time by near 20 ſeconds. The eighth column contains the mean ſtate of the thermometer for the day; and the ninth and laſt column ſhews the mean ſtate of the barometer." ("The Original Obſervations," p. xxvii. and xxviii.)

Second Method.—Compariſons of Mr. Harriſon's Watch with Mean Time.

	ObſervedTranſit of Sun per Clock.	Time per Clock at compariſon with Watch.	Apparent Time.	Equation of Time.	Mean Time.	Time per Harriſon's Watch at compariſon with Clock.	Harriſon's Watch faſt for Mean Time.
1766.	h. m. s.	h. m. s.	h. m. s.	— m. s.	h. m. s.	h. m. s.	m. s.
♂ May 6	2 53 30.27	3 39 1	0 45 23.60	3 39 .8	0 41 43.8	0 42 0	0 16.2
☿ 7	2 57 20.50	3 12 34	0 15 11.10	3 45 .0	0 11 26.1	0 12 0	0 33.9
☽ 12	3 16 43.71	3 28 33	0 11 47.38	3 59.32	0 7 48.0	0 10 0	2 12.0
♃ 15	3 28 28.77	3 45 20	0 16 48.47	4 1.10	0 12 47.4	0 16 0	3 12.6
♄ 17	3 36 21.83	4 3 34	0 27 7.68	3 59.47	0 23 8.2	0 27 0	3 51.8

If we include here both the 6th and 17th, there will be 12 days in this calculation, during which the watch gained in the whole 3^{m} 51^{s}.8 or 231^{s}.8, therefore $\frac{231.8}{12} = 19^{s}.32$ is the rate on this mode of compariſon, which agrees very well with the preceding one calculated on the ſame period.

Explanation, by Dr. Maſkelyne. According to the arrangement in this laſt Table "the firſt column contains the day of the month; the ſecond, the obſerved tranſit of the ſun's centre over the meridian, according to the time of the tranſit clock; the third column ſhews the time by the clock, when compared with Mr. Harriſon's watch; the fourth, the apparent time at the ſame compariſon; the fifth, the equation of time, which, applied to the numbers in the preceding column,

lumn, gives the mean time contained in the ſixth column; the ſeventh column gives the time ſhewn by Mr. Harriſon's watch, when compared with the clock; laſtly, the eighth column ſhews how much the watch is too faſt for mean time each day." ("The Original Obſervations," p. xxxix.)

PROBLEM X.

To find the equation of equal altitudes.

Rule, (by A. Mackay, LL.D. F.R.S. Edin. &c.) Enter Table XXIII. (contained in his "Theory and Practice of finding the Longitude," vol. ii.) with the *interval of time* between the obſervations at the *top*, and the *latitude of the place* of obſervation in the *ſide* column, and take out the correſpondent number; take out the number from Table XXIV. anſwering to the *interval of time* and the *ſun's declination*; ſubtract it from the former, if the latitude and declination are of the ſame name, otherwiſe add them, and find the log. correſponding to the remainder or ſum, which ſubtracted from the pro. log. of the daily variation of the ſun's declination, increaſed by 5, the remainder will be the pro. log. of the equation of equal altitudes.

Example. Let the latitude of the place of obſervation be 57° 9′ N.; the interval of time between the obſervations 5^h 17^m; ſun's declination 17° 48′ S., and change of declination 16′ 19″½.

Required the equation of correſponding altitude?

No. from Table XXIII. to interval and lat.	= 1782	
No. from Table XXIV. to inter. and declin.	= 284	
Sum - - -	2066	log. ſub. 3.3151
Daily variation of declination	16′ 19″.5 p. log. + 5 =	6.0424
Equation of equal altitudes	= $20^s.2$ p. log. -	2.7273

In the Tables I. and II. of Mr. Wales, and in Tab. XLIII. of Mr. Vince, the arguments at top and ſide are "half the interval between the obſervations," and "☉'s longitude."

PROBLEM XI.

To find the errors and rate of a chronometer by equal altitudes of the ſun.

Rule, (by A. Mackay, LL.D. F.R.S. Edin. &c.) In the morning, when the ſun is more than two hours diſtant from the meridian, in theſe latitudes, let a ſet of obſervations be taken, conſiſting, for the ſake of greater accuracy, of at leaſt three altitudes; which, together with the correſponding times per watch, are to be written down regularly, the time of each obſervation being previouſly increaſed by 12 hours. In the afternoon obſerve the inſtants when the ſun comes to the ſame altitudes, and write down each oppoſite to its reſpective altitude. Now, half the ſum of any two times, anſwering to the ſame altitude, will be the time of noon per watch uncorrected; find the mean of all the times of noon, thus deduced from each correſponding pair of obſervations, to which the equation of equal altitudes is to be applied, by addition or ſubtraction, according as the ſun is receding from, or approaching to, the elevated pole; the ſum or difference will be the time per watch of apparent noon, or the inſtant when the ſun's centre was on the meridian, the difference between which and noon is the error of the watch for apparent time, and the watch will be faſt or ſlow, accordingly as the time of noon thereby is more or leſs than 12 hours.

If the watch be regulated to mean ſolar time, it is obvious, that the time of noon found as above, ſhould agree with that found by applying the equation of time to noon, according to its ſign in the Nautical Almanac. If theſe times do not agree, their difference will be the error of the watch for mean ſolar time. Inſtead of applying the equation of time to twelve hours, it perhaps will be found more convenient to apply it with a contrary ſign to the time per watch of apparent noon; and the difference between this time and 12 hours will be the error of the watch.

Example 1. January 29, 1786, in lat. 57° 9′ N. the following equal altitudes of the ſun were obſerved. Required the error of the chronometer?

	Time.	A.M.		P.M.
Alt. =	8° 5′	21^h 35^m 8s		2^h 55^m 43^s
	8 10	- 36 8	- - -	54 42
	8 20	- 38 9	- . -	52 41.2
	8 25	- 39 12½	- - -	51 38
	21^h 35^m 8°	21^h 36 8	21^h 38^m 9^s	21^h 39 12.5
	2 55 43	2 54 42	2 52 41.2	2 51 38
Sum	24 30 51	24 30 50	24 30 50.2	24 30 50.5
M.	12 15 25.5	12 15 25	12 15 25.1	12 15 25.2
				25.1
				25.0
				25.5
Sum - - - - - - - - -				.8
Time of noon per chronometer uncorrected				12 15 25.2
Equation of equal altitudes, by Prob. X.				20.2
Time per chronometer of apparent noon				12 15 5.0
Chronometer faſt for apparent time -				15 5
Time per watch of apparent noon -				12 15 5.0
Equation of time - - - . -				13 29.8
Time per chronometer of mean noon -				12 1 35.2
Chronometer faſt for mean time - -				1 35.2

In obſerving equal altitudes, it will be found convenient to put the index of the inſtrument to a certain diviſion, and to wait till either limb of the ſun attains that altitude. If the ſucceſſive altitudes of the ſame ſet are equidiſtant from each other, the mean of the morning obſervations may be compared with the mean of thoſe obſerved in the afternoon, in order to find the time of noon.

Example 2. April 20th, 1786, in latitude 57° 9′ N. the following obſervations were made, in order to aſcertain the error of the chronometer.

		A.M.	P.M.
Alt. = 35° 40′	time p.chr.	21^h 20^m 27s .5	2^h 37^m 29^s .5
35 45	- -	21 16 .0	36 41 .0
35 50	- -	22 4 .5	35 52 .5
35 55	- -	22 53 .0	35 4 .0
36 0	- -	23 41 .3	34 15 .6
		10 22 :3	29 22 .6
Mean -	-	21 22 4.46	2 35 52.52
		2 35 52.52	
Chronometer	-	23 57 56.98	
Carried over		11 58 58.49	

Time per chron. of noon uncorrected	11 58 58.49	
Equation of equal alt.	— 19.53	
Time p. chr. of app. noon	11 58 38.96	11 58 38.96
Chron. ſlow for app. time	1 21.04 eq.ti.	+ 1 16.20
Time per chron. of mean noon	-	11 59 55.16
Chron. ſlow for mean time	- -	- 4.84

Hence, the obſervations of the two preceding examples being ſuppoſed to be made at the times ſpecified, by the ſame chronometer, its daily rate may be eſtabliſhed upon the ſuppoſition of an uniform motion, as follows:

January 29th, clock faſt at noon		= 1ᵐ 35′.3
April 20th, clock ſlow at noon		- 4.8
Interval, 81 days.	Difference	- 1 40.1

Now 1ᵐ 40′.1, div. by 81, gives 1′.236 for the daily error or rate of the chronometer.

Second method of operation.

Example 3, (extracted from W. Wales, F.R.S.) Admit that on the 25th of Auguſt, 1793, the following obſervations of equal altitudes were made at Quebec, as in the annexed ſcheme.

Obſervation.

Thermometer.	Morning.	Afternoon.	Dou. Alt.	Thermometer.	
°	h. m. s.	h. m. s.	° ′	°	
56	19 26 53.9	4 35 43.3	45 00	67	Upper Limb.
	19 30 2.3	4 32 35.7			Lower Limb.
58	20 4 25.6	3 58 14.6	57 30	68	Upper Limb.
	20 7 36.0	3 55 5.0			Lower Limb.

Operation.

Upper Limbs.	Lower Limbs.	Upper Limbs.	Lower Limbs.	
h. m. s.	h. m. s.	h. m. s.	h. m. s.	
28 35 43.3	28 32 35.7	27 58 14.6	27 55 5.0	Afternoon obſerv.
19 26 53.9	19 30 2.3	20 4 25.6	20 7 36.0	Morning obſerv.
9 8 49.4	9 2 33.4	7 53 49.0	7 47 29.0	Interval.
4 34 24.7	4 31 16.7	3 56 54.5	3 53 44.5	Half interval.
0 1 18.6	0 1 19.0	0 1 20.1	0 1 20.5	Noon nearly.
+ 18.3	+ 18.2	+ 17.1	+ 17.0	Equa. Tab. I.
— 1.1	— 1.2	— 1.5	— 1.5	Equa. Tab. II. (by Wales).
0 1 35.8	0 1 36.0	0 1 35.7	0 1 36.0 35.7 36.0 35.8	True time of noon by the watch.
			4)143.5	

Time of noon by the chronometer - -	0ʰ 1ᵐ 35ˢ.6
Mean time of apparent noon (Naut. Alm. p. II.) -	0 1 35 .3
Chronometer too faſt for mean time - ′ -	00 .6

In any caſe of neceſſity, the obſervations of the equal altitudes may be taken in the forenoon of any day, and in the afternoon of the following day, and then the error of the chronometer may be aſcertained by a ſimilar proceſs, as it was at the inſtant of the intermediate midnight. In this example Mr. Wales has added 24 hours to the time of the afternoon obſervation; and ſubtracted therefrom the time of the morning obſervation, the difference being the interval between the obſervations. We thought it not neceſſary to give Mr. Wales's rule, as it is very ſimilar to Dr. Mackay's, and as the operation will be ſufficiently underſtood from the arrangement of the figures in the table.

Third Method.

Rule, (by Joſeph de Mendoza Rios, Eſq. F. R. S.) The equation (in Table XXXIII. of Mr. Mendoza's "Collection of Tables for Navigation and Nautical Aſtronomy,") is divided into two parts, and both have for arguments the ſun's longitude, (which muſt be previouſly found by Problem II.) and the interval, or time elapſed, between the obſervations; the firſt part is, beſides, to be multiplied by the tangent of the latitude, or, which comes to the ſame, by the ſine and ſecant, of the place of obſervation. The ſigns at the top of each ſection mark whether ſuch a part muſt be added to, or ſubtracted from the middle time, in order to have the time of true noon; but the ſigns of the firſt part muſt be changed, if the place of obſervation is in the ſouthern hemiſphere.

Example 4. September 17th, 1789, (civil time) the following obſervations were made by Count de Bruhl, at his obſervatory at Harefield, ſituated in lat. 51° 36′ 9″.

	Altitude of ☉'s upper limb.	Times by the Chronometer. Morning.	Times by the Chronometer. Afternoon.
	67° 40′	21 42m 21s.4	2h 0m 3s.0
	68 0	21 44 5.0	1 58 22.0
	68 20	21 45 45.5	1 56 39.0
	68 40	21 47 29.0	1 54 55.4
	69 0	21 49 12.4	1 53 11.0
	69 20	21 52 46.4	1 49 41.0
	69 40	21 54 31.6	1 47 52.0
	70 0	21 58 15.6	1 44 11.2
Sums - -		174 34 26.9	15 4 54.6

Means (div. by 8) 21 49 18.4 } 1 53 6.8

25 53 6.8 } Interv. (differ.) 4h 3m 48s.4 or 4 4

Sum - - 47 42 25.2

Middle time (half) 23 51 12.6

The ſun's longitude was then 5 ſigns 25°: conſequently

	First Part.		Second Part.
For 5 ſigns 25°, and { 4h 0m	+ 15s.53 -	-	−0.46
4 20	+ 15.66 -	-	−0.45
Differences - - -	0.13		0.01

$$20^m : 0^s.13 :: 4^m : x \left(= \frac{4' \times 0.13}{20} = 0.03\right) \qquad 20^m : 0^s.01 :: 4^m : x \left(= \frac{4' \times 0.01}{20} = 0.00\right)$$

For ſix ſigns 0°, and { 4h 0m	+ 15.63 -	-	0.00
4 20	+ 15.76 -	-	0.09
Difference - - -	0.13		

$$20^m : 0.13 :: 4^m : x \left(= \frac{4' \times 0.13}{20} = 0.03\right)$$

Therefore,

For 5s 25° } and 4h 4m {	+ 15.56 -	-	− 0.46
6 0 }	+ 15.66 -	-	0.00
Differences - - -	0.10		0.46

$$5^\circ : 0^s.10 :: 1^\circ : x\ (= 0.02) \qquad 5^\circ : 0.46 :: 1^\circ : x\ (= 0.09)$$

	First Part.		Second Part.
Thus, for five ſigns 26°, and 4h 4m -	+ 15s.58	- - -	− 0s.37
Log. firſt part - - - -	1.19257		
Log. ſine latitude - - - - -	9.89417		
Log. ſecant latitude - - - -	0.20684		
Log. firſt part corrected (ſum) - -	1.29358	- - -	+ 19.66
Equation - - - - - - - - -			+ 19.29
Middle time - - - - - - - -			23h 51m 12.60
Time of true noon - - - - - - -			23 51 31.89

To the time of true noon by the chronometer, thus obtained, it is only neceſſary to apply the equation of time, in order to compare the chronometer with equated, or mean time. The equation of time, in the preſent example, is 5m 49s.5, ſo that at true noon the mean time is 23h 54m 10s.5; and rom hence it reſults, that the chronometer deviated − 2m 38s.61 from mean time.

In theſe four examples, the obſerver is ſuppoſed to be in a ſtationary ſituation.

Problem XII.

To find the error of the chronometer by equal altitudes of the ſun, the ſhip being under way.

Rule, (by A. Mackay, LL.D. F.R.S. Edin. &c.) Let ſeveral ſets of equal altitudes be obſerved in the morning and afternoon, and from thence find the corrected time of noon, as before, in Prob. XI.; alſo, let the ſun's azimuth be obſerved, by which, the variation of the compaſs being applied, the true azimuth at the time of obſervation will be obtained.

Now, to the conſtant log. 9.2219 add the proportional log. of the interval of time between the equal altitudes, the hours and minutes being conſidered as minutes and ſeconds; the prop. log. of the hourly rate of ſailing, the log. co-ſine of the ſhip's latitude, the log. ſecant of the courſe, and the log. tangent of the ſun's azimuth; the ſum, rejecting tens in the index, will be the prop. log. of the correction anſwering to the change of latitude; and to the ſum of the firſt four logs. add the log. co-ſecant of the courſe; the ſum, rejecting tens in the index, will be the prop. log. of the change of longitude. The firſt correction is to be added to, or ſubſtracted from, the time of noon before found, accordingly as the ſhip's latitude is increaſing or diminiſhing; and the ſecond correction is additive or ſubſtractive, accordingly as the ſhip's courſe has been in the eaſtern or weſtern hemiſphere. The reſult thus deduced will be the time per watch of apparent noon, under the meridian of the firſt place of obſervation.

If the two laſt corrections be applied with a contrary ſign, the time of apparent noon, under the meridian of the ſecond place of obſervation, will be obtained.

The firſt correction vaniſhes, if the courſe made good between the obſervations is either due eaſt or weſt; and the ſecond, if the ſhip ſails on a meridian.

Example. Auguſt 7th, 1804, equal altitudes of the ſun's lower limb were obſerved, whereof the means were $9^h\ 14^m\ 52^s$ A.M., and $2^h\ 48^m\ 18^s$ P.M. reſpectively, the corrected azimuth of the ſun from the ſouth was $69\frac{3}{4}°$, the ſhip's courſe during the elapſed time S.W. by W. at the rate of 8.6 knots per hour, and the ſhip's latitude and longitude at noon were 39° 18′ N. and 31° 24′ W. reſpectively. Required the error of the watch for apparent noon, under the meridian of the place where the firſt ſet of obſervations was made?

Conſtant logarithm	9.2219		
Int. of time $= 5^h 33^m$ or $5^m 33^s$ p. log.	=1.5110		
Hourly rate of ſailing $8^h 6^m$ or $8^m 36^s$ p. log.	=1.3208		
Latitude 39° 18′, co-ſine -	9.8886		
	1.9423	- -	1.9423
Courſe 3 points, ſecant -	0.0801	co-ſecant -	0.2553
Azimuth 69° 45′, tangent -	0.4331	ſec. cor. $1^m 9^s$ P.L.	2.1976
Firſt correction $0^m 38^s$ p. log.	2.4555		

		h	m	s
Mean of morning ſet - -		9	14	52
——— afternoon ſet - -		2	48	18
Uncorrect time of noon - -		12	1	35
Equation of equal altitudes	+			7
Equation of latitude - -	—			38
Equation of longitude -	—		1	9
Time p. watch of apparent noon, under meridian of firſt place of obſervation -		11	59	55
Watch ſlow for apparent time				5
Equation of time - -			5	23
Watch ſlow for mean time -			5	28

The problem may otherwiſe be performed, by eſtimating how many minutes the ſun is higher or lower, in conſequence of the change of latitude in the elapſed time, at the inſtant it will attain the correſponding altitude in the afternoon, and ſetting the index of the quadrant accordingly. This quantity may be found with ſufficient accuracy from a traverſe table.

PROBLEM XIII.

To find the error of a chronometer, by equal altitudes of a fixed ſtar.

Rule, (by A. Mackay, LL.D. F.R.S. Edin. &c.) Let ſeveral altitudes, and the correſponding times per watch, of a known ſtar, be obſerved when in the eaſtern hemiſphere; and when the ſtar is in the weſtern hemiſphere, obſerve the inſtants when it comes to each of the former altitudes.

Take the mean of each correſponding pair of times, and the mean of theſe will be the apparent time per watch of the ſtar's tranſit over the meridian.

From the apparent right aſcenſion of the ſtar, taken from the table, ſubtract the ſun's right aſcenſion, and the remainder will be the approximate time of the ſtar's tranſit; from which ſubtract the equation correſponding thereto, and the ſun's right aſcenſion obtained by Prob. V., or from Table XVIII. (of Dr. Mackay), and from the ſame table take the equation anſwering to the ſhip's longitude, which muſt be added, if the longitude is eaſt, but ſubtracted, if weſt. Hence the apparent time of the paſſage of the ſtar over the meridian will be obtained.

Now, the difference between the obſerved and computed times of the ſtar's tranſit, will be the error of the watch for apparent time, and which is faſt or ſlow, accordingly as the time by obſervation is later or earlier than the computed time of the ſtar's tranſit.

Example. July 4th, 1804, in latitude 35° 48′ S. and longitude 23° 26′ E. the following equal altitudes of Atair were obſerved. Required the error of the chronometer for apparent time?

	Time per Chronometer.	Altitude.	Time per Chronometer.
	$8^h\ 17^m\ 0^s$	27° 23′	$14^h\ 35^m\ 57^s$
	19 16	27 40	33 42
	20 12	27 55	32 44
	21 54	28 12	31 5
	23 16	28 30	29 41
	8 25 55	28 52	14 27 1
Sum	7 33		10 10
Mean	8 21 15.5		14 31 41.6
			8 21 15.5
			22 52 57.1

		h	m	s
Obſerved time of tranſit - -		11	26	28.6
Atair's right aſcenſion - -		19	41	18
Sun's right aſcenſion at noon, p. N. Al.		8	14	5
Approximate time of Atair's tranſit		11	27	13
Equation to $8^h 14^m$ and $11^h 27^m$ Tab. XVIII.	—		1	53
Equation to $8^h 14^m$ and $23^{\circ} 26^m$ Tab. XVIII.	+			16
Apparent time of ſtar's tranſit -		11	25	36
Apparent time of tranſit per watch -		11	26	29
Watch faſt - - -		0	0	53

In this problem, the obſerver is ſuppoſed to continue in the place during the interval between the correſponding obſervations, but if the obſervations are taken on board of a ſhip under way, the equations muſt be applied ariſing from the ſhip's run, according to the directions given and exemplified in the laſt problem, to reduce the time of the tranſit to either of the two places of obſervation; then the difference between this time and the time indicated by the chronometer, when all allowances are made for rate, &c. will be the longitude of the ſaid place. It may be proper to add here, that when the courſe and diſtance made good between the obſervations are given, inſtead of the obſerved interval of time and hourly rate of ſailing, the conſtant log. 1.4771 (= 9.2219 + pr. log. of one minute) is to be uſed inſtead of 9.2219 which is uſed in Prob. XII.

Problem XIV.

To find the apparent time on any given day in a known latitude by one obſerved altitude of the ſun.

Rule, (according to the Requiſite Tables.) From the obſerved altitude ſubtract the dip of the horizon, and the refraction; and to the remainder add the ſun's ſemi-diameter; the ſum will be the true altitude of the ſun's centre. Subtract the natural ſine of the altitude thus corrected, from the natural ſine of the calculated meridional altitude, and to the logarithm of the remainder add the log. ſecant of the ſhip's latitude, and the log. ſecant of the ſun's declination; their ſum, rejecting 20 from the index, muſt be ſought for in Tab. XVI. under log. riſing, and the time correſponding to it is the apparent time from the neareſt noon, when the ſun's altitude was obſerved. Conſequently, if the obſervation be made in the forenoon, the time, thus found muſt be taken from 24 hours, and the remainder will be the apparent time from noon of the preceding day. The parallax in altitude is here diſregarded, as being too trifling to deſerve notice.

Example. July 9th, 1775, about 8 A.M. in latitude 34° 55′ N. longitude 40° W. the altitude of the ſun's lower limb was obſerved to be 36° 49′½; the obſerver's eye being 21 feet above the ſurface of the ſea; what was the apparent time when this obſervation was made?

Refr. (Tab. I.)	1′ 16″	Sun's declin. Naut. Al.	22° 23′ 15″ N	Tab. VI. of Req. Tab.		
Dip. (Tab. II.)	4 22	Ship's long. gives -	— 52			
		Time for noon gives	+ 1 18			
Sum - -	5 38					
Sun's ſemi-dia.	15 47	Sun's declination -	22 23 41	N. log. ſec. - -		10.03407
		Co. latitude -	55 5 0	N. log. co-ſec. - -		10.08619
Cor. ⊙'s alt.	10 9					
Alt. ⊙'s l. l.	36 49 30	Meridional alt. -	77 28 41	Nat. ſine -	97623	
⊙'s true alt.	36 59 39	- - - - -		Nat. ſine -	60181	
					37442	Log. 4.57336
Time from noon on the 9th -	3^{h} 58^{m} 22^{s}	- - -		Log. riſing - - -		4.69362
	24 0 0					
Apparent time on the 8th -	20 1 38	which was required.				

Second Method.

Rule, (by Joſeph de Mendoza Rios, Eſq. F.R.S.) With the ſhip's longitude and the eſtimated apparent time, find, by the Nautical Almanac, the ſun's declination for the moment of the obſervation. (Problem III.)

From the obſerved altitude of the limb, deduce the true altitude of the centre.

From the ſun's declination, conclude the polar diſtance, and add it together with the ſhip's latitude and the altitude; take half the ſum, and the difference between the half ſum and the altitude.

Take the logarithmic co-ſecant of the polar diſtance, the logarithmic ſecant of the latitude, the logarithmic co-ſine of the half ſum, and the logarithmic ſine of the difference. The ſum (with the index reduced to the units) will be the logarithmic verſed ſine of the time from noon (or the ſun's horary angle), when the altitude was obſerved.

The time from noon is itſelf the apparent time, if the altitude was obſerved to the weſt, or in the afternoon; but, if it was obſerved to the eaſt, or in the forenoon, the time from noon muſt be taken from 24^{h}, in order to have the apparent time of the preceding day.

Example. February 11th, 1792, in latitude 23° 20′ S. and longitude 27° 27′ W., the altitude of the ſun's lower limb was obſerved (to the eaſt) to be 45° 10′ 10″, the obſerver's eye being 14 feet above the ſurface of the ſea. The eſtimated time was then 20^{h} 57^{m} 30^{s} (8^{h} 57^{m} 30^{s} in the morning by the watch). What is the apparent time at the ſhip, at the moment of the obſervation?

Eſtimated time at the ſhip, Feb. 11th -	20^{h}	57^{m}	30^{s}
Longitude W. 27° 27′ = - - -	+ 1	49	48
Time at Greenwich - - - -	22	47	18
The true altitude will be found to be -	45°	21′	53″

⊙'s declin. (by Naut. Almanac) S -	13°	41′	36″		
Polar diſtance -	76	18	24	L. co-ſec.	0.01252
Latitude -	23	20	0	L. ſec. -	0.03706
Altitude -	45	21	53		
Sum - -	145	0	17		
Half-ſum -	72	30	8	L. co-ſine	9.47804
Half-ſum-alt -	27	8	15	L. ſine -	9.65609
Time from noon	3^{h}	4^{m}	40^{s}	L. verſ. (ſum)	9.18671
Apparent time required - -	20	55	20		

Third Method.

Rule, (by A. Mackay, LL.D. F.R.S. Edin. &c. and others.) Correct the obſerved altitude of the ſun's limb, and reduce the declination to the time and place of obſervation, which, ſubtracted from, or added to 90°, according as the declination and latitude are of the ſame or of contrary names, the remainder or ſum will be the ſun's *polar diſtance.*

Now, add together the ſun's corrected altitude and polar diſtance, and the latitude of the place of obſervation, and call the difference between half the ſum of theſe and the altitude, the *remainder*.

Then, to the log. co-ſecant of the polar diſtance, add the log. ſecant of the latitude, the log. co-ſine of the half ſum, and the log. ſine of the remainder; half the ſum of theſe will be the log. ſine of an arch; which, being multiplied by 8, will be ſun's diſtance from the meridian in apparent time. Hence, the apparent time of obſervation, and the error of the chronometer will be known.

Example. March 4th, 1804, in latitude 45° 37′ N. and longitude 19° 19′ W. the following altitudes of the ſun's lower limb were obſerved, the height of the eye being 16 feet above the ſurface of the ſea. Required the apparent time of obſervation, and the error of the watch?

Time per watch.	Alt. ⊙'s l. limb.
$2^h\ 53^m\ 32^s$	24° 59′
54 30	52
55 36	54
56 47	35
20 25	190
Mean 2 55 6	24 47.5
Semi-diameter -	+ 16.2
Dip. - -	— 3.8
Correction - -	— 1.9
Cor. alt. ⊙'s centre =	24 58.0

⊙'s dec. at noon, p. N. A.	= 6° 23′.4
Eq. tab. XIII. to dec. and $2^h\ 55^m$ P. M.	= — 2.8
Do. to dec. and 19° 19′ W.	= — 1.2
Reduced declin.	6 19.4
Polar diſtance	96 19.4

Sun's polar diſt.	= 96 19.4	Co-ſecant -	0.00265
Ship's latitude	= 45 37.0	Secant. -	0.15524
Sum - -	166 54.4		
Half - -	83 27.2	Co-ſine -	9.05695
Remainder - -	58 29.2	Sine - -	9.93071
			19.14555
Arc - -	21 57.4 8	Sine - -	9.57277
Apparent time -	2 55 39		
Time per chronom.	2 55 6		
Chronometer ſlow -	33^s		

Fourth Method.

Rule, (from A. Mackay, LL.D. F.R.S. Edin. &c.) Enter Tab. XXVII. (of Dr. Mackay) with the declination of the object at the top, and the latitude of the place of obſervation in the ſide column; take out the correſponding number, to which prefix the index 4, and add to it the log. ſine of the corrected altitude; find the natural number anſwering thereto, to which apply the number from Tab. XXVIII. by ſubtraction or addition, according as the latitude and declination are of the ſame or of contrary names. Now, find the above difference or ſum in Table XXIX. and the correſponding time will be the diſtance of the object from the meridian.

Example. May 7th, 1803, in latitude 56° 4′ N. and longitude 7° 30′ W. at $4^h\ 37^m\ 4^s$ P.M. per chronometer, the altitude of the ſun's lower limb was 25° 6′ 1″, and height of the eye 18 feet. Required the error of the chronometer for apparent time?

Alt. ⊙'s l. l.	25° 6′.1	⊙'s dec. p. N. Al. =	16° 37.5′ N.
Semi-diam.	+ 15.9	Eq. to $4^h\ 37^m$ P.M.	+ 3.2
Dip. -	— 4.1	do. to 7° 30′ W.	+ .3
Correction	— 1.9	Reduced declination	16 41.0 N.
Cor. alt. ⊙'s c.	25 16.0		

To latitude 56° 4′, and declination 16° 41′, the number from

Table XXVII. =	4.2719	Table XXVIII. =	4455
Alt. 25° 16′ ſine -	9.6303		
Sum - -	3.9022	Natural number -	7984
Apparent time -	$4^h\ 37^m\ 20^s$	per Table XXIX.	3529
Time per chron.	4 37 4		
Chronom. ſlow -	16		

Fifth Method. By Spherical Trigonometry.

If in any ſpherical triangle, P ⊙ Z, P repreſent the pole, ⊙ the ſun, and Z the zenith of the place, then we ſhall have that caſe in ſpherical trigonometry, in which the three ſides of the triangle are given to find the horary angle at P.

Example. Suppoſe the co-latitude, Z P, of London to be 38° 28′, the co-alt. or zen. diſtance Z ⊙ corrected 43° 40′, and the co-declination or polar diſtance, ⊙ P, reduced to be 66° 52′ 9″, on June 21, 1795, required the horary angle ⊙PZ, and the mean time correſponding?

The work is thus; viz.

Co. lat. -	38° 28′		
Zenith diſtance	43 40		
Polar diſtance	66 32 9″		
2)	148 40 9		
½ ſum	74 20 4½		
½ ſum — Z P =	35 52 4½	ſine -	9.7678374
½ ſum — ⊙ P =	7 47 55½	ſine -	9.1325553
	Co-ar. s. 38° 28′		0.2061683
	Co-ar. s. 66 32 9″		0.0374842
		2)	19.1440452
	Sine 21° 55′ 5″ =		9.5720226
	2		

43 50 10 = the angle from noon, which converted to time is $2^h\ 55^m\ 20^s$ of apparent time from noon; to which add the equation at the time, which is $1^m\ 25^s.6$, and the ſum $2^h\ 56^m\ 45^s.6$ will be the mean time from noon, which may be either before or after it.

PROBLEM XV.

To find the apparent time at a given place, on any night, by an obſerved altitude of a ſtar.

Rule, (according to the Requiſite Tables.) Subtract the dip of the horizon and the refraction from the obſerved altitude of the ſtar, and let its right aſcenſion and declination for the given year be taken out of the tables; compute its meridian altitude, from the natural ſine of which take the natural ſine of its corrected altitude, and find the logarithm of the remainder. To this logarithm add the logarithmic ſecant of

the

the latitude of the ſhip or place, and the logarithmic ſecant of the ſtar's declination; their ſum, rejecting 20 from the index, muſt be ſought for in Table XVI. under *log. riſing*, and the time correſponding to it will be the diſtance of the ſtar from the meridian; which being added to the ſtar's right aſcenſion in time, if the ſtar was weſt of the meridian at the time of obſervation, or ſubtracted from it, if the ſtar was then eaſt of the meridian, will give the right aſcenſion of the mid-heaven. Find the ſun's right aſcenſion in time by Prob. V. for noon at the given place, and ſubtract it from the right aſcenſion of the mid-heaven; the remainder is the eſtimate time.

Enter Table XXIII. again, as in Prob. V. with the eſtimate time and daily variation of the ſun's right aſcenſion, and ſubtract the minutes and ſeconds, thus found, from the eſtimate time; the remainder is the apparent time when the altitude of the ſtar was obſerved.

Example. April 14th, 1780, latitude 48° 56′, N. longitude 66°, W. the obſerved altitude of Aldebaran, weſt of the meridian, was 22° 24½′; the height of the obſerver's eye, above the ſurface of the ſea, 21 feet; what was the apparent time when that obſervation was made?

Sun's A.R. for n. at Greenw.	1 31^{m} 1	Refract. Tab. I.	2^{m} 18^{s}
Long. 66°, W. Tab. XXIII. giv. -	+ 41	Dip, Table II.	4 22
☉'s A.R. at n. given place	1 31 42	Correction	6 40
		Obſ. alt. ſtar	22° 24 30
Star's dec. Tab. VII. -	16 3 N.		
Co-latitude	41 4 N.	True alt. ſtar	22 17 50

Star's merid. alt.	57 7	Nat. ſine	83978
True alt. ſtar	22 18	Nat. ſine	37946
Difference of the nat. ſines	46032	log.	4.66306
Latitude of the ſhip	48° 56′ 0″	log. ſecant	10.18248
Star's declination	16 3 0	log. ſecant	10.01727
Star weſt of the meridian	4^{h} 57 8	log. riſing	4.86281
Star's right aſ. Tab. VII.	4 23 20		
Right aſcen. mid heaven	9 20 28		
Sun's right aſcen. at noon	1 31 42		
Eſtimate time -	7 48 46		
Num. from Tab. XXIII. ſubt. - -	0 1 12		
Apparent time -	7 47 34		

Second Method.

Rule, (by A. Mackay, LL.D. F.R.S. Edin. &c.) Correct the obſerved altitude of the ſtar, and let its declination and right aſcenſion be reduced to the time of obſervation.

With the latitude of the place, the true altitude, and apparent declination of the ſtar, compute its horary diſtance from the meridian, by any of the methods given in the laſt problem; which being added to or ſubtracted from its right aſcenſion, according as it was obſerved in the weſtern or eaſtern hemiſphere; the ſum or remainder will be the right aſcenſion of the meridian.

From the right aſcenſion of the meridian, increaſed by 24 hours if neceſſary, ſubtract the ſun's right aſcenſion, as given in the Nautical Almanac for the noon of the propoſed day; the remainder will be the *approximate time* of obſervation; from which ſubtract the equation anſwering thereto, and the ſun's right aſcenſion, from Table XVIII. and let the equation from the ſame table, correſponding to the longitude, be added or ſubtracted, accordingly as the ſhip is to the eaſt or weſt of Greenwich, and the reſult will be the apparent time of obſervation. Hence the error of the watch will be known.

Example. December 13, 1804, in latitude 37° 46′ N. longitude 21° 15′ E. a certain phenomenon was obſerved, and at the ſame inſtant the altitude of Arcturus, eaſt of the meridian, was obſerved to be 34° 6′.4; the height of the eye 10 feet. Required the apparent time of obſervation?

Obſ. alt. of Arcturus =	34° 6′.4		
Dip - -	— 3 .0		
Refraction -	— 1 .4		
True alt. of Arcturus =	34 2 .0		
Polar diſtance -	69 47 .8	co-ſecant,	0.02758
Latitude - -	37 46 .0	ſecant	0.10209
Sum -	141 35 .8		
Half -	70 47 .9	co-ſine -	9.51706
Remainder -	36 45 .9	ſine -	9.77709
			19.42382
Arch - -	31 0 .3 8		
Arcturus E. of mer. =	4^{h} 8^{m} 2^{s}		
Arcturus right aſcen. =	14 6 46		
Right aſc. of mer. =	9 58 44		
Sun's right aſcenſion	17 22 24		
Approximate time	16 36 20		
Eq. to long. Tab. XVIII.	+ 16		
Eq. to approx. time	— 3 2		
App. time of obſ.	16 33 34		

In order to attain the greateſt accuracy from obſervations of this kind, ſeveral ſtars ſhould be obſerved, and the error of the watch deduced from each ſtar ſeparately. If an equal number of ſtars be obſerved on each ſide of the meridian, and nearly equidiſtant therefrom, thoſe errors which ariſe from the inſtrument, the ſpheroidal figure of the earth, &c. will by this means be rendered almoſt inſenſible. If the ſhip is under way, during the interval between the obſervations of the different ſtars, and if that interval is conſiderable, it will be neceſſary to reduce the error to the ſame meridian, by allowing for the difference of longitude made good between the obſervations, as in Prob. XII.

Third Method.

Rule, (from Mr. Mendoza's Tables.) Find the right aſcenſion and declination of the ſtar for the given time by the catalogue.

Reduce the obſerved altitude to the true.

With the ſtar's declination and true altitude, and the ſhip's latitude, compute the ſtar's horary angle (or diſtance from the meridian,) when the altitude was obſerved to the weſt, take the ſum of the horary angle and the ſtar's right aſcenſion; when it was obſerved to the eaſt, ſubtract the horary angle from the right aſcenſion, increaſing this by 24^h, if neceſſary; the ſum (deducting 24^h if greater than this quantity) or remainder, will be the right aſcenſion of mid-heaven.

Take out of the Nautical Almanac, the right aſcenſion for noon of the given day; and its variation during the 24 hours which comprehend the time of obſervation.

If the apparent time at Greenwich, at the moment of the obſervation is accurately known, find the ſun's right aſcenſion for that moment; and ſubtract it from the right aſcenſion of mid-heaven (increaſed by 24^h, if neceſſary) and the remainder will be the apparent time at the ſhip required.

If the apparent time at the ſhip is not well known, it will be neceſſary to proceed according to the following rules:

Subtract the ſun's right aſcenſion for noon, from the right aſcenſion of mid-heaven (increaſed by 24 hours if neceſſary); and the remainder will be the approximated apparent time at the ſhip.

With the difference of longitude, find the correſponding time at Greenwich; and take the interval between it and the noon before. Find the proportional part of the variation of the right aſcenſion to this interval; and add it to, or ſubtract it from the approximated time at the ſhip, accordingly as the correſponding time at Greenwich is before or after the ſaid noon; the ſum, or difference will be the time required.

Example. March 1, 1792, at $9^h\ 32^m\ 9^s$, time eſtimated by means of the watch, latitude 28° 7′ north, and longitude 36° 6′ weſt, the altitude of Aldebaran was obſerved (to the weſt) to be 32° 11′ 45″, the obſerver's eye being 16 feet above the ſurface of the ſea: What is the apparent time at the ſhip when the obſervation was made?

The right aſcenſion of Aldebaran for March 1, is (by Table XXV.)			$4^h\ 24^m\ 0^s,6$
The declination of the ſame - -			16° 4′ 40″ N.
The true altitude will be found to be -			32 6 18
*'s Polar diſt.	73° 55′ 20″	L. co-ſec. 0.01733	
Ship's lat.	28 7 0	L. ſec. 0.05454	
Altitude	32 6 18		
Sum -	134 8 38		
Half-ſum	67 4 9	L. co-ſine 9.59061	
Half-ſum alt.	34 58 1	L. ſine 9.75823	
*'s horary ang. W.		L. verſ. (ſum) 9.42071	4 7 4
*'s right aſcenſion - - -			4 24 0.6
Right aſcenſion of mid heaven - (ſum)			8 31 4.6
⊙'s right aſcen. March 1, at noon, at Greenw.			22 52 25.0
(Variation of R. A. in 24^h following $3^m\ 43^s.8$)			
Approximated app. time at the ſhip (diff.)			9 38 39.6
Longitude W. 36° 6′ = - - -			2 24 24
Approximated apparent time at Greenwich			12 3 3.6
Propor^l. part of $3^m\ 44^s$ to $12^h\ 3^m$ — $1^m\ 52^s\ 28^t$ - - .			= —0 1 52.5
Approximated apparent time at the ſhip			9 38 39.6
Apparent time at the ſhip required -			9 36 47.1

PROBLEM XVI.

To find the longitude at ſea by a chronometer.

Rule, (by W. Wales. F.R.S., &c.) Obſerve the altitude of the ſun's limb, either in the morning or evening, when it is, at leaſt, three points of the compaſs from the meridian, and note the time when it was obſerved by the time-keeper.

Multiply the daily rate of the watch by the number of days which have elapſed ſince that on which the laſt obſervation was made for finding it, and add the product to the time ſhewn by the watch when the ſun's altitude was obſerved, if the watch be loſing, but ſubtract it from that time if the watch be gaining. To the ſum, or remainder, add what the watch was too ſlow, or ſubtract from it what the watch was too faſt for mean time at the place where its rate was found, on the day when the laſt obſervation was made for finding it, and the reſult will be the mean time at the place when the ſun's altitude was obſerved. To this time add the longitude of the place in time, where the rate of the watch was found, if it be weſt; or ſubtract the longitude in time from it, if it be eaſt, and the ſum or remainder will be the mean time at Greenwich.

To this time find the ſun's declination by Problem III. and correct the obſerved altitude of the ſun's limb for the dip of the horizon, refraction, parallax, and ſemi-diameter, with which, the latitude of the ſhip, and the ſun's declination, find the mean time at the ſhip, (by Problem XIV.)

Take the difference between the mean time at the ſhip, and the mean time at Greenwich, and it will be the longitude of the ſhip in time; eaſt, if the time at the ſhip be greater than the time at Greenwich, but weſt if it be leſs.

Example 1. After having found the rate of a chronometer to be gaining $1^s.67$, (as in Example 1 of Prob. VII.) and that it was too faſt for mean time at Barbadoes, on the 31ſt of December, 1793, by $4^h\ 1^m\ 49^s.7$, let us ſuppoſe that on the 4th of February, 1794, in the afternoon, latitude 44° 26′ N. the following obſervations were taken: what was the longitude of the ſhip; the height of the obſerver's eye above the ſurface of the ſea being 21 feet?

Times by the watch	Alt. of the ⊙'s L.L.		
		Chr. too faſt, Dec. 31, 1793,	$4^h\ 1^m\ 49^s.7$
		Gain to Feb. 4, 1794, = $1^s.67 \times 35^d$ -	+ 58.5
		Time-keep. too faſt, Feb. 4,	4 2 48.2
$5^h\ 2^m\ 51^s$	9° 17′ 15″		
3 44	9 8 45	Sun's ſemi-diameter -	16′ 16″
4 40	8 59 30	Sun's horizontal parallax -	9
5 49	8 50 00		
			16 25
4)17 4	36 15 30	Dip of the horizon 4′ 22″ Refraction - 5 48	10 10
5 4 16	9 3 52		
4 2 48	+ 6 15	Correction of the ſun's alt.	6 15
1 1 28	9 10 7	True altitude	
3 58 45	-	Longitude of Barbadoes, W.	
5 0 13	-	Mean time at Greenwich	

Sun's declination for noon at Greenwich	16° 3′ 24″ S.
Correction for time at Greenwich -	— 3 31
Sun's correct declination - -	15 59 53 S.

	90° 00′		
Ship's latitude	44 26	N. ſecant -	10.14626
Co-latitude	45 34		
Sun's declin.	16 00	S. ſecant -	10.01715

Merid.

Merid. altitude	29 34 N.S. 49344	33413 log. 4.52393
Sun's obſ. alt.	9 10 N.S. 15931	
Apparent time at the ſhip	$3^h\ 56^m\ 29^s$	Log riſing 4.68734
Equation of time, add	14 26	
Mean time at the ſhip	4 10 55	
Mean time at Green.	5 0 13	
Longitude in time	0 49 18 = 12° 19'½ W.	

Example 2. March 29th, 1794, latitude 55° 9½' N. the following obſervations were made to determine the longitude by the ſame chronometer :

Time by the Watch.	Alt. of the ⊙'s L.L.		
		Chr. too faſt Dec. 31, 1793,	$4^h 1^m 49^s.7$
		Gain to Mar. 29, 1794, = $1^s.67 \times 88\frac{1}{2}^d$	+ 2 27.8
$18^h\ 8^m 30^s$	11°27'15"	Chr. too faſt March 29,	4 4 17.5
9 28	34 45		
10 26	42 00	Sun's ſemi-diameter -	16' 3"
11 27	49 30	Sun's parallax in altitude	9
12 32	58 00		
5)52 23	5)211 30	Dip of the horizon 4' 22" Refraction - 4 31	8 53
18 10 28.6	11 42 18		
4 4 17.5	+ 7 19	Correction of the ſun's alt.	7 19
14 6 11	11 49 37	True altitude.	
3 58 45	-	Longitude of Barbadoes, W.	
18 4 56	-	Mean time at Greenwich.	

Sun's declination for noon at Greenwich		3° 58' 00" N.
Correction for time at Greenwich -		− 5 49
Sun's correct declination - -		3 52 11 N.
	90° 00'	
Ship's lat.	55 9½ N. ſecant	10.24313
Co lat.	34 50½	
Sun's declin.	3 52⅙ N. ſecant	10.00099
Merid. alt.	38 42⅔ Nat. S. 62539	42043 log. 4.62369
Sun's obſ. alt.	11 49⅝ Nat. S. 20496	
	$4^h\ 59^m\ 9^s$	Log riſing 4.86781
	24	
Appar. time at the ſhip	19 0 51	
Equation of time	+ 4 32	
Mean time at the ſhip	19 5 23	
Mean time at Greenw.	18 4 56	
Longitude in time	1 0 27 = 15° 6'¾ eaſt.	

SAME PROBLEM.

Rule, (by A. Mackay, LL.D. F.R.S. Edin. &c.) ' Let ſeveral altitudes of the ſun, or of any fixed ſtars to be obſerved ; and correct the mean altitude as uſual ; with which, the ſhip's latitude, and heavenly object's declination, compute the apparent time of obſervation, to which apply the equation of time, reduced to the time and place of obſervation, according to its title in the Nautical Almanac, and hence the mean time of obſervation will be known. To the mean of the times of obſervation, as ſhewn by the chronometer, apply its error and accumulated rate. Hence, the mean time, under the meridian of the place where the error and rate were eſtabliſhed, will be known : to which apply the difference of longitude in time between the given place and Greenwich, and the mean time of obſervation under the meridian of Greenwich will be obtained. Now, the difference between the time at the place of obſervation and that of Greenwich will be the longitude of the place in time ; and which is eaſt or weſt, accordingly as the time by obſervation is later or earlier than the Greenwich time.

Example 3. February 3, 1804, being in latitude 15° 48' N. the mean of ſeveral altitudes of Spica Virginis, eaſt of the meridian was 53° 24', and that of the correſponding times, $15^h\ 18^m\ 22^s$ per chronometer, which had been ſet to mean ſolar time at Rio Janeiro, December 5th, 1803, and was then gaining 23ˢ.8 daily, on mean time. The height of the eye was 16 feet. Required the longitude of the ſhip?

Daily rate - - - -			53ˢ.8
No. of Days between Dec. 5, 1803, & Feb. 3, 1804,			60
Gain in 60 days - - -		53^m	48ˢ
Now, $15^h\ 18^m - 54^m = 14^h\ 24^m$, in which time it gains			32
Accumulated rate - - -		54	20
Time per watch of obſervation -	15^h	18	22
Mean time of obſervation at Rio Janeiro	14	24	2
Longitude of Rio Janeiro in time	2	50	55 W.
Mean time at Greenwich - -	17	14	57
Equation of time - -	—	14	12
Apparent time at Greenwich -	17	0	45.

Mean of ob. alt. = 53°24'.0		Sun's R.A. at noon	$21^h\ 4^m\ 3^s$
Dip and refraction —	4.5	Equa. tab. XVIII. of Dr. Mackay	+ 2 53
Alt. corrected	53 19.5	Reduced R. aſcen.	21 6 56

To lat. 15° 48' N. and reduced declin. 10° 8' S. the number from

Dr. Mackay's Table XXVII. =	4.0236	Dr. Mackay's Ta. XXVIII.	=0506
Alt. 53° 19½ ſine	9.9042		
	3.9278	Natural number	8468
		Dr. Mackay's Tab. XXIX.	8974

Mer. diſt. Spica Virg.	$1^h 44^m 43^s$
Right aſc. Spica Virg.	13 14 53
Right aſcen. merid.	11 30 10
Sun's right aſcenſion	21 6 56
Apparent time	14 23 14
App. ti. at Greenw.	17 0 45
Longitude in time	2 37 31 = 39° 29¾' W.

Example 4. Auguſt 16, 1804, in latitude 38° 19' S. the mean of ſeveral altitudes of Antares, weſt of the meridian, was 14° 28'.9, the height of the eye being 12 feet, and the mean of the times per watch $11^h\ 41^m\ 38^s$ P. M. which had been compared with mean time at the Cape of Good Hope, June 22d, and was found to be $1^h\ 10^m\ 28^s$ ſlow, and gained 3ˢ.54 daily ; required the ſhip's longitude ?

Daily gain - - -	$3^s.54$		
Number of days between 22d June and 16th Auguſt	55		
Gain in 55 days - - -	$3^m\ 14^s.7$		
The Green. time of obſ. is about $11^h 35^m$, and cor. gain	1 .7		
Accumulated rate - -	3 16		
Error, 22d June - -	1^h 10 28		
Watch ſlow at time of obſervation -	1 7 12		
Time per watch of obſervation -	11 41 38		
Mean time of obſ. at Cape of Good Hope	12 48 50		
Longitude of Cape of Good Hope -	1 13 33E.		
Mean time at Greenwich - -	11 35 17		
Equation of time - -	— 3 52		
Apparent time at Greenwich - -	11 31 25		
Obſ. alt. of Antares = 14° 28′.9		Sun's R. A. at noon	9 42 40
Dip and refraction — 6 .9		Equa. Tab. XVIII.	+ 1 44
Corrected altitude	14 22	Red. right aſcen.	9 44 24
Polar diſtance	64 1	Co-ſecant -	0.04628
Latitude -	38 19	Secant -	0.10535
Sum -	116 42		
Half - -	58 21	Co-ſine -	9.71993
Difference -	43 59	Sine -	9.84164
			19.71320
Arch - -	45 57$\frac{1}{4}$ 8	Sine -	9.85660
Mer. diſt. of Ant.	$6^h\ 7^m\ 38^s$		
R. A. of Antares	16 17 27		
R. A. meridian	22 25 5		
Sun's right aſcen.	9 44 24		
Apparent time	12 40 41		
Ap. time at Green.	11 31 25		
Long. in time	1 9 16 = 17° 19′ E.		

In practice, it will be found very convenient to have a table conſtructed, ſhewing the error of the chronometer at the noon of every day for ſeveral weeks, or during the eſtimated time of the run to a place where its error and rate can be again ſettled. To this table a column ſhould be added, containing its hourly rate continued up to 24 hours.

Thus, ſuppoſing the daily rate of a chronometer, deduced from a ſeries of obſervations, was — $4^s.72$, and its error for mean time, May 9, 1820, at noon was $3^m\ 58^s.6$ ſlow; then we ſhall have the ſubjoined table; viz.

Error of Chronometer at Mean Noon.	Hourly Rate.
♂ May 9 Error = $3^m\ 58^s.6$	1 hour = $0^s.2$
☿ — 10 — = 4 3 .3	2 — = 0 .4
♃ — 11 — = 4 8 .0	3 — = 0 .6
♀ — 12 — = 4 12 .8	4 — = 0 .8
♄ — 13 — = 4 17 .5	5 — = 1 .0
☉ — 14 — = 4 22 .2	6 — = 1 .2
☽ — 15 — = 4 26 .9	7 — = 1 .4
♂ — 16 — = 4 31 .6	8 — = 1 .6
☿ — 17 — = 4 36 .4	9 — = 1 .8
♃ — 18 — = 4 41 .1	10 — = 2 .0
♀ — 19 — = 4 45 .8	11 — = 2 .2
♄ — 20 — = 4 50 .5	12 — = 2 .4

In the laſt three problem, and indeed in all calculations, where the time is aſcertained from an obſervation of the ſun's, or of a ſtar's altitude taken at a diſtance from the meridian, the accuracy of the reſult will entirely depend on the accuracy of the obſervation which furniſhed the data; it is, therefore, of the utmoſt importance, that the heavenly body ſhould be in a ſituation, or azimuth line, in which its change of altitude is the greateſt poſſible in a given time; this preciſe ſituation in the diurnal or nocturnal arc of any body, depends partly on the latitude of the place of obſervation, and partly on the object's declination; but, in all the heavenly objects, the ſituation alluded to, is when they are in the prime vertical; i. e. when they are either due eaſt or due weſt of the obſerver; therefore, the nearer the obſerved object is to the prime vertical, provided it be not too near the horizon, ſo as to be too much affected by refraction, the more likely will the determined time be to be accurate. Dr. Mackay, in Table XXV. of his "Theory and Practice of finding the Longitude," p. 56, vol. ii., has given us "the altitude to be obſerved, in order to aſcertain the apparent time with the greateſt accuracy," which table is very convenient for determining very nearly when any heavenly object is due eaſt or weſt: his arguments are, at the top "Declination of the ſun or ſtar," and at the ſide "Latitude:"—and ſince him, Joſeph de Mendoza Rios, Eſq. has given not only the requiſite altitudes, but alſo the correſponding diſtances from noon in time in a parallel column, with the ſame arguments and mode of arrangement, in Table XXVIII. of his valuable and very cheap volume. This volume contains a complete collection of tables for navigation and nautical aſtronomy, that no navigator ſhould be without. Indeed the commiſſioners of the Board of Longitude, and the court of directors of the Eaſt India company, with a liberality characteriſtic of the Engliſh nation, have enabled the author (who as liberally gives up his right to the benefits of his labours) to give, for we can hardly ſay ſell, to the world the work in queſtion for one third of its real value, as an encouragement to nautical ſcience.

In the ſixteen problems, which we have here exemplified, we have confined ourſelves to obſervations of the ſun and ſtars, though we might have extended our examples to the moon and planets alſo, if we had deemed it neceſſary; but the reſults derived from obſervations of theſe bodies, moving as they do in eccentric orbits, would have been leſs certain, as well as the calculations more complex, than thoſe we have given, which are our reaſons for having omitted them.

CHRONOMETER. A generical term for an inſtrument to meaſure time in *Muſic*. Accordingly a clock, a watch, or a ſun-dial, is a *Chronometer*. See the preceding article. There are, however, chronometers conſtructed purpoſely to regulate the bars and meaſures of muſic; one in particular invented by M. Sauveur, deſcribed in his "Principles of Acouſtics." It was a pendulum of a particular kind, which he excluſively applied to aſcertain the time in the performance of muſical compoſitions. L'Affilard, in his "Principles dedicated to Religious Ladies," placed at the head of all his airs, figures which expreſſed the number of vibrations of the pendulum, during the performance of each bar.

Rouſſeau ſaid in his dictionary, 34 years ago, that it was then 30 years ſince a ſimilar inſtrument appeared under the title of chronometer, which beat the time itſelf; but neither the one nor the other has ſucceeded. Many, however, continues Rouſſeau, have pretended that it is very much to be wiſhed that ſuch an inſtrument was completed in order to fix with preciſion the time of each bar in a piece of muſic;

as, by that means, the true original meaſure of each compoſition would be recorded, without which expedient, it loſes its character; and after the death of the author, it is only by a kind of tradition, very likely to vary and be loſt, that the time is known. Old people already complain that the time of many airs is loſt; and it is believed that they are performed too ſlow. This may have come on by degrees, from the characters in preſent uſe, which look much quicker than thoſe of a hundred, or indeed of fifty years ago, when demi-ſemiquavers were ſeldom uſed, and where there are now only minims, there uſed to be ſemi-breves, as in *alla breve* time. We are certain from our own memory, that the time of Handel's muſic is often miſtaken, and performed ſometimes quicker and ſometimes ſlower than under his own direction.

The Encyclopediſts of the preſent time diſpute Rouſſeau's opinions about ſuch an inſtrument to regulate the meaſure of each bar throughout a piece, which would be too mechanical, and trench on the authority of the leader. It has long been obſerved that muſic on a barrel is ſtiff, and without that flexibility, feeling, and expreſſion, that are given to it by the human hand or voice, though the accuracy of clock-work is proverbial. But though we are equally diſturbed by the abuſe and bungling uſe of *rallentando;* yet there is a retardation as well as acceleration of time, which is almoſt imperceptible, in the execution of particular paſſages of *pathos* and of *ſpirit* by a great muſician, which ſenſibility alone can produce or underſtand.

If a chronometer were to beat the time aloud, it would carry us back to muſical infancy; or if the pendulum were to be watched in its oſcillations, it would take the performer's eye from the book, and too much divide his attention. We can therefore only recommend with ſincerity, the conſtruction of a ſmall machine, which might be an appendage to a piano-forte, to aſcertain by the vibration of a pendulum the original time in which every movement of a compoſition was conceived, as indicated by numerical ſigns at the beginning of each ſtrain, by the compoſer himſelf.

CHRONOSCOPE, formed of χρονος, *time,* and σκεπτομαι, *I conſider*, a word ſometimes uſed for a pendulum, or machine to meaſure time. See PENDULUM and CHRONOMETER.

CHRONUS, or CHRONOS, in *Ancient Geography*, a river placed by Ptolemy in European Sarmatia.

CHROSTASIMA, in *Natural Hiſtory*, a name uſed by Dr. Hill for all pellucid gems, which have one ſimple and permanent appearance in all lights.

Of this kind are the diamond, the carbuncle, the amethyſt, the ſapphire, the beryl, the emerald, and the topaz.

CHROUET, WARNER, in *Biography*, a phyſician of eminence, in Brabant in Flanders, flouriſhed towards the end of the 17th and beginning of the 18th centuries. The work by which he principally diſtinguiſhed himſelf is his diſſertation "De trium Oculi Humorum, aliarumque ejus Partium Origine, et Formatione explicata, Leodii, 1688, 8vo." He ſhews that the veſſels which Nuck ſuppoſed he had diſcovered, and which he called ducts, for conveying the aqueous humour, were branches of the carotid arteries. His experiments, Haller obſerves, were made on the eyes of brutes, but the human eye is found to be ſimilarly conſtructed. He ſpeaks but obſcurely of the *membrana pupillaris*, which he ſays is wanting in the dog. He deſcribes, very well, the cellular ſtructure of the vitreous humour, and gives chymical analyſes of the cryſtalline and other humours. The work was reprinted in 1691, with ſtrictures on the anſwer to it by Nuck. We have alſo by him, "La Connoiſſance des Eaux Minérales d'Aix-la-Chapelle, de Chaud Fontaine, et de Spa, par leurs véritables Principes," Leyde, 1714, 12mo. He ſhews himſelf, by the analyſes of theſe waters, to have been well ſkilled in practical chymiſtry. Haller, Eloy. Dict. Hiſt.

CHRUDIM, in *Geography*, a town of Bohemia, and capital of a circle of the ſame name, ſituated on a river called "Chrudimka;" which circle contains 33 towns. It is chiefly remarkable for a great number of fiſh-ponds, and an excellent breed of horſes; 100 miles S.E. of Dreſden, and 50 E. of Prague.

CHRUTUNGI, in *Ancient Geography*, the name of a people which formed a part of the Scythians.

CHRYSI, a town of Aſia Minor, in the Æolide. Pliny.—Alſo, the name of a ſmall iſland, near that of Crete, on the coaſt of the Peloponneſus. Pliny.—Alſo, a place in the Troade, called *Sminthium.*

CHRYSÆ-FANUM, a place of Sicily, near the road that paſſed from Aſſorus to Enna.

CHRYSALIS, in *Entomology*, a technical expreſſion among the writers on inſects during the laſt century that has the ſame meaning as the more obſolete word aurelia, and is intended to imply what the Linnæan phraſeology denominates the pupa, or middle ſtate in which all lepidopterous and moſt other inſects remain for ſome time between the larva or caterpillar form, and the period of their appearance as perfect inſects. The word chryſalis is employed by the beſt writers, with the exception of Linnæus. Like the term aurelia, it alludes however to the metallic or golden ſplendour of the caſe in which the creature is contained while in the pupa ſtate, and is conſequently applicable only to the pupæ of certain ſpecies of the papilio or butterfly tribe, which in this ſtate exhibits ſuch a ſplendid aſpect. The term pupa adopted by Linnæus is more generally expreſſive, as it implies that the inſect like an infant yet remains enveloped in its ſwaddling clothes. See AURELIA, ENTOMOLOGY, and PUPA.

CHRYSANTHEMOIDES, in *Botany*, *Oſteoſpermum*, Comm. Hort. See OSTEOSPERMUM-*Spinoſum*, Linn. *Spineſcens*, Willd.

CHRYSANTHEMOIDES-*Afrum*, Dill. Elth. See OSTEOSPERMUM *moniliferum*.

CHRYSANTHEMUM, (Χρυσανθεμον, Dioſcor.) from χρυσὸς, *gold*, and ανθος, *a flower.*) Linn. Gen. 966. Schreb. 1307. Juſſ. 183. Vent. 2. 546. Gært. 990. (Leucanthemum and chryſanthemum, Tourn.) Claſs and order, *ſyngeneſia polygamia ſuperflua.* Nat. ord. *Compoſitæ diſcoideæ*, Linn. *Corymbiferæ*, Juſſ.

Gen. Ch. *Calyx common*, hemiſpherical, imbricated; interior ſcales larger by degrees; innermoſt membranous. *Corol. compound*, radiated; florets of the ray female, ſtrap-ſhaped; of the diſc hermaphrodite, funnel-ſhaped, ſpreading, the length of the calyx. *Stam.* five, capillary very ſhort; anthers forming a hollow cylinder. *Piſt.* germ egg-ſhaped; ſtyle filiform, longer than the ſtamens; ſtigmas two, obtuſe, revolute. *Seed* one to each floret, oblong, not crowned with a marginal rim. *Recep.* naked, dotted, convex.

Eſſ. Ch. Receptacle naked. Seed without a marginal ring. Calyx hemiſpherical, imbricated; ſcales dilated at the margin, membranous.

* *Ray white.*

Leucanthema of Tournefort.

Sp. 1. C. *pinnatifidum*, Linn. jun. Sup. 377. Willd. 1. Ait. Kew. iii. 231. (*Matricaria pinnatifida*, Lam. Deſrouſſeaux in Encyc. 7.) "Stem ſhrubby; leaves ſmooth, attenuated at the baſe, pinnatifid; ſegments gaſhed." A ſhrub, two feet high. *Root* perennial. *Stem* ſhort, rather thick, woody, naked; branches numerous, cylindrical, with a thick foliage above, naked near the bottom, but marked with the ſcars of fallen leaves. *Leaves* about ſeven inches long, and three broad, thickly and irregularly ſet, oval-oblong, narrowing into a petiole at their baſe, green, ſmooth, and gloſſy on both ſides. *Flowers* in a looſe corymb, furniſhed at its diviſions with ſlender bractes, ſmaller than thoſe of C. *leucanthemum*. A native of the iſland of Madeira. Deſrouſſeaux mentions a variety, C. *lacerum* of ſome authors, which he thinks may be a diſtinct ſpecies. It is two or three feet high, and forms a leſs buſhy head than the preceding. Its leaves are leſs, more deeply pinnatifid, with the ſegments more deeply but leſs frequently gaſhed. *Flowers* on long petioles, leſs numerous on each branch. 2. C. *paludoſum*, Willd. 2. Deſf. Atl. tab. 238. Poiret. Itin. ii. 241. "Leaves all oblong-wedge-ſhaped, obtuſely ſerrated; ſtem diffuſely branched." *Root* annual. *Leaves* ſmooth, deeply ſerrated; upper ones only three-toothed at the tip. *Flowers* reſembling thoſe of C. *leucanthemum*, ſolitary, terminating the branches. A native of moiſt places in the kingdom of Tunis. 3. C. *atratum*, Linn. Sp. 5, excluding Var. *β*. Mart. 3. Willd. 3. (Bellis alpina major folio rigido, Bauh. Pin.) "Leaves all oblong-wedge-ſhaped, acutely ſerrated; ſtem ſimple, one-flowered, erect." Willd. *Root* perennial. *Root-leaves* lobed at the tip. *Calyx* with a black margin. Haller judges it not ſpecifically different from C. *leucanthemum*. 4. C. *heterophyllum*, Willd. "Leaves ſeſſile; lower ones linear-lanceolate, ſerrated; upper ones ſpatula-ſhaped." *Stem* aſcending, a foot high, erect, ſimple, one-flowered. *Flowers* reſembling thoſe of C. *leucanthemum*, from which, according to Willdenow, who deſcribed it from a dried ſpecimen, it differs in the ſhape of its leaves, and eſpecially in the extreme minuteneſs of its upper ones. A native of Piedmont. 5. C. *leucanthemum*, great white ox-eye, or ox-eye daiſy, Linn. Sp. Pl. 4. Mart. 5. Willd. 5. Eng. Bot. 601. (Matricaria, Lam.) "Leaves embracing the ſtem, lanceolate, ſerrated, gaſh-toothed at the baſe; ſtem erect, branched." Willd. "Leaves embracing the ſtem, oblong, obtuſe, gaſhed, pinnatifid at the baſe; root-ones inverſely egg-ſhaped, petioled." Dr. Smith. *Root* perennial, ſomewhat woody, fibrous. *Stems* two feet high, furrowed with red angles, ſomewhat hairy. *Leaves* deep green, gloſſy, ſmooth; upper ones alternate. *Flowers* ſhewy, large, ſolitary, terminal; calyx hemiſpherico-depreſſed, ſmooth; ſcales numerous, imbricated, ſcarous at the edges; inner ones dilated into a membrane at the tip; florets of the ray three times the length of the calyx, numerous, ſpreading, elliptic oblong, bitten at the tip, toothed. *Seeds* cylindrical, entirely deſtitute of a marginal rim, furrowed, black, with white ribs. *Receptacle* convex. A native of dry paſtures and meadows in moſt parts of Europe. It varies much in different ſituations; hence the diſcordance of authors with reſpect to its varieties and kindred ſpecies. 6. C. *montanum*, Linn. Sp. Pl. 6. Mart. 6. Willd. 6. (Matricaria montana, Lam. Leucanthemum montanum minus, Tourn. Bellis montana minor, Bauh. Hiſt.) "Lower leaves petioled, ſpatula-ſhaped, ſerrated; upper ones linear-lanceolate, ſerrated; ſtem generally one-flowered." *Root* perennial. Probably only a variety of the preceding. A native of the ſouth of France, Sileſia, and other parts of Europe. 7. C. *rotundifolium*, Willd. 7. Waldſt. and Kitaib. Pl. Rar. Hung. "Leaves petioled, ſerrated; lower ones roundiſh; upper ones egg-ſhaped; ſtem one-flowered." A native of the Carpathian mountains. 8. C. *ceratophylloides*, Willd. 8. Allion. Ped. 686. tab. 37. fig. 1. "Leaves pinnated; pinnæ linear, acute; ſtem erect, one-flowered." *Root* perennial. *Leaves* alternate, unequally pinnated; pinnæ quite entire. *Flowers* reſembling thoſe of C. *leucanthemum*, ſcales ſphacelated. A native of the mountains of Piedmont. 9. C. *graminifolium*, Linn. Sp. Plant. 7. Mart. 7. Willd. 9. Jacq. Obſ. 4. tab. 92. (Matricaria graminifolia, Lam. "Leucanthemum gramineo folio, Tourn. Inſt. 493. Bellis montana gramineis foliis, Mag. Monſp. 291. Hort. 31. tab. 31.) "Leaves linear, generally quite entire; ſtem quite ſimple." *Root* perennial. *Stems* from ſix to eight inches high, nearly erect, ſlender, ſtriated, ſmooth, deſtitute of leaves near the top. *Leaves* ſlightly villous; root-ones often a little toothed near the ſummit. *Flowers* terminal, rather large, ſolitary; ſcales of the calyx egg-ſhaped, elongated, ſcarious, and blackiſh at the edges. A native of mountains in the ſouth of France. 10. C. *tanacetifolium*, Willd. 11. (Matricaria tanacetifolia, Lam. Buphthalmum orientale tanaceti minoris folio, Tourn. Cor. 37.) "Leaves pinnated, hairy; pinnæ pectinate-ſerrated; calyx tomentous. *Root* perennial. *Stem* about two feet high, furrowed, pubeſcent, eſpecially toward the baſe. *Leaves* ſeſſile. *Flowers* ſmall; calyx white, with down. A native of the Levant. 11. C. *monſpelienſe*, Linn. Sp. Pl. 9. Mart. 8. Willd. 12. (Matricaria monſpelienſis, Lam. Leucanthemum montanum foliis chryſanthemi, Tourn. Inſt 492.) "Lower leaves palmated; leaflets linear, pinnatifid." *Root* perennial. *Stems* about a foot high, cylindrical, weak, nearly upright, ſuperficially ſtriated, branched, almoſt ſmooth. *Leaves* alternate, ſeſſile, green. *Flowers* large, ſolitary, terminal; florets of the ray white, or ſlightly tinged with purple; calyx-leaves elongated, divided by a green line, and ending in a dry brown membrane. A native of the ſouth of France. 12. C. *achilleæ*, Linn. Syſt. Nat. Mart. 11. Willd. 13. (C. italicum, Linn. Parthenium foliis tenuiſſimis, achilleæ cæſuris, Mich. gen. 34, tab. 29.) "Leaves twice pinnated; pinnæ oblong, ſerrated; flowers in corymbs." Willd. *Root* perennial. *Stem* erect, a foot high, ſomewhat angular, many-flowered. *Leaves* like thoſe of Millefoil, but eight times as large; beſprinkled with ſcarcely conſpicuous, prominent dots; with a few white hairs underneath, and ending in a white ſtiff point. A native of Italy. As the ſame ſynonym from Micheli is referred to by Linnæus under both C. achilleæ and C. italicum, and as no other ſynonym is quoted under either, it ſeems almoſt certain that he has, inadvertently, inſerted the ſame plant twice; and was, perhaps, leſs likely to detect the error, as, notwithſtanding the white ray of C. italicum, he was induced to place it among the chryſanthema, on account of the reſemblance of its foliage to ſome of the ſpecies of that diviſion. Deſrouſſeaux maintains, that C. achilleæ is nothing more than a variety of C. corymboſum, which is unqueſtionably a pyrethrum; but as its ſeeds are not deſcribed, we have left it for the preſent where Linnœus placed it. 13. C. *argenteum*, Willd. 14. (Matricaria argentea, Linn. Spec. Pl. Encyc. Meth. Mart. Chamœmelum orientale incanum, millefolii folio, Tourn. cor. 37.) "Leaves twice pinnated, hoary; pinnæ acute, generally quite entire; ſtem one-flowered, ſimple." Willd. *Root* perennial. *Stems* ſcarcely a foot high, erect, cylindrical, downy, often ſimple, almoſt deſtitute of leaves near the top, and ſurrounded at the baſe with dry ſcales, which are the remains of the petioles of the fallen leaves. *Leaves* alternate, oval-oblong, rather obtuſe; root ones petioled. *Flowers* rather large, terminal; florets of the diſk yellow, of the ray white, linear; ſcales of the calyx egg-ſhaped, acute, numerous, cloſely imbricated, blackiſh at the edges. A native of the Levant. The whole plant is ſweet-ſcented. 14. C. *tricolor*, Willd. 16. Bot. Mag. 508. Andrews Repoſ. tab. 109. C. carinatum, Schouſb. Pl. Moroc. tab. 6.) "Leaves twice pinnatifid;

tifid; pinnulæ linear, diſtant, recurved; ſtem erect, branched." *Root* annual. *Flowers* highly beautiful; florets of the diſk dark crimſon; of the ray, white with a yellow baſe; outer ſcales of the calyx keeled; inner ones flat, membranous. There is a variety with perfectly yellow flowers. 15. C. *indicum*, Linn. Sp. Pl. 12. Mart. 13. Willd. 17. Bot. Mag. 327. (Matricaria indica, Encyc. Meth. 23. M. ſinenſis, Pluk. Amel. tab. 430, fig. 2. Rumph. Amb. 5, tab. 91, fig. 1. Tſietti-gu, Rheed. Mal. 10, tab. 44.) "Leaves egg-ſhaped, attenuated at the baſe, three-lobed, toothed; ſtem branched." *Stem* ſomewhat woody, two or three feet high, upright, cylindrical, much branched. *Leaves* reſembling thoſe of mugwort, alternate, petioled, ſerrated, upper ſurface deep green, lower ſurface ſoft to the touch, and clothed with a ſlight down; lobes a little gaſhed and toothed; teeth unequal, peduncled, large, mucronate. *Flowers* large, ſolitary, terminating the branches; florets of the diſk yellow: of the ray whitiſh with a tinge of purple; ſcales of the calyx few, concave, rounded, terminated by a ſcarious ſilvery membrane. A native of China, where, and in other parts of the Eaſt, it has been long cultivated, and highly eſteemed for its beauty. A great number of varieties have, in conſequence, been produced, ſingle, ſemi-double, and double, ſometimes the ſize of the palm of the human hand, reddiſh, quite white, yellowiſh, fleſh-coloured, purple, and of every intermediate colour. Though this magnificent plant has been ſo long cultivated in the Eaſt, it does not appear to have found its way to Europe till 1795, when it flowered for the firſt time in Great Britain, in the collection of Mr. Colville, nurſery-man at Chelſea. It appears to be a hardy green-houſe plant, and as the moſt ſpecious varieties have been ſelected, it promiſes to be a laſting ornament to our conſervatories. The Chineſe employ it to decorate their houſes and tables on feſtive occaſions, and are ſaid to prefer thoſe pieces of porcelain on which it is painted. 16. C. *coccineum*, Willd. 10. (Buphthalmum tanaceti folio ampliore, flore magno coccineo, Tourn. Cor. 37.) "Leaves pinnated, ſmooth; pinnæ pinnatifid, acute; peduncle thickened." *Root* perennial. *Stem* furrowed, ſmooth. *Leaves* ſmooth; ſegments of the pinnæ linear, acute. *Flowers* with a large ſcarlet or purple ray; ſcales of the calyx ſomewhat ſphacelated. A native of Iberia.

** *Florets of the ray yellow.*
Chryſanthema, Tourn.

17. C. *pectinatum*, Linn. Sp. Pl. 17. Mart. 16. Willd. 18. (C. pallidum, Bar. Ic. 421. Matricaria pectinata, Encyc. Meth.) "Leaves pinnated, linear, parallel, acute, quite entire; peduncles ſolitary, one-flowered." *Root* perennial. *Stems* very ſhort, thickiſh, proſtrate, creeping. *Leaves* ſmall, pubeſcent. *Flower* on a longiſh peduncle, with an awl-ſhaped leaf or two at the baſe. A native of Spain and Italy. 18. C. *ſegetum*, yellow ox-eye; or corn marigold, Linn. Sp. Pl. 15. Mart. 17. Willd. 19. Curt. Flor. Lond. faſc. 6, tab. 60. Eng. Bot. 540. (Bellis lutea, foliis profunde inciſis, major, Bauh. Pin. 262.) "Leaves embracing the ſtem, glaucous, laciniated near the ſummit, toothed at the baſe." *Root* annual, ſpindle-ſhaped, ſmall. *Stem* one or two feet high, branched, angular. *Leaves* oblong, variouſly toothed or pinnatifid-laciniated, rarely entire. *Flowers* large, terminal; ſcales of the calyx with a broad membranous edge; florets of the ray inverſely heart-ſhaped, ſpreading. *Seeds* furrowed. A common weed in corn-fields, eſpecially on a gravelly ſoil, in various parts of Europe, flowering from June to Auguſt. 19. C. *umbroſum*, Willd. 22. "Leaves ſeſſile, oblong-lanceolate, attenuated at the baſe, pinnatifid, ſerrated; ſtem erect, branched at the baſe." *Stem* a foot high; branches one-flowered. *Leaves* about three inches long; upper ones linear-lanceolate. A native of mount Athos, deſcribed by Willdenow from a dried ſpecimen. 20. C. *coronarium*, garden chryſanthemum, Linn. Sp. Pl. 16. Mart 22. Willd. 23. Gært. tab. 168. (C. foliis matricariæ, Bauh. Pin. 134. C. creticum, Cluſ. Hiſt. 1. 334. Moriſ. Hiſt. 3. tab. 4. fig. 2, 3. Matricaria coronaria, Encyc. Meth.) "Leaves twice pinnatifid, acute, broader near the ſummit; ſtem branched." *Root* annual. *Stem* two feet high or more, herbaceous, cylindrical, ſtriated, ſmooth, erect; branches forming looſe tufts. *Leaves* alternate, embracing the ſtem. *Flowers* large, terminal, ſolitary; ſcales of the calyx imbricated, oblong, obtuſe, very ſcarious at the edges and ſummit. A native of Candia, Sicily, and Switzerland. There is a variety with double flowers, commonly cultivated as a hardy annual in the Engliſh gardens. 21. C. *floſculoſum*, Linn. Sp. Pl. 19. Mart. 23. (Matricaria rigida, excluding var. β. M. grandis. var. β Encyc. Meth. Balſamita ageratifolia β virgata. C. floſc. β Willd. Tanacetum chryſanthemoides, Gært. tab. 165. "Florets all uniform, hermaphrodite." Deſrouſſeaux (Encyc. Meth.) aſſerts that var. β. is a diſtinct ſpecies, and even ſuſpects that two ſpecies are confounded under the original C. floſculoſum. He thus diſtinguiſhes them: 1. Matricaria *rigida* (Chryſanthemum floſculoſum, Linn. excluding var. β. Bellis ſpinoſa, foliis aggerati, Bauh. Pin. 262. Alp. Exot. tab. 326. Moriſ. Hiſt. 3. tab. 9. fig. 16. Balſamita foliis aggerati, Vail. Act. 339. Tanacetum foliis integris rigidis, Hal. Helv.). "Stem ſhrubby; leaves obovate-wedge-ſhaped, toothed; teeth tranſverſe, rigid." *Root* perennial. *Stem* a foot and half high, ſhrubby, branched; branches cylindrical, ſtriated, nearly ſmooth, leafy almoſt to the ſummit. *Leaves* ſeſſile, a little embracing the ſtem, evergreen, egg-ſhaped, narrowed towards the top, edged with ſtiff, ſharpiſh teeth. *Flowers* ſix or ſeven lines in diameter, yellow, terminal; ſcales of the calyx numerous, imbricated, reflexed at the ſummit, ſcarious, and ſlightly torn, Lam. Encyc. *Seeds* crowned on the outer ſide with an erect, concave, toothed, rim. A native of Africa, and the iſle of Candia. 2. M. *virgata* (Cotula grandis, Jacq. Obſ. 4. p. 4. tab. 81. Chryſanthemum diſcoideum, Allion. Flor. Ped. tab. 11. fig. 1.) "Leaves ſerrated; lower ones ſpatula-ſhaped; upper ones linear-lanceolate; branches rod-like." *Root* annual. *Stems* about a foot and half high, herbaceous, ſlender, elongated, cylindrical, furrowed, almoſt deſtitute of leaves towards their ſummits; branches few, upright, one-flowered. *Leaves* ſcattered, tooth-ſerrated, ſmooth; lower ones narrowed into a petiole; upper ones ſeſſile, narrow. *Flowers* terminal; ſcales of the calyx numerous, imbricated in three or four ranks, lanceolate, ſcarcely ſcarious at the edges. A native of the county of Nice. 3. M. *grandis* (Cotula grandis, Linn. Sp. Pl. Chryſanthemum floſculoſum, β, Linn. Mant. 2. 473.). "Stem generally ſimple, thick, very lofty, hairy toward the bottom, with a large flower." *Root* biennial. *Stem* three or four feet high, ſtriated, villous, rough, with ſtrong hairs near the bottom. *Leaves* fleſhy, ſoft to the touch. *Flowers* near three inches in diameter, yellow, terminal, flat. A native of the coaſt of Barbary. All theſe ſuppoſed ſpecies are deſcribed from living ſpecimens. *Obſ.* The want of a ray inconteſtibly excludes them altogether from the Chryſanthemum and the Matricaria of Linnæus, but we have placed them here, partly that they may not be entirely omitted, the Balſamita of Deſfontaines and Willdenow not having been admitted into the ſyſtem, with a diſtinct generic character, when that part of our alphabet went to the preſs; partly becauſe we wiſhed to lay before our readers at one view the original deſcriptions of Deſrouſſeaux; but chiefly becauſe we are by no means ſatisfied with the manner in which theſe plants are diſpoſed of

by Willdenow. His Balſamita ageratifolia is doubtleſs the original Chryſanthemum floſculoſum of Linnæus, the Matricaria rigida of the Encyclopedie Methodique; and this appears to be the only one of the three which had fallen under his notice; but from the toothed rim of the germ it is certainly a Tanacetum, as Gærtner has made it, and not a Balſamita. The other two may poſſibly belong to Balſamita, ſhould that new genus finally prove a legitimate one. We have to lament that, with reſpect to this branch of the ſubject, we derive no information whatever from the labours of the French botaniſt.

*** *Dubious ſpecies.*

22. C. *japonicum*, Mart. 24. Willd. 24. Thunb. Jap. 321. "Leaves petioled, gaſhed at the tip, toothed." *Stem* ſimple, erect, ſtriated, villous. *Leaves* alternate, oblong, ſmooth, green above, pale underneath. A native of Japan. Though Thunberg's ſpecimen was without flower, he pronounces it of this genus; but it was ſurely a wild, rap-at-a-venture gueſs. 23. C. *incanum*, Willd. 25. Thunb. Prod. 161. "Stem ſhrubby; leaves trifid, tomentous." 24. C. *glabratum*, Willd. 26. Thunb. Prod. 161. "Stem herbaceous; leaves pinnated, ſmooth; pinnæ linear." 25. C. *hirtum*, Willd. 27. Thunb. Prod. 161. "Stem herbaceous; leaves twice pinnatifid, hairy; ſtem zig-zag." The laſt three are natives of the Cape of Good Hope. 26. C. *procumbens*, Mart. 27. Lour. Cochin. 499. (Matricaria ſinenſis, Pluk. Amalth. tab. 430. fig. 3.) "Leaves ſinuate-gaſhed, blunt; ſtem procumbent." *Root* perennial. *Stem* three feet high, frequently creeping, ſlender, much branched. *Leaves* egg-ſhaped, ſomewhat downy, petioled. *Flowers* ſmall; peduncles many flowered, terminal. A native of Cochinchina and China, where it is alſo cultivated in gardens, and has produced many varieties.

Obſ. La Marck, and Deſrouſſeaux, one of his ſucceſſors in the botanical department of Encyclopedie Methodique, have entirely diſcarded the genus Chryſanthemum, and interſperſed its ſpecies among thoſe of Matricaria; obſerving, not without much ſhew of reaſon, that the membranous termination of a calyx-ſcale is a circumſtance too minute and too equivocal to be admitted as an eſſential part of a generic character. We ourſelves, however, have for the preſent retained the Linnæan diviſions. It is rather ſurpriſing that theſe excellent naturaliſts ſhould have paid no attention to the preſence or abſence of a marginal rim at the top of the ſeed, a difference which has been received by Gærtner as a ſufficient generic diſtinction. The genus Pyrethrum, whoſe ſeeds have a marginal rim, has accordingly been adopted by Dr. Smith, with his uſual judgment, and has been avowedly taken up from him by Willdenow.

CHRYSANTHEMUM *corymbiferum, fruteſcens, inodorum, alpinum, atratum β, ſerotinum, arcticum, myconis, bipinnatum, balſamita*, Linn. See PYRETHRUM.

CHRYSANTHEMUM *Halleri*, Suter. Helv. —— *macrophyllum*, Waldſ. and Kitaib. —— *caucaſſicum*, —— *fuſcatum, multicaule, trifurcatum*, Deſf. —— *orientale*. See PYRETHRUM.

CHRYSANTHEMUM *maderaſpatanum, ſcabioſæ capitulis parvis*, Pluk. Alm. See SPILANTHES *pſeudo-acmella*.

CHRYSANTHEMUM *bidens Acmella dicta*, Rai. Supp. See SPILANTUS *acmella*.

CHRYSANTHEMUM *aquaticum foliis multifidis*, Herm. Engl. —— *cannabinum coridis indi fol.* Herm. Par. —— *cannabinum cicutariæ foliis*, Moriſ. Hiſt. See BIDENS *bipinnata*.

CHRYSANTHEMUM *conyzoides æthiopicum capitulo aphyllo*, Pluk. Mant. See PROTEA *leviſanus*.

CHRYSANTHEMUM *ericoides coronatum*, Breyn. Cent. Pluk. Mant. Moriſ. Hiſt. See STAAVIA.

CHRYSANTHEMUM *americanum fruteſcens balſaminæ foliis nigris*, Pluk. Alm. See KLEINIA *porophyllum*.

CHRYSANTHEMUM *bengalenſe anguſtifolium*, Pluk. Alm. See ÆTHULIA *divaricata*.

CHRYSANTHEMUM *conyzoides cernuum*, Mor. Hiſ. See CARPESIUM *cernuum*.

CHRYSANTHEMUM *alpinum incanum foliis laciniatis*, Bauh. Pin. See SENECIO *incanus*.

CHRYSANTHEMUM *alpinum, foliis abrotani multifidis*, Bauh. Pin. —— *alpinum* II. Cluſ. Hiſt. See SENECIO *abrotanifolius*.

CHRYSANTHEMUM *americanum perenne, caule alato*, Monſ. Hiſt. See HELENIUM *autumnale*.

CHRYSANTHEMUM *exoticum perpuſillum, foliis coronopi*, Pluk. Alm. See COTULA *anthemoides*.

CHRYSANTHEMUM *exoticum minus, chamæmeli nudi facie*, Breyn. Cent. See CONYZA *coronopifolia*.

CHRYSANTHEMUM *valentinum*, Cluſ. Hiſt. See ANACYCLUS *valentinus*.

CHRYSANTHEMUM *luſitanicum, agerati folio*, Tourn. Inſt. —— *parvum ſive bellis lutea*, Bauh. Hiſt. See ANTHEMIS *repanda*.

CHRYSANTHEMUM *foliis tanaceti*, Læſ. Pruſ. Barr. Ic. See ANTHEMIS *tinctoria*.

CHRYSANTHEMUM *africanum, leucoii foliis*, Breyn. Prod. See AMELLUS *lychnitis*.

CHRYSANTHEMUM *maderaſpatanum, menthæ arvenſis folio*, Pluk. Alm. See ECLIPTA *proſtrata*.

CHRYSANTHEMUM *cannabinum americanum alatum*, Sloan. Hiſt. —— *curaſſavicum*, Herm. Par. —— *americanum foliis baccharidis*. —— *americanum bidens*, Pluk. Alm. —— *conyzoides curaſſavicum*, Volk. Norib. See VERBESINA *alata*.

CHRYSANTHEMUM *paluſtre minimum repens*, Sloan. —— *humile ranunculi folio*, Plum. See VERBESINA *mutica*.

CHRYSANTHEMUM *conyzoides nodiflorum*, Sloan. See VERBESINA *nodiflora*.

CHRYSANTHEMUM *ex inſulis caribæis*, Pluk. Alm., Moriſ. Hiſt. —— *fruticoſum maritimum*, Sloan. Jam., Cateſb. Car. See BUPHTHALMUM *fruteſcens*.

CHRYSANTHEMUM *bermudiana*, Moriſ. Hiſt. Pluk. Alm. See BUPHTHALMUM *arboreſcens*.

CHRYSANTHEMUM *conyzoides luſitanicum*, Breyn. Cent. See BUPHTHALMUM *aquaticum*.

CHRYSANTHEMUM *perenne minus*, Moriſ. Hiſt. See BUPHTHALMUM *grandiflorum*.

CHRYSANTHEMUM *ſcropulariæ folio*, Pluk. Alm. Moriſ. Hiſt. See BUPHTHALMUM *helianthoides*.

CHRYSANTHEMUM *americanum majus perenne*, Moriſ. Hiſt. Pluk. Phyt. See HELIANTHUS *multiflorus*.

CHRYSANTHEMUM *latifolium braſilianum*, Bauh. Pin. See HELIANTHUS *tuberoſus*.

CHRYSANTHEMUM *canadenſe latifolium altiſſimum*, Moriſ. Blæſ. Bocc. Sic. —— *canadenſe ſtrumoſum*, Herm. Lugb. Moriſ. Hiſt. See HELIANTHUS *ſtrumoſus*.

CHRYSANTHEMUM *virginianum elatius anguſtifolium*, Mor. Hiſt. Pluk. Alm. See HELIANTHUS *giganteus*.

CHRYSANTHEMUM *virginianum altiſſimum*, Moriſ. Hiſt. See HELIANTHUS *altiſſimus*.

CHRYSANTHEMUM *virginianum repens*, Moriſ. Hiſt. See HELIANTHUS *divaricatus*.

CHRYSANTHEMUM *americanum perenne, foliis diviſis, majus*, Moriſ. Hiſt. See RUDBECKIA *laciniata*.

CHRYSANTHEMUM *americanum majus, foliis magis diviſis*, Moriſ. Hiſt. See RUDBECKIA *digitata*.

CHRYSANTHEMUM *cannabinum virginianum*, Pluk. Alm. —— *annuum majus virginianum, umbone nigricante*, Mor. Hiſt. See RUDBECKIA *triloba*.

CHRYSANTHEMUM *helenii folio*, Pluk. Alm. Moriſ. Hiſt. See RUDBECKIA *hirta*.

CHRYSANTHEMUM *americanum doronici folio*, Pluk. Alm. Cateſ. Car. See RUDBECKIA *purpurea*.

CHRYSANTHEMUM *americanum, ſcabioſæ tenuiſſime diviſis foliis ad intervalla confertis*, Pluk. Mant. See COREOPSIS *tenuifolia* (*verticillata*, Lam.)

CHRYSANTHEMUM *virginianum anagyridis folio*, Moriſ. Hiſt. See COREOPSIS *tripteris*.

CHRYSANTHEMUM *americanum, ciceris folio glabro*, Herm. Par. Pluk. Alm. See COREOPSIS *alba*.

CHRYSANTHEMUM *trifoliatum ſcandens*, Sloan. Jam. See COREOPSIS *reptans*.

CHRYSANTHEMUM *hirſutum virginianum, auriculato dulcamaræ folio*, Pluk. Alm. —— *virginianum trifoliatum humilius*, Moriſ. Hiſt. See COREOPSIS *auriculata*.

CHRYSANTHEMUM *canadenſe bidens, alato caule*, Moriſ. Blæſ. —— *virginianum, alato caule*, Moriſ. Hiſt. Pluk. Alm. See COREOPSIS *alternifolia*.

CHRYSANTHEMUM *americanum, caule alato, amplioribus foliis binatis*, Pluk. Alm. See BALTIMORA *recta*.

CHRYSANTHEMUM *virginianum, foliis aſperis tribus ſ. quaternis ad genicula ſitis*, Moriſ. Hiſt. See SILPHIUM *trifoliatum*.

CHRYSANTHEMUM *anguloſis platani foliis*, Pluk. Alm. —— *perenne virginianum majus*, Moriſ. Hiſt. See POLYMNIA *uvedalia*.

CHRYSANTHEMUM *virginianum villoſum, diſco luteo*, Pluk. Alm. See CHRYSOGONUM *virginianum*.

CHRYSANTHEMUM *æthiopicum*, Pluk. Alm. —— *foliorum pinnis breviſſimis dentatis*, Burm. Afric. See ARCTOTIS *dentata*.

CHRYSANTHEMUM *africanum fruteſcens ſpinoſum*, Volk. Nor. See OSTEOSPERMUM *ſpineſcens*.

CHRYSANTHEMUM *africanum fruteſcens telephii ſere foliis craſſis*; —— *arboreſcens æthiopicum foliis populi albæ*, Breyn. Cent. See OSTEOSPERMUM *moniliferum*.

CHRYSANTHEMUM *fruticoſum, polygali foliis africanum*, Pluk. Mant. See OSTEOSPERMUM *polygaloides*.

CHRYSANTHEMUM *africanum pumilum ramoſum, foliis tenuiſſimis*, Rai. Sup. See OTHONNA *tagetes*.

CHRYSANTHEMUM *africanum fruteſcens, telephii foliis craſſis*, Pluk. Alm. See OTHONNA *fruteſcens*.

CHRYSANTHEMUM, in *Gardening*, contains plants of the flowering herbaceous annual, perennial, and ſhrubby kinds, of which the ſpecies cultivated for ornamental purpoſes are chiefly the annual garden chryſanthemum, (C. *coronarium*); the late-flowering creeping chryſanthemum, (C. *ſerotinum*); the Montpelier chryſanthemum, or ox-eye, (C. *Monſpelienſe*); the corymbed chryſanthemum (C. *corymboſum*); the ſhrubby Canary chryſanthemum, or ox-eye, (C. *fruteſcens*); and the baſtard ſhrubby chryſanthemum, (C. *floſculoſum*). Of which the firſt has a furrowed, leafy, branching ſtem, three feet high, with ſmooth ſtem-claſping leaves; pinnas either pinnate or pinnatifid, the end one very large, bifid, with the pinnules ſharply gaſhed; the peduncles terminating, one-flowered; the flowers of different colours. It is a native of Sicily, &c.

The ſecond has a perennial creeping root; the ſtem ſtrong, branched, erect, ſomewhat villoſe, three or four feet high; the leaves are ſeſſile, ſmooth; on ſome plants with many acuminate ſerratures beyond the middle; on others very few towards the end only; others, again, quite entire; the flowers on the ends of the branches of a white colour, appearing in September.

The third is an elegant perennial plant, without ſcent, very ſmooth, and ſlightly villoſe, with erect branching ſtems, three or four feet in height; the lower leaves bipinnatifid; upper pinnatifid, one or two at top, quite entire; the flowers large, white, and radiated, like thoſe of the ſecond ſort.

The fourth is perennial, having an erect ſtem, from eighteen inches to two or three feet high or more; the leaves alternate; pinnas pinnate to the middle; the ſegments ſharply toothed; the ſtalks are terminated by corymbs of large white flowers. The whole plant is without ſmell or taſte, flowering in July and Auguſt, and a native of the ſouth of France, &c.

The fifth has a ſhrubby ſtem, near two feet high, dividing into many branches; the leaves are of a greyiſh colour, cut into many narrow ſegments; the flowers axillary, ſtanding upon naked peduncles ſingly, and greatly reſembling thoſe of common chamomile. There is a ſucceſſion of theſe for a great part of the year, for which it is chiefly eſteemed. It is found in the Canary iſlands.

The laſt is a procumbent ever-green under-ſhrub, two feet in height; the leaves obovate, gradually narrowing into the petiole, ſinuate, toothed, and ſtiffiſh; the flowers ſmall, terminating, ſolitary, and of a deep yellow colour. It is found at the Cape of Good Hope.

Of this there are varieties with ſingle and double flowers, both white and yellow; with fiſtular florets, which has the name of quill-leaved chryſanthemum.

Method of Culture. In the firſt, or annual kind, the culture may be effected either by ſeeds or cuttings, but the latter method is the more expeditious, and, of courſe, more commonly practiſed.

In the former of theſe modes, the ſeed ſhould be ſown in the early ſpring months, on a very moderate hot bed, or under hand-glaſſes, and continued ſo late as the latter end of April, in a ſunny ſituation in the open ground. It may be put in ſmall drills, or on the ſurface, the mould being previouſly made fine and even, and the ſeed ſown thin, and evenly covered in to the depth of nearly half an inch. When the plants are of ſufficient growth, as in May, or the following month, they may be planted out ſingly in the ſituations where they are to flower. A little water ſhould be occaſionally given, both while in the beds and when planted out, eſpecially when the weather is dry in the latter caſe. And, in order to have fine double ſorts, care ſhould be had to remove all the bad flowers from about them as ſoon as they can be aſcertained, leaving only one or two good ones in a place; and to have them fine in pots, they ſhould be removed into them as ſoon as they can be known, with large balls of earth about their roots, a little water being given at the time to prevent their growth being checked.

The latter method is conſtantly employed for continuing the double ſorts, ſo that they may blow early in the ſucceeding ſummer, in which the cuttings of the ſtrong ſide-ſhoots, about three inches long, which have not flowered, ſhould be planted in large pots near the tops, not too nearly together, in the early autumnal months, as the latter end of September, a little water being given at the time, the pots being removed into a frame or a green-houſe for protection during the winter, and air freely admitted in proper weather. About the beginning of April they ſhould be removed from the pots into the ſituations where they are to flower, being planted out ſingly. In this culture they flower much earlier than when raiſed from ſeed. But ſome ſhould always be raiſed from ſeed, in order to afford cuttings to increaſe the double ſorts from, and thereby avoid their degenerating. The ſeed made uſe of ſhould conſtantly be collected from the beſt and moſt full double-flowered plants.

The ſecond, third, and fourth ſpecies are capable of being increaſed by ſowing the ſeeds in March in beds of fine mould, in warm ſunny ſituations, or by dividing the roots and planting them out in the autumnal months, when the ſeaſon is open and rather moiſt. The plants in the former of theſe modes ſhould be tranſplanted into other beds in the latter end of ſummer, and ſet out to the diſtance of ten or twelve inches, in order to be removed in the autumn following into the places where they are to flower and remain.

The fifth and ſixth ſpecies are eaſily increaſed by planting cuttings of the young branches in pots filled with good rich earth any time during the ſpring or early ſummer months, proper ſhade and water being given. When the plants are well-rooted in the beginning of the autumn, they ſhould be removed, and planted in ſeparate pots, and during the winter placed under the protection of a deep garden-frame or green-houſe.

The plants of the firſt ſort are well ſuited for ornament in the beds or borders of pleaſure-grounds and other places, as they produce many flowers and continue late in the autumn; and though they are annual, when produced from ſeeds, the cuttings, as has been ſeen, when planted out in the autumn continue the winter, and flower earlier in the enſuing ſummer than the plants raiſed by ſeed.

The next three ſorts are proper for the borders of extenſive ornamented grounds, as they produce an agreeable variety a conſiderable length of time in autumn, and are of a large as well as hardy growth. And the two laſt are adapted for green-houſe collections, where they afford variety among other potted plants of ſimilar growth.

CHRYSANTHERINUS Lapis, in *Natural Hiſtory*, a name given by old writers to a ſtone famous for its imaginary virtues of preventing children from ſickneſſes during the time of dentition, by being worn round the neck by way of necklace; we have no farther account given us of it by authors, than that it was a very brittle ſtone, and not eaſily worked into form.

CHRYSAORIS, in *Ancient Geography*, a town of Caria, which afterwards aſſumed the name of Adrias, or rather Idrias.

CHRYSAORUS, a river of Aſia Minor, in Lydia.

CHRYSARGYRUM, a tribute formerly levied on courteſans, and perſons of ill fame.

Hoffman ſays, it was paid in gold and ſilver; whence its name, *χρυσος*, *gold*, and *αργυρος*, *ſilver*.

Zoſimus ſays, that Conſtantine firſt ſet it on foot; though there appear ſome traces of it in the life of Caligula by Suetonius; and that of Alexander by Lampridius. Evagrius ſays, Conſtantine found it eſtabliſhed, and had ſome thoughts of aboliſhing it. It was paid every four years: ſome ſay, all petty traders were liable to it. It was aboliſhed by Anaſtaſius.

M. Godeau thinks the chryſargyrum was a general tribute, levied every four years, on perſons of all conditions, rich and poor, ſlaves and freemen; nay, even on all animals, as low as dogs; for each whereof they paid ſix oboli.

CHRYSAS, in *Ancient Geography*, a ſtream of Sicily, which traverſed the country of the Aſſorins, according to Cicero.

CHRYSE, a promontory near the river Lanos, in the country of the Serres. Pliny.—Alſo, an iſland placed by Pliny near and on the other ſide of the river Indus.—Alſo, a town near Lemnos, conſecrated to Apollo. Steph. Byz. —Alſo, a town of Aſia Minor, in Caria.—Alſo, a promontory of the iſland of Lemnos, near Epheſtias, and oppoſite to the iſland of Tenedos. Steph. Byz.—Alſo, a town of Pontus, mentioned by Sophocles in his tragedy of Philoctetes.—Alſo, the name given by Ptolemy to the country, called *Aurea* CHERSONESUS.

CHRYSEI, a people of India, who inhabited the mountains, between the rivers Iomanes and Indus.

CHRYSIPPA, a town of Aſia Minor, in Cilicia. Steph. Byz.

CHRYSIPPUS, in *Biography*, celebrated as a philoſopher among the Stoics. He was a native of Solis, a town of Cilicia. He is reported to have ſpent his paternal fortune in the public ſervice, and then to have devoted himſelf to philoſophy. He fixed his reſidence at Athens, the great ſeat of learning and ſcience, and became a diſciple of Cleanthes, the ſucceſſor of Zeno. The ſcholar did not, however, follow implicitly the doctrines of his maſter, and the natural powers of his mind enabled him to diſtinguiſh himſelf above his contemporaries. Chryſippus poſſeſſed a large ſhare of penetration and acuteneſs; while, at the ſame time, he was ſo induſtrious, that he rarely ſuffered a day to elapſe without writing 500 lines. He had a great talent for diſputation, and diſcovered ſo much promptitude and confidence in his mode of arguing, as to be charged with a boldneſs approaching to audacity. He was accuſtomed to ſay, "Give me doctrines, and I will find arguments to ſupport them;" and ſo highly did he think of himſelf, and of his own talents, that when he was aſked by a friend to point out a proper perſon as preceptor to his ſon, he mentioned himſelf, "for," ſays he, "if I thought any philoſopher excelled me, I would myſelf become his pupil." He never paid any ſort of deference to perſons of mere rank, and refuſed to dedicate to great men or princes any of his works. The violence of his temper in vindicating his own opinions, created him many adverſaries, particularly among the Epicureans and followers of the ſect of Academics. His own friends could not always juſtify the courſe which he took, it being ſo much his practice to take oppoſite ſides of a queſtion, that he not unfrequently raiſed objections which he knew not how to anſwer, and thus furniſhed his antagoniſts with weapons againſt himſelf. Among his moſt able adverſaries was Carneades, who often availed himſelf of this circumſtance, and refuted Chryſippus by convicting him of inconſiſtency. Plutarch, in his piece "On Stoic Contradictions," has, it is believed, collected moſt of his examples from the writings of Chryſippus. His ſkill in ſophiſtry, and particularly the frequent uſe which he makes of the figure *ſorites* is noticed by Perſius, who calls it the heap of Chryſippus:

> "Inventus, Chryſippe, tui finitor acervi."

It is generally allowed that this philoſopher poſſeſſed great learning and ingenuity, ſo much ſo, as to rank the next to Zeno, yet, from the fragments of his works that have come down to us, it ſhould ſeem that his diſcourſes abounded more in curious ſubtleties, and nice diſtinctions, than in ſolid arguments and ſound reaſoning; and it was the prejudice of the party that dictated the encomium, "that if the gods themſelves were to hold diſputations, they would adopt the manner of Chryſippus." This philoſopher has been charged with maintaining doctrines ſubverſive of religion and the intereſts of morality; there ſeems, however, to have been little reaſon for ſuch an accuſation, ſince his mode of life was not only decent but philoſophically frugal and temperate. Plutarch affirms, concerning Chryſippus and his maſter Cleanthes, that when they had filled heaven, earth, the air, and the ſea, with divinities, they allowed none of them to be exempt from death, except Jupiter alone, into whom they imagined that all the other deities would at laſt be reſolved. Hence the Stoics have been charged with maintaining that the divine nature is mutable and corruptible, but the inference is not fairly drawn. According to the ſtoical ſyſtem, the inferior deities, which are portions of that divine fire by which all nature is animated, will, in the general conflagration of the univerſe, return to the ſource from which they were originally derived, till a general renovation take place. Cicero has borne his teſtimony to the true ſtoical faith of Chryſippus, "who," he ſays, "is eſteemed the moſt ingenious interpreter of ſtoic dreams, and has aſſembled a numerous band of unknown gods, indeed ſo perfectly unknown, that the human mind, though it be capable of forming conceptions of every kind, is unable to frame a conjecture concerning their nature. He ſays, that the divine energy is placed in reaſon, and in the ſoul or mind of the univerſe. The world itſelf he maintains to be God, or an univerſal effuſion of his ſpirit; and aſſerts, that the ſuperior part of this ſpirit, which conſiſts in mind and reaſon, is the common nature of things, containing the whole, and every part. Sometimes he ſpeaks of God as the power of fate, and the neceſſary chain of events; ſometimes he calls him fire; and ſometimes he deifies the fluid parts of nature, as water and air; and again, the earth, the ſun, the moon and ſtars, and the univerſe, in which theſe are comprehended, and even thoſe men who have obtained immortality." Such were the opinions of Chryſippus, and ſuch, it is well known, were the doctrines maintained by the moſt eminent of the ſtoic ſchool; it appears, therefore, very unjuſt to brand this philoſopher with any other kind of impiety than that which the ſect itſelf, of which he was a chief ſupporter, gloried in. Chryſippus, by his great induſtry, wrote ſeveral hundred volumes, of which three hundred are ſaid to have been on logical ſubjects, but in all his works, he borrowed freely from the writings of others. What remains of this voluminous author is to be found diſperſed in the more celebrated works of Cicero, Plutarch, Seneca, and Aulus Gellius. He died in the 143d olympiad, at the great age of 83. He was a freeman of Athens, and to his memory a ſtatue was erected by Ptolemy. Brucker by Enfield.

CHRYSIS, in *Botany*, Reneal Sp. See HELIANTHUS *annuus*.

CHRYSIS, in *Entomology*, a genus of the hymenopterous order of inſects, poſſeſſing the following character. Mouth horny, projecting; jaws advanced, elongated, horny, linear, with a ſingle tooth, tip membranaceous and acute; lip tongue-ſhaped, linear, and emarginate at the tip; no tongue. Palpi, or feelers, four, advanced, unequal, and filiform. Antennæ ſhort and filiform, conſiſting of twelve (ſometimes thirteen) joints, the firſt of which is longeſt, and uſually ſituated near the mouth. Body ſhining, gloſſy, and partaking of a golden ſplendour in general. Abdomen arched, and concave, ſometimes flattiſh beneath, with a ſcale on each ſide. Tail moſt commonly dentated; ſting ſomewhat exſerted. Wings flat.

The inſects of this tribe or genus obtained the name of chryſis, from the extreme brilliancy of their colours, which, in the greater number of ſpecies, emulate the luſtre of gold, the ruby, beryl, ſapphire, and other precious gems. Few of this genus exceed the ſize of the common houſe-fly (muſca domeſtica), and many are ſtill ſmaller than that diminutive inſect, which renders them pleaſing and convenient objects for microſcopical inveſtigation. They are very lively in the ſun-ſhine, about the middle of the day, hover on the wing in a manner ſimilar to the bee, and if diſturbed fly ſwiftly. During the warmer ſummer months they are frequently obſerved among fruit trees, and eſpecially preferring thoſe which are raiſed againſt walls in a ſouthern aſpect: they occur likewiſe againſt the trunks of decayed trees on the ſide moſt expoſed to the ſun; and ſometimes among flowers. Theſe brilliant little inſects will not allow themſelves to be captured with impunity; they bite hard, and the ſting of the female is a formidable weapon compared with the ſize of the inſect, and capable of inflicting at leaſt a painful puncture, if incautiouſly taken in the hand. The larvæ of theſe inſects have hitherto eſcaped the reſearch of naturaliſts, or have not certainly been aſcertained with any degree of preciſion; it is only ſuppoſed, by analogy, their metamorphoſes reſemble that of waſps. Degeer found one of the ſpecies of this genus, his *chryſis micans*, in a reſinous nut-gall formed on the pine, and imagined the inſect muſt have been depoſited there in the egg ſtate, and undergone its various changes to the larva, pupa, and perfect ſtate within the gall (and which gall moſt probably originated from the acrimonious puncture of the parent inſect), for he found, on examination, at the bottom of the gall, an empty ſpinning of a looſe ſilky texture, enveloping the remains of the pupa caſe which was burſt open, as he preſumed, by the chryſis, when it attained its laſt and perfect form. He obſerved alſo the excrements of a larva, that of the inſect beyond doubt, which had effected its eſcape. The generic Engliſh term, *golden-fly*, is applicable to moſt ſpecies of the chryſis genus.

Species.

IGNITA. Smooth and ſhining; thorax green, abdomen golden, with four teeth at the apex, Linn. Fn. Suec. Fabr. Donov. Brit. Inſ.

This inſect is one of the moſt beautiful and abundant ſpecies of the genus throughout Europe. In England it is partially known by the name of red-tailed golden-fly, but it is the whole of the ſuperior ſurface of the abdomen that is of a fine crimſon colour, changeable to gold. The French call it chryſis en flammé.

FASCIATA. Thorax green, with a blue band; anterior part of the abdomen blue, faſciated with violet, golden in the middle; poſterior end red, with four teeth.—*Chryſis faſciata; thorace viridi faſcia cyanea abdomine antice cyaneo-violaceoque faſciato; medio aureo, poſtice rubro quadridentato,* Donov. Inſ. India.

"This charming inſect is a native of Tranquebar, where there is every reaſon to believe it is uncommonly rare. The ſpecies does not appear to be deſcribed by any author. The only ſpecimen we are acquainted with, is in the cabinet of ſir J. Banks, bart." See our hiſtory of Indian inſects above referred to.

SMARAGDULA. Shining green; tail with ſix teeth, and blue. Fabr. A native of North America.

CALENS. Shining blue; abdomen golden; tail four toothed, and blue. Fabr.

This is the ſame ſize as the former; the antennæ and tips of the legs are brown. This is an European ſpecies; it has been found in Italy, and alſo in Siberia.

SPLENDIDA. Gloſſy blue; tail four-toothed, Fabr. Spec. Inſ.

"Very ſcarce. This is a native of Tranquebar, where it was diſcovered by Dr. Koenig. Fabricius deſcribes the inſect from a ſpecimen in the cabinet of ſir Joſeph Banks, bart. A variety of the ſame ſpecies is found in New Holland," Donov. Inſ. India; —which work contains the only figure of Chryſis ſplendida extant at preſent.

LYNCEA. Shining blue; ſecond ſegment of the abdomen with a bluiſh eye on each ſide; ſcutel prominent and acute. Fabr.

Inhabits Africa. The head is grooved; the ocellar ſpot on each ſide the abdomen has a fulvous pupil; tail armed with four teeth; legs green, and black at the ends.

Oculata. Shining green; an ocellar golden ſpot on each ſide of the abdomen; tail with ſix teeth, and blue, Fabr. Ent. Syſt.

This inſect is diſtinguiſhed for the peculiar brilliancy of its colours, and the very remarkable ocellated ſpot on each ſide the body on the ſuperior ſurface. Fabricius deſcribed it from a ſpecimen in the Bankſian cabinet taken on the coaſt of Malabar. We have received the ſame kind from Bengal. Vide Donov. Inſ. India.

Carnea. Gloſſy; thorax and firſt ſegment of the abdomen green, reſt fleſh coloured; tail ſerrated. Fabr. Sp. Inſ. Inhabits Italy.

The head is of a green colour, lip villous, and ſilvery; thorax rough and pointed each ſide.

Integra. Shining green; abdomen golden; green at the baſe and tip; tail entire. Fabr.

Reſembles Chryſis ignita in general appearance, but is eaſily diſtinguiſhed by its entire tail. It inhabits Spain.

Bidentata. Smooth, ſhining blue; thorax bidentated, and with the two firſt ſegments of the abdomen golden. Fabr. Degeer. Donov. Brit. Inſ. Inhabits Europe, and is taken rarely in England.

Succincta. Smooth, ſhining green; on the thorax a ſcarlet band; abdomen golden, and armed with three teeth. Fabr. Found in the northern parts of Europe.

Lucidula. Smooth, ſhining green; anterior part of the thorax and abdomen golden; tail entire, Fabr. *Sphex nobilis*, Scopoli.

This inſect is of a ſmall ſize, the antennæ are black; wings marked with a marginal black dot. Inhabits chiefly the ſouth of Europe.

Fulgida. Smooth and gloſſy; thorax and firſt ſegment of the abdomen blue, the reſt golden; tail four-toothed, Linn. Fn. Suec.

Inhabits Europe, and is rather larger than Chryſis ignita.

Purpurata. Smooth, ſhining golden; band in the middle of the abdomen and the ſerrated tail purple. Fabr.

Deſcribed by Fabricius as a native of Saxony. The head is ſcabrous, and golden; antennæ fuſcous; thorax ſcabrous, golden, with three duſky purpliſh lines in the middle; legs golden.

Gloriosa. Smooth, golden, and ſhining; head, breaſt, and legs, blue green. Fabr.

Inhabits Barbary. Deſcribed from the cabinet of Desfontaines. The antennæ are greeniſh blue; head green, with the crown golden; abdomen golden beneath; tail entire; legs blue green. This inſect has ſometimes the whole of the head of a golden colour.

Feroida. Smooth, ſhining golden; abdomen beneath deep black. Fabr.

A ſmall inſect, with the head, thorax, and abdomen, golden, glabrous and ſhining; beneath the wings cyaneous; legs black. Inhabits Italy.

Aenea. Glabrous, ſhining golden; antennæ and legs fuſcous. Fabr.

Deſcribed as a native of Saxony from the collection of Hybner; the ſize is ſmall; wings fuſcous at the tip.

Aurata. Glabrous, and ſhining; thorax green; abdomen golden; tail bidentated. Linn. Fn. Suec.

Found againſt walls in Europe.

Regia. Glabrous, ſhining; thorax blue; abdomen golden; tail entire. Fabr. *Veſpa thorace viridi cæruleo, abdomine aureo cupreo, pene inermi.* Geoff. Inſ.

A native of Europe. The head and thorax are blue without ſpots; abdomen ſubgloboſe, golden, ſhining, ſpotleſs, with the tail entire; antennæ black; wings duſky.

Cyanea. Glabrous, ſhining; thorax and abdomen blue; tail with three teeth. Linn.

Veſpa cærulea nitens, Geoffr. Inhabits Europe. This inſect is very common in England, and has nearly the ſame habits as Chryſis ignita. Donov. Brit. Inſ.

Nitidula. Shining green; thorax bidentated behind; tail with four teeth. Fabr.

Deſcribed from the Bankſian cabinet as an American inſect.

Amethystina. Shining green; tail four-toothed, and blue; wings fuſcous. Fabr.

Inhabits New Holland. Size of the laſt. Antennæ fuſcous, and at the baſe green; thorax green; ſcutel prominent and concave; wings duſky.

Cyanochrysa. Glabrous, green gold; head and thorax blue; tail with four teeth; wings brown. Forſt. Nov. Gen.

This inſect is a native of Spain. Its ſize is rather leſs than Chryſis ignita; wings and tarſi fuſcous.

Cyanura. Glabrous, ſhining green; thorax bidentated; abdomen four-toothed and tipped with blue. Forſt. Nov. Inſ.

Inhabits the ſame country as the preceding. Its ſize is conſiderable; antennæ black; eyes large and of a purpliſh brown colour; two laſt ſegments of the abdomen blue.

Beryllina. Head greeniſh-blue; thorax blue, greeniſh at the anterior part, and bidentated behind; abdomen green and bluiſh with a reddiſh gloſs; legs blue with a teſtaceous dot. Muſ. Leſk. Linn. Gmel. This kind inhabits Europe.

Thalassina. Head green blue, abdomen golden, the laſt ſegments green blue, and armed with four teeth; thorax gold with a ſquare green ſpot in the middle and green behind. Linn. A native of Europe. Muſ. Leſk.

Inermis. Blue; anterior part of the thorax green; abdomen golden and entire. Linn. Muſ. Leſk. A native of Europe.

Chrysorrhousa. Green; laſt ſegment of the abdomen golden and entire. Linn. Inhabits Europe.

Leskii. Green; ſpot before the ſcutel and abdomen green gold, and entire. Linn. An European ſpecies.

Scutellaris. Shining blue; ſcutel and abdomen golden; tail blue. Fabr.

This and the following new ſpecies are deſcribed by Fabricius in his "Supplementum Entomologiæ Syſtematicæ," one of his laſt publications. Chryſis ſcutellaris is a native of Italy, and bears much affinity with Chryſis calens. The head is blue; antennæ black; thorax blue, gloſſed with green; abdomen ſcarcely toothed; legs blue. Deſcribed from the cabinet of Dr. Allioni.

Cærulescens. Glabrous, ſhining, golden purple; antennæ and poſterior part of the thorax black. Fabr.

A native of France, in the cabinet of Boſc. Size and general appearance ſimilar to that of Chryſis ignita; head, thorax, and abdomen, golden purple; thorax beneath the ſcutel black; breaſt and legs blue and ſhining.

Maculata. Glabrous green and ſhining; occipital band, and dorſal ſpots on the abdomen deep black; tail entire. Fabr. Muſ. Boſc.

Inhabits the American iſlands. The head is braſſy green; antennæ black; thorax green with a bluiſh anterior dot; abdomen braſſy, with the black dorſal ſpots large.

Dimidiata. Glabrous, ſhining green; thorax and two firſt joints of the abdomen golden; tail four-toothed. Fabr. Muſ. Boſc.

The head of this inſect is green; antennæ, and vertical ſpot on the head black; thorax golden, with green breaſt.

Sex-dentata. Glabrous, ſhining green; ſegments of the abdomen blue at the baſe; tail with ſix teeth.

An inſect of ſmall ſize, the native country of which is unknown. The thorax is green and without ſpots.

CHRYSITES, a name given by the ancients to yellow litharge, ſuch as we call litharge of gold. We diſtinguiſh this only in regard to the colour, and ſo did the ancient Greeks; but Avicenna, and the reſt of the Arabians, have uſed this word only for the name of ſuch litharge as was made from gold, or whatever colour it happened to be; the reſt they called by the name of Argyrites, as they tell us, whether it was made of ſilver, copper, or even of the marcaſite melted, and refined by lead. Sec KLIMIA.

CHRYSITRIX, in *Botany*, (from χρυσος, *gold*, and ϑριξ, hair.) Linn. Mant. 304. Schreb. 1610. Juſſ. 27. Claſs and order, *polygamia diœcia*. Nat. ord. *Calamariæ*, Linn. *Cyperoideæ*, Juſſ.

Gen. Ch. Hermaphrodite. *Cal.* Glumes bivalved, numerous, imbricated; valves ovate-oblong, cloſe, cartilaginous, permanent. *Cor.* Glumes one-valved, chaff-like, very numerous, faſcicled, briſtle-ſhaped, membranous, coloured, bright, longer than the calyx, permanent. *Stam.* Filaments ſolitary, in each glume of the corolla, capillary, the length of the glume; anther linear, adnate to the filament below the tip. *Piſt.* Germ oblong, obtuſe; ſtyle filiform, ſhort; ſtigmas three, long. *Seed* not known. Male, in a diſtinct plant, differing in nothing from the hermaphrodite but the want of a piſtil. This genus would therefore be placed by Dr. Smith in the claſs Monandria.

Sp. C. *capenſis*. Mart. Lam. Illuſt. Pl. 842. *Root* perennial. Stature of Siſyrinchium. *Leaves* about a foot long, ſword-ſhaped, equidiſtant, of an even ſurface. *Scape* reſembling a leaf, compreſſed, membranous. *Spathe* terminal, bivalved; one valve ſtraight, as if it were a continuation of the ſcape; the other lower, egg-ſhaped, dehiſcent. *Flower* from the upper edge of the ſcape, reſembling a faſtigiate faſcicle of golden briſtles, ſtraightened by a cartilaginous perianth. Linn. Mant. A native of the Cape of Good Hope.

CHRYSOANA, in *Ancient Geography*, a river of India, on the other ſide of the Ganges. Ptolemy.

CHRYSOBALANUS, in *Botany*, (from χρυσος, *gold*, and βαλανος, a *drupe*, *acorn*, &c.) Linn. Gen. 621. Schreb. 850. Juſſ. 340. Vent. 3. 352. Icaquier; Encyc. Meth. Claſs and order, *icoſandria monogynia*. Nat. Ord. *Pomaceæ*, Linn. *Roſaceæ*, Juſſ.

Gen. Ch. *Cal.* Perianth one-leafed, bell-ſhaped, ſmall, five-cleft to the middle; ſegments expanding, withering. *Cor.* Petals five, longer than the calyx, oblong, ſpreading, inſerted by their claws into the calyx. *Stam.* Filaments numerous, forming a circle, erect, the length of the petals, or longer, flattened and villous near the baſe; anthers ſmall, didymous, *Piſt.* Germ ſuperior, egg-ſhaped; ſtyle the ſhape and length of the ſtamens, inſerted laterally at the baſe of the germ; ſtigma obtuſe. *Peric.* Drupe egg-ſhaped. *Seed*, nut egg-ſhaped, a little pointed at the ſummit, obſcurely pentagonal, wrinkled, marked with five longitudinal furrows, ſomewhat five-valved, containing an oval kernel.

Eſſ. Ch. Calyx five-cleft. Petals five. Stamens numerous. Drupe ſuperior. Nut furrowed, ſomewhat five-valved. Lam.

Sp. C. *icaco*, Linn. Sp. Pl. Mart. Lam. Willd. Jacq. Amer. tab. 94. coloured fig, tab. 141. Lam. Illuſt. Pl. 428. (Icaco, Plum. Guajeru. Marcgr. Braſ.) An irregular ſhrub, eight or ten feet high; branches cylindrical, ſmooth. with a brown or ruſſet bark, beſprinkled with whitiſh minute ſpots. *Leaves* two inches long, and about one and a half broad, turning brown or blackiſh when dried; alternate, egg-ſhaped, obtuſe, entire, emarginate; ſmooth on both ſides, coriaceous, veined, on ſhort petioles. *Flowers* ſmall, whitiſh, a little villous or cottony on the outſide without ſmell; racemes branched, looſe, a little ſhorter than the leaves, axillary and terminal; peduncles a little angular, compreſſed; bractes ſcale-like, ſmall, acutely egg-ſhaped, villous, caducous. *Fruit* about the ſize and nearly the ſhape of a damaſcene plumb, either quite entire, or with five, ſix, or ſeven grooves; ſkin very thin; pulp in ſmall quantity, adhering firmly to the nut, the conſiſtence of a baked apple, with little ſmell, and a ſweet ſomewhat auſtere, but not unpleaſant taſte. A native of South America and the Weſt Indies, in ſituations not far remote from the ſea, where it continues in flower almoſt the whole year, but generally ripens its fruit in June and December. The fruit is moſt commonly yellowiſh, or a kind of ruſſet white; but is found red, purple, violet, and nearly black; ſome of which, on farther examination, may not improbably prove diſtinct ſpecies. In its native climate, it is ſold commonly in the market, and is eaten either raw or preſerved in ſugar. Its root paſſes for an aſtringent, and has been employed as ſuch in medicine.

CHRYSOBERYL. Oriental or opaleſcent chryſolite of the *Jewellers*. The colour of this mineral is aſparagus green, paſſing into greeniſh white on one ſide and on the other through olive-green into yellowiſh grey, and ſometimes reddiſh-brown. It generally exhibits a bluiſh milky light, undulating within the cryſtals. It is uſually met with in ſmall rounded pieces, but occaſionally poſſeſſes a well marked cryſtalline figure. Its primitive form is a rectangular parallelepiped, but it is alſo found in ſhort regular hexahedral priſms either with or without a truncated hexahedral pyramid at each extremity of the priſm. The ſurface of the rounded pieces is ſomewhat rough, and generally reflects glittering variegated colours. The cryſtals poſſeſs a double refraction, are externally ſhining, and very brilliant internally, ſo that when poliſhed it is ſometimes miſtaken for the yellow diamond. The fracture of chryſoberyl is perfectly choncoidal: its fragments are indeterminate, angular, and ſharp-edged: its hardneſs is ſuperior to that of quartz; its ſp. gr. is 3.7.

It is infuſible *per ſe* before the blowpipe. It conſiſts, according to Klaproth, of

Alumine	71.5
Silex	18
Lime	6
Oxyd of Iron	1.5
	97.0

It is procured chiefly from Brazil, where it accompanies topaz. It has alſo been diſcovered in ſand from the Iſland of Ceylon, together with rubies and ſapphires. A few ſpecimens have been brought from Nertſchinſk in Siberia. It is however, upon the whole, a rare mineral, and from its hardneſs and luſtre is conſiderably valued by jewellers.

CHRYSOCERI, in *Antiquity*, a deſignation given to oxen deſigned for ſacrifices. They were ſo called from their horns being gilded.

CHRYSOCOLLA, in the *Materia Medica of the Ancients*, the name of a fine green arenaceous powder, properly one of the ſaburræ, and found on the ſhores of the Red Sea, on thoſe of ſome parts of America, and in Ruſſia; and that found at this time has all the properties of that mentioned by the ancients. It ſerves to the ſoldering of gold and other metals, and, given internally, is a violent and dangerous emetic.

It is of a very elegant colour, ferments violently with aqua fortis, and is wholly diſſolved by it, and tinges it with a bluiſh green; and, being calcined, it loſes all its green colour.

Chryſocolla is repreſented by Pliny as found in mines of gold, ſilver, copper, and lead: its colour, he ſays, was various, according to that of the matter in which it is found; yellow, if among gold, white in ſilver, green in copper, and black in lead. The Arabs and inhabitants of Guzuratte, call the modern chryſocolla, which is borax, tincar or tincal. The beſt is that found in copper-mines; and the worſt, in thoſe of lead.

Chrysocolla is alſo the name of a ſort of precious ſtone, mentioned by Pliny, lib. xxxvii. cap. 10, who calls it alſo *amphitane*. He deſcribes it as of a gold colour, and of a ſquare figure; adding, that it has the virtue of attracting iron, and even gold. But this, in all probability, is fabulous; and the ſtone he ſpeaks of is apparently no other than the cubic pyrites.

CHRYSOCOMA, in *Botany*, (χρυσοκομη, Dioſc. from χρυσος, *gold*, and κομη, *the human head of hair*, alſo *the buſhy top of trees and herbs*.) Goldy-locks. Linn. Gen. 939. Schreb. 1275. Juſſ. 180. Vent. 2. 512. Gært. 967. Claſs and order, *ſyngeneſia polygamia æqualis*. Nat. ord. *Compoſitæ diſcoideæ*. *Corymbiferæ*, Juſſ.

Gen. Ch. *Cal. common*, hemiſpherical, imbricated; ſcales linear, outwardly convex, acuminate. *Cor.* florets hermaphrodite, tubular, funnel-ſhaped, numerous, equal; border five-cleft, revolute. *Stam.* filaments five, very ſhort; anthers forming a hollow cylinder. *Piſt.* germ oblong, crowned; ſtyle filiform, ſcarcely longer than the florets; ſtigmas two, oblong, depreſſed, involute. *Peric. common*, the permanent calyx. *Seeds* ſolitary, ovate-oblong, compreſſed; down ſimple. *Recep.* naked, flat.

Eſſ. Ch. Receptacle naked. Down ſimple; calyx hemiſpherical, imbricated. Style ſcarcely longer than the florets. Willd. Calyx hemiſpherical or egg-ſhaped, of a moderate ſize, imbricated; ſcales oblong, externally convex, florets all androgynous, pitted, rough with the toothed-edges of the cavities. Down ſimple, often-toothed, rough. Gært.

* *Shrubby.*

Sp. 1. C. *comaurea*, Linn. Sp. Pl. 2. Mart. 2. Willd. 1. "Leaves linear, ſtraight, ſmooth, decurrent from the back." *Stem* about a foot high, woody; branches numerous, ſmall. *Leaves* narrow, deep green, ſcattered, with a ſhort appendage on the back part, which runs along the petiole. *Flowers* yellow, terminal on ſlender naked peduncles. A native of the Cape of Good Hope. It is cultivated in our green-houſes, chiefly on account of its continuing in flower the greater part of the year. 2. C. *patula*, Linn. Mant. 280. Mart. 5. Willd. 2. "Somewhat ſhrubby; leaves linear, ſmooth; branches divaricated." *Stem* compound, branches growing by threes or fours, much divaricated, ſmooth. *Leaves* obtuſe, ſpreading. *Flowers* terminal, ſolitary, ſcarcely peduncled. A native of the Cape of Good Hope; nearly allied to the preceding, differing chiefly in its much divaricated branches, and ſcarcely peduncled flowers. 3. C. *ſericea*, Linn. jun. ſup. Mart. 3. (Conyza ſericea, Willd. 42.) "Silky white; leaves linear, channelled; little branches panicled near the top." Branches, leaves, and peduncles, very white, with ſilky pubeſcence. Little branches ſimple, but panicled with flower-bearing tip; ſhorter little branches, terminated with a few-flowered panicle. *Leaves* long, flaccid. *Flowers* yellow; calyxes ſmooth; ſcales yellow, awl-ſhaped. It differs from tomentoſa in being much whiter; and having ſmaller flowers, leaves an inch long, and panicled branches, not one-flowered. A native of the Canary iſlands, where the acrid pungency of its bark and wood has recommended it as a cure for the tooth-ache. *Obſ.* Willdenow has removed this ſpecies to the genus Conyza, but as he has not aſſigned his reaſons, we have left it in its original ſtation. Authors, when they make ſuch changes, ſhould always diſtinctly ſpecify the grounds of their determination, and ſhould carefully refer from the old genus to the new; but to this very obvious rule the Berlin profeſſor is altogether inattentive, to the great inconvenience of thoſe who conſult him; for as his unfiniſhed work is without an index, it is often at the expence of not a little time and patience that we find out what he has done with a plant. 4. C. *cernua*, Linn. Sp. Pl. 3. Mart. 6. Willd. 3. (Coma aurea africana fruticans, foliis Linariæ anguſtis, major; Comm. Hort. 2. Tab. 45.) "Somewhat ſhrubby; leaves linear, recurved, ſomewhat ſcabrous; flowers nodding at the time when the anthers diſcharge their pollen." A leſs plant than C. comaurea, but branching out in the ſame manner. *Leaves* ſhorter and a little hairy. *Flowers* not half ſo large, of a pale ſulphur colour. A native of the Cape of Good Hope. It flowers great part of the year, and ripens its ſeeds in our climate. 5. C. *microphylla*, Willd. 4. Thun. prod. 142. "Leaves round, recurved, ſmooth." A native of the Cape of Good Hope. 6. C. *ciliata*, Linn. Sp. Pl. 4. Mart. 7. (C. ciliaris; Reich. 5. Willd. 5. Coma africana fruticans ericæ folio. Comm. Hort. 2. Tab. 48.) "Somewhat ſhrubby; leaves linear, ſtraight, ciliated; branches pubeſcent." A native of the Cape of Good Hope. 7. C. *montana*, Mart. 4. Willd. 6. Vahl. Symb. p. 70. "Leaves oblong, quite entire, flowers ſolitary." *Stem* branched; branches round, villous. *Leaves* acute, villous. *Flowers* terminal, outer ſcales of the calyx oblong, obtuſe, ſpreading at the tip; inner ones longer, linear, acute; down ferruginous, the length of the calyx. Found by Forſkal on Mount Horeb. 8. C. *tomentoſa*, Syſt. Veg. 615. Mart. 8. Willd. 7. "Somewhat ſhrubby; leaves and branches tomentous." *Leaves* linear. Native country unknown. 9. *C. nivea*, Willd. 8. (Chyſocoma tomentoſa; Jacq. Hort. Schœnb. 2. Tab. 147.) "Leaves linear-lanceolate, tomentous, flat; corymbs terminal, ſeſſile." A native of the Cape of Good Hope. It differs from the preceding in its corymbous flowers, on one-flowered branches. 10. C. *ſcabra*, Linn. Sp. Pl. 5. Mart. 9. Willd. 9. (Baccharis, Hort. Clif. Conyza Africana tenuifolia, flore aureo, Dill. Elth. tab. 88. fig. 103.) "Somewhat ſhrubby; leaves lanceolate, egg-ſhaped, recurved, tooth-ſerrated; peduncles pubeſcent." An underſhrub, nine or twelve inches high. *Leaves* alternate, narrow, ſomewhat hairy. *Flowers* ſmall, yellow; in heads at firſt roundiſh, not rough with hairs, afterwards longer, and contracted towards the end; peduncles long, ſlender, furniſhed with a few ſmall leaves; ſcales of the calyx numerous, narrow, green. A native of the Cape of Good Hope; flowering in Auguſt and September. 11. C. *denticulata*, Willd. 10. Jacq. Hort. Schreb. 3. tab. 368. "Leaves oblong, attenuated at the baſe, ſlightly toothed, undulated." Native country unknown.

** *Herbaceous.*

12. C. *undulata*, Willd. 11. Thunb. Prod. 142. "Leaves heart-ſhaped, lanceolate, undulated." *Root* perennial. A native of the Cape of Good Hope. 13. C. *purpurea*, Mart. 13. Willd. 12. Forſt. Prodromus, n. 286. "Leaves elliptic-lanceolate, ſomewhat ſerrated, pubeſcent; panicle terminal, reſembling a corymb. 14. C. *linoſyris*, Linn. Sp. 6. Mart. 10. Willd. 13. Gært. tab. 166. (Chryſocome Dioſcoridis & Plinii, Col. Ecphr. i. tab. 82. Linoſyris nuperorum, Lob. Hiſt. 223. Ic. tab. 409. Ger. Emac. 553. fig. 9. Oſyris auſtriaca, Cluſ. Hiſt. i. p. 325. Linariæ tertium genus, Frag. 358. Linaria, folioſo capitulo luteo, major and minor, Bauh. Pin. 213. L. aurea, Ger. 442—8.) "Leaves linear, ſmooth; calyxes looſe."

Root perennial. *Stems* two feet and a half high, round, ſtiff. *Leaves* cloſely and irregularly ſet, long, narrow, of a pale green colour. *Flowers* in an umbel, bright yellow; peduncles one-flowered, ſlender from the upper part of the ſtem. A native of the temperate parts of Europe. The plant, when handled, yields a fine aromatic ſmell. 15. C. *biflora*, Linn. Sp. 7. Mart. 11. Willd. 14. (After, Gmel. Sib. ii. tab. 82. fig. 1. Conyza, Am. Ruth. 192. "Panicled; leaves lanceolate, three-nerved, dotted, naked." *Root* perennial, creeping, and ſpreading to a conſiderable diſtance. *Stems* numerous, erect. *Leaves* acute, rough. *Flowers* yellow, larger than thoſe of the preceding ſpecies. A native of Siberia. The flowers vary with and without a ray, and are ſaid by Willdenow to be either white or blue. 16. C. *villoſa*, Linn. Sp. Plant. 8. Mart. 12. Willd. 15. (After incanus, Gmel. Sib. ii. tab. 82. fig. 2. Conyza tomentoſa & incana, Amm. Ruth. 190.) "Leaves lanceolate, villous; calyxes cloſe." *Root* perennial. *Leaves* quite entire, hoary, alternate, ſeſſile. *Flowers* yellow, in a ſort of umbel; calyx hairy. *Seeds* ſmall, hirſute, crowned with dun-coloured hairs. A native of Siberia and Hungary.

C. *oppoſitifolia*, Linn. Sp. Pl. See EUPATORIUM *divaricatum*.

C. *graminifolia*, Linn. Sp. Pl. See SOLIDAGO *lanceolata*.

C. *æthiopica plantaginis folio*, Breyn. Cent. See GNAPHALIUM *nudiflorum*.

C. *ſyriaca flore atrorubente*, Breyn. Cent. See GNAPHALIUM *ſanguineum*.

C. *dichotoma*, Linn. jun. Sup. Jacq. Ic. See CONYZA *inuloides*.

CHRYOCOME, Dioſcoridis & Plinii. See CHRYSOCOMA *linoſyris*.

CHRYSOCOME *ſive ſtœchas citrina minor*, Barrel. Ic. See GNAPHALIUM *ſtœchas*.

CHRYSOCOME *altera*, Cluſ. Hiſt. See GNAPHALIUM *luteo album*.

CHRYSOCOME *ſive argyrocoma Africana ericoides flore albo*, Seb. Theſ. See XERANTHEMUM *veſtitum*, Linn. *Elichryſum*, Willd.

CHRYSOCOME *ſive argyrocoma gnaphaloides Africana, ampliſſimis floribus*, Seb. Theſ. See XERANTHEMUM *ſpecioſiſſimum*, Linn. *Elichryſum*, Willd.

CHRYSOCOME *ſive argyrocoma Africana ericoides, capitis b. ſpei*, Seb. Theſ. See XERANTHEMUM *ſeſamoides*, Linn. *Elichryſum*, Willd.

CHRYSOGONUM, (χρυσογονον, Dioſcor. from χρυσος, *gold*; and γονυ, *the keel, or a joint*.) Linn. Gen. 988. Schreb. 1337. Juſſ. 188. Gært. 1009. Claſs and order, *ſyngeneſia polygamia neceſſaria*, Linn. *Corymbiferæ*, Juſſ.

Gen. Ch. *Calyx common* ſimple, five-leaved; leaves oblong, acuminate, nearly the length of the ray, rough on the outer, naked on the inner ſide, ſpreading. *Corol. compound* radiate; florets of the diſk numerous, hermaphrodite but barren, funnel-ſhaped, five-toothed, erect; of the ray five, ſtrap-ſhaped, oblong, truncated, three-toothed, fertile. *Stam. of the hermaphrodite*, filaments five, very ſmall; anthers forming a hollow cylinder. *Piſt. of the hermaphrodite*, germ very ſmall, abortive; ſtyle briſtle-ſhaped, the length of the floret; ſtigma obſcure; *of the female*, germ larger; ſtyle ſhorter; ſtigmas two, revolute. *Recep.* chaffy, chaff-like ſcales diſſimilar in form; thoſe of the diſk ſimple, linear-oblong, obtuſe, concave, pubeſcent outwards, one to each floret; thoſe of the ray compound, four to each floret, united ſo as to form a proper pericarp; the outer one very large, inverſely egg-ſhaped, convex outwards, concave within, covering the back of the ſeed; the three inner ones narrow, linear-oblong, ſhutting up the aperture of the larger ſcale, ſo that two cover the ſides of the ſeed, and the third its interior part, the whole forming a complete pericarp, which opens as the ſeed ripens. *Seeds* inverſely egg-ſhaped, convex outwards, concave within, marked with two obſolete longitudinal furrows, and crowned with a membranous, top-ſhaped ſcale, about half the length of the ſeed; teeth generally three, but, according to Gærtner, ſometimes ſix.

Eſſ. Ch. Calyx ſimple, five-leaved. Receptacle chaffy; chaff diſſimilar in form. Seeds incloſed in a chaffy five-ſcaled pericarp, and crowned with a ſimple toothed ſcale.

Obſ. In forming theſe characters, we have chiefly followed Gærtner, as correſponding moſt with our own ideas of the ſtructure of the parts of fructification: but that eminent carpologiſt muſt have been guilty of an egregious overſight in twice ſtating the five diſſimilar ſcales to encloſe the germ of the barren florets, firſt at the end of his deſcription of the receptacle, and afterwards in the reference to his figure; a ſtate altogether inconſiſtent with the former part of his own deſcription, as well as in oppoſition to all other authors.

Sp. C. *virginianum*, Linn. Sp. Mart. Willd. Gært. tab. 174. *Leaves* reſembling thoſe of *Lamium purpureum*, or common balm, oppoſite, moderately hairy, on long petioles. *Flowers* gold-coloured, terminal. A native of Virginia.

CHRYSOGONUM *Dioſcoridis*, Raw. It. Rai. Hiſt. See LEONTICE *chryſogonum*.

CHRYSOGONUM, Linn. Sp. Pl. Ed. 1. See LINNIA *pauciflora*.

CHRYSOGONUM, in the *Materia Medica*, is alſo the name of a Syrian plant, called the red turnep, the leontopetalon coſta ſimplici of Tournefort.

CHRYSOLACHANON, in *Botany*, a name by which Pliny, and ſome other authors, have expreſſed the white garden beet.

CHRYSOLITE, *Peridot* of the French mineralogiſts. The principal colour of this mineral is piſtachia-green paſſing into browniſh olive. It occurs in angular or rounded fragments, or cryſtallized. Its primitive form is a ſtraight priſm with rectangular baſes; it alſo occurs in eight, ten, and twelve-ſided priſms. Its internal luſtre is brilliant and vitreous. Its fracture is perfectly conchoidal; its fragments are indeterminately angular and ſharp edged. It is perfectly tranſparent, and poſſeſſes a double refraction in a remarkable degree. Its hardneſs exceeds that of glaſs. Sp. gr. 3. 34.

It is infuſible *per ſe* before the blow-pipe, but with borax forms a tranſparent green glaſs. It has been analyſed by Klaproth and Vauquelin, with the following reſults.

	Klap.	Vauq.
Silex	39	38
Magneſia	43.5	50.5
Oxyd of iron	19	9.5
	101.5	98.0

It is not known with any certainty whence the chryſolite is procured; Upper Egypt is ſaid to be one of the countries which afford it, and a few come to the jewellers of Europe from the Eaſt Indies. It ranks among the gems, but its ſoftneſs and unattractive tone of colour, eſpecially when the yellow predominates, render it of little value.

CHRYSOLITE is alſo a general name which the ancients gave to all precious ſtones, wherein the yellow, or golden, was the prevailing colour.

When the ſtone was green, they called it *chryſopraſus*:

the red and blue too had their particular denominations, which expreſſed their colour: the gold being ſignified by chryſo; which ſtill began the name.

We know but few of theſe chryſolites now: or rather, they are referred to the ſpecies of ſtone which they approach the neareſt to: the green to the emerald, the red to the ruby; and ſo of the reſt.

CHRYSOLITE *paſte.* The way of making an artificial chryſolite paſte is this: take of prepared cryſtal two ounces, ordinary red lead eight ounces; mix theſe well together, and add crocus martis made with vinegar, twelve grains: mix all together; put them into a crucible, lute it over, and bake the whole for twenty-four hours, or longer, in a potter's kiln, and it will produce a very elegant reſemblance of the true chryſolite.

CHRYSOLORAS, MANUEL, in *Biography*, a learned Greek, the firſt profeſſor of his language in modern Italy, was born at Conſtantinople of noble Roman parents, whoſe anceſtors are ſuppoſed to have migrated with Conſtantine the Great. It is uncertain in what year he came into Italy. It is, however, well aſcertained, that, on occaſion of the ſiege of Conſtantinople by the Turks in 1393, the emperor Manuel Paleologus ſent him and other envoys and orators to implore the compaſſion and aſſiſtance of the weſtern princes. After viſiting the coaſts of France and England, where he obtained ſome contributions and more promiſes, he returned with the pecuniary aid he had collected. About the year 1396, the city of Florence ſent him an invitation to open there a public ſchool for the Greek language: with this he complied, and taught with great aſſiduity and applauſe for three years; when the emperor Manuel himſelf coming to Milan, Chryſoloras left Florence, and went to that city, where he taught Greek. He was in England again with the emperor about the year 1405; after which, he travelled to Rome, on an invitation from Pope Gregory XII., and opened a ſchool there. He was employed on various embaſſies, and, in 1413, accompanied two cardinal legates to the court of the emperor Sigiſmond, in order to determine the place for holding a general council. This was fixed at Conſtance; and Chryſoloras was ſent thither, either by the emperor Manuel, or by the Pope, and died while he was performing his miſſion. He was interred in the Dominican church of that city: his epitaph was written by Guarino, and many tributes of praiſe were beſtowed on him by his ſcholars; among the more celebrated of whom were Poggio, Vergerio, Manetti, and Leonardus Brunus Aretinus: of theſe, the laſt in ſpeaking of his maſter, ſays, "On the arrival of Manuel, I heſitated, whether I ſhould deſert my legal ſtudies, or relinquiſh this golden opportunity of being introduced to a familiar converſe with Homer, Plato, and Demoſthenes? with thoſe poets, philoſophers, and orators, of whom ſuch wonders are related, and who are celebrated by every age as the great maſters of human ſcience? Of profeſſors and ſcholars in civil law, a ſufficient ſupply will always be found in our univerſities; but a teacher, and ſuch a teacher, of the Greek language, if he be once ſuffered to eſcape, may never afterwards be retrieved. Convinced by theſe reaſons, I gave myſelf to Chryſoloras; and, ſo ſtrong was my paſſion, that the leſſons which I had imbibed in the day were the conſtant ſubject of my nightly dreams." A funeral oration was pronounced for him in Venice by Andrea Guiliano. Chryſoloras wrote a Greek grammar in the Greek language, which was ſo highly eſteemed, that above a century afterwards, it was uſed by Eraſmus. He publiſhed alſo a "Parallel between ancient and modern Rome," addreſſed to John, ſon of the emperor Manuel. He had a nephew and diſciple, John Chryſoloras, who was his coadjutor, and very eminent in reviving Greek learning in Italy. John lived chiefly in Conſtantinople, and died about 1425. Gibbon. Gen. Biog.

CHRYSOMALLOS, in *Ancient Geography*, a name given to Mount Ida, in Crete, according to Strabo.

CHRYSOMELA, in *Entomology*, a genus of coleopterous inſects in the Linnæan ſyſtem, containing many beautiful ſpecies. In the larva ſtate they feed on the leaves of trees and plants, the pulp and tender parts of which they devour, but reject the fibres; ſome kinds infeſt the cotyledons only, and are very deſtructive. In the perfect, as in the larva ſtate, they are found chiefly in woods and gardens. Many of theſe inſects are ſlow in motion, but ſome kinds have the poſterior legs formed for leaping. The antennæ of the chryſomelæ are moniliform, or compoſed of little globular articulations. feelers ſix, thickeſt towards the end; thorax marginate; wing-caſes immarginate; body in moſt ſpecies oval. Gmel. Linn. Syſt. Nat.

In the earlier editions of the Linnæan Syſtema Naturæ, the generic character of the Chryſomelæ is ſomewhat differently defined: to conſtitute a Linnæan Chryſomela it was ſufficient that the antenna was moniliform, and gradually increaſed in thickneſs towards the end, and that the thorax and elytra were immarginate. Linnæus divided them into five diſtinct families; namely, 1. Thoſe having the body of an oval form. 2. The *Saltatoriæ*, or thoſe whoſe poſterior thighs are much thicker than the others, and formed for leaping. 3. Thoſe with the body cylindrical. 4. Such as have the body oblong, and the thorax broader than the abdomen. 5. Thoſe of a ſlender form, with the thorax of an equal breadth with the abdomen.

Geoffroy, diſſatisfied with the genus Chryſomela, as laid down by the Swediſh naturaliſt, divides the inſects of this tribe into ſeveral diſtinct genera, in his "Hiſt. des Inſects." Schaeffer has followed Geoffroy in alterations, and in ſome meaſure improved the genera; and the ſame may be ſaid of Scopoli, though we think the latter exceptionable in referring ſeveral of the Linnæan Chryſomelæ to the Coccinella genus, becauſe their antennæ are ſcarcely ſo long as the thorax, and others to the genus Attelabus, becauſe their thorax is broader than the head and body. Geoffroy divides the Linnæan Chryſomelæ into ſeven genera: his firſt genus, *galeruca*, differs from the other Linnæan Chryſomelæ in the rugoſity or roughneſs, and margin of its thorax. His ſecond genus is *chryſomela*, and has the thorax ſmooth and margined. *Cryptocephalus*, Geoffroy's third genus, conſiſts of thoſe Linnæan Chryſomelæ which have the articulations of the antennæ rather longer than uſual, and the thorax of an hemiſpherical form. Thoſe which have the thorax cylindrical conſtitute his genus *crioceris*. Of his genus *diaperis* he deſcribes only one ſpecies; the generic character conſiſts in the articulations of the antennæ being rather larger than common, and appearing to be perſoliated; and the thorax convex and margined. *Altica* is the ſixth genus, and comprehends the Linnæan family Saltatoriæ, or thoſe whoſe poſterior legs are formed for leaping. The laſt genus is *melolontha*, thoſe having antennæ ſerrated, or with lateral appendices like a ſaw, and placed on the fore part of the head before the eyes. In Geoffroy's arrangement of this tribe of inſects we perceive the baſis upon which the Galeruca, Cryptocephalus, Crioceris, and other analogous genera are founded in the more modern ſyſtem of Fabricius. In the "Entomologia Britannica," the genus Chryſomela is thus defined: antennæ moniliform, and thickeſt towards the end; head inſerted; thorax and wing-caſes immarginate; body ovate and convex.

The Fabrician genus Chryſomela conſiſts of thoſe inſects which have ſix feelers thickeſt towards the end ; the lip horny and entire ; and the antennæ moniliform. Thoſe correſpond with the Linnæan character of the Chryſomela, but the ſpecies deſcribed by this writer are numerous, and, with a few exceptions, conſiſt of inſects entirely unknown to Linnæus. The works of Panzer, Marſham, and other recent entomologiſts, comprehend likewiſe a great variety of new ſpecies, the principal of which we ſhall proceed to enumerate.

Chryſomela, Fabr. Linn. &c.
Species.

Obscurata. Above duſky-braſſy ; thorax very glabrous; wing-caſes with ſcattered dots. Fabr. Suppl. Inhabits Germany. Daldorff.

14-Guttata. Duſky-teſtaceous ; wing-caſes with ſix white dots. Fabr. Suppl. A native of the Cape. Lund.

Ebraea. Deep black, gloſſy ; wing-caſes white, varied with deep black dots. Fabr. Suppl. Same country and cabinet as the laſt.

Exclamationis. Ovate ; thorax and legs ferruginous ; body yellow, with nine black abbreviated lines, the exterior one interrupted. Fabr. &c. Inhabits North America. The head is ferruginous, and without ſpots ; thorax ſmooth, ferruginous, with the anterior margin pale and ſcutel ferruginous.

6-Notata. Black ; thorax and wing-caſes pale, with two black dots. Fabr. Suppl. Muſ. Lund. *Obſ.* The head of this inſect is of a pale colour, varied with black ; thorax pale and gloſſy, with two black dots ; wing-caſes ſlightly ſtriated, pale, with a pair of black dots in the middle of each ; body black ; legs pale ; thighs with a black dot at the tip.

Cajennensis. Oblong, ferruginous ; wing-caſes with four black ſpots, and a black band in the middle. Fabr. Suppl.

The head of this inſect is duſky ferruginous, with frontal line and antennæ black ; the thorax oblong, duſky ferruginous and immaculate ; wing-caſes ſmooth and ferruginous, with a pair of black ſpots at the baſe ; in the middle a black band, and behind two black ſpots.

Marmorata. Oblong, black ; anterior margin of the thorax and the wing-caſes yellow, ſpotted with black. Fabr. Inhabits Cayenne. Cuvier.

Sumptuosa. Very gloſſy ; head and thorax braſſy ; wing-caſes violaceous. Fabr. Found in the iſland of Trinidad. Ryan. Muſ. Lund.

Bulgharensis. Oblong, azure, gloſſy ; wing-caſes with ſcattered dots ; antennæ fuſcous. Schrank. Inhabits Germany. Deſcribed from the cabinet of Daldorff.

Punctatissima. Ovate ; deep black ; wing-caſes yellow, with numerous black dots ; ſternum cornuted. Olivier, and Fabr. Ent. Syſt. Inhabits Cayenne.

The head is black, with an oblong impreſſed dot in front ; thorax black and gloſſy, with the margin a little prominent ; wing-caſes very ſmooth ; legs black.

Fustulata. Deep black, with five bands of fulvous dots. Fabr. Ent. Syſt. *Erotylus puſtulatus*, Mant. Inſ. A native of Cayenne. Dr. Schulz.

Morio. Ovate, deep black ; antennæ and legs black. Fabr. Inhabits Van Diemen's land. Bankſian cabinet.

Coriaria. Ovate ; deep black ; legs entirely violet. Fabr. *Chryſomela laichert*, Auſt. 143. 2. A native of Germany.

Nigrita. Ovate ; blue ; wing-caſes punctured and more duſky. Fabr. Found in the neighbourhood of Paris. Boſc.

Goettingensis. Ovate ; deep black ; legs violet, ends rufous. Linn. Inhabits Germany ; alſo found in England, but very rarely. Donov. Brit. Inſ.

Hottentotta. Ovate ; blue black ; antennæ and legs of the ſame colour ; wing-caſes irregularly dotted. Fabr. A native of Germany.

Æthiops. Ovate ; black, beneath duſky ; wing-caſes irregularly dotted. Fabr. Inhabits Germany. Smidt.

Vittata. Ovate ; blue ; margin and ſtripe along the middle yellow, Fabr. Inhabits America. Schulz.

Bicolor. Ovate ; braſſy-green ; beneath violet ; wing-caſes ſtriated with dots. Fabr. *Chryſomela viriolicærulea*, Forſk.

This inſect inhabits Alexandria ; it is entirely of a duſky-greeniſh-braſſy colour above, and has the wing-caſes ſtriated with dots in pairs.

Bankii. Ovate ; above braſſy ; beneath teſtaceous. Roſs Fn. Etruſ. A native of Europe, and found in England but rarely. Donov. Brit. Inſ.

Ferruginea. Ovate ; ferruginous ; beneath black. Fabr. Deſcribed as an African inſect from the Bankſian cabinet.

Lusitanica. Ovate ; thorax coppery ; wing-caſes braſſy, with impreſſed bluiſh dots ; beneath violet. Fabr. A native of Luſitania. Bankſian cabinet.

Affinis. Ovate ; obſcure-braſſy, beneath violet ; wing-caſes ſmooth. Fabr. Found under ſtones in Barbary. Vahl.

Metallica. Ovate ; braſſy, ſhining ; antennæ and legs teſtaceous. Fabr. Very much reſembles *Chryſomela Bankſii.* Inhabits Germany. Helwig, &c.

Lamina. Braſſy-green ; thorax very glabrous ; margin thick ; wing-caſes ſtriated with dots. Fabr. Inhabits Germany. Smidt.

Gibbosa. Ovate ; black ; wing-caſes yellow, with two bands and dots at the baſe black. Fabr. A South American ſpecies. The wing-caſes are yellowiſh, with four black dots at the baſe.

8-Maculata. Ovate ; duſky ferruginous ; wing-caſes with four yellow ſpots on each. Fabr. A native of Surinam.

10-Pustulata. Ovate ; black ; wing-caſes with five rufous ſpots. Fabr. Deſcribed from the cabinet of Gigot d'Orcy. It is a native of St. Domingo.

Trimaculata. Blue ; wing-caſes yellow, with a band and two ſpots of black. Linn. Inhabits South America.

Adonidis. Black ; margin of the thorax yellow, with a black dot ; wing-caſes yellow ; ſuture and ſtripe black. Fabr. *Chryſomela adonidis*, Pallas It. A variety, β, is deſcribed by Fabricius, with the margin of the thorax teſtaceous inſtead of yellow ; and the wing-caſes teſtaceous ; the marginal dot on the thorax black, and the ſuture and ſtripe on the elytra of the ſame colour as in the firſt-mentioned inſect. Hubner conſiders it as a ſexual difference.

Clavata. Head and thorax ferruginous ; wing-caſes black, with a yellowiſh ſtripe. Fabricius deſcribes this from the Hunterian cabinet. Its country is unknown.

Trifasciata. Dull teſtaceous ; wing-caſes yellow, with two braſſy-green bands. Fabr. From Surinam.

Suturalis. Teſtaceous, wing-caſes braſſy, with two dots, and two bands of yellow. Fabr. A native of Cayenne. Von Rohr.

Pulchra. Braſſy ; wing-caſes yellow ; ſuture and ſtripe braſſy. Fabr. Inhabits North America. Bankſian cabinet.

Guttata. Deep black, with a ſinuate band ; margin of the wing-caſes and ſix dots of white. Fabr. Inhabits the Cape of Good Hope. Bankſian cabinet.

14-Punctata. Ovate, teſtaceous ; wing-caſes yellow, with 16 black dots, two of which are common, or united. Linn. Inhabits the Eaſt Indies. The poſterior thighs are very thick, and ſingle-toothed.

IGNITA. Blue, poliſhed, wing-caſes braſſy; antennæ and ends of the legs fuſcous. Fabr.

Deſcribed from the cabinet of Dr. Hunter as a native of Cayenne.

SURINAMENSIS. Blue, very gloſſy; antennæ aud ends of the legs fuſcous. Fabr. *Chryſomela Americana,* Sulz. This is an inſect of large ſize, and inhabits Surinam.

ASIATICA. Ovate, braſſy-green, and highly poliſhed; wing-caſes blue. Fabr. *Chryſomela Aſiatica,* Pallas. Found in the ſouthern parts of Ruſſia.

GRAMINIS. Ovate, green-blue, poliſhed; antennæ and legs of ths ſame colour, Linn. Inhabits Europe, and is found in England. Donov. Brit. Inſ.

BIFRONS. Ovate, braſſy-green; body blue. Fabr. Found on plants in Italy. Dr. Allioni.

CUPREA. Ovate; head and thorax braſſy; wing-caſes coppery; body deep black. Geoffroy.

This ſpecies is a native of Germany. The body, antennæ, and legs are black; head braſſy, with the eyes fuſcous; margin of the abdomen ſanguineous.

TRISTIS. Ovate, blue; antennæ fuſcous. Fabr. Inhabits the ſouth of Europe.

HEMOPTERA. Ovate, violaceous; ends of the feet and wings red. Linn.

Found on plants in Europe. Geoffroy, &c. and in England, Marſh.

VARIANS. Ovate, blue (ſometimes braſſy); antennæ and legs black. Fabr. *Chryſomela varians,* Act. Hall. *Chryſomela Hyperici,* Degeer. Inhabits Saxony.

VIOLACEA. Subrotund, blue; antennæ and legs ſame colour. Fabr. Inhabits Germany. Smidt.

CENTAURII. Ovate, ſhining coppery; braſſy green beneath; legs coppery. Fabr. *Chryſomela centauræ.* Herbſt. Inhabits Germany.

TRICOLOR. Ovate, braſſy, poliſhed; beneath black; antennæ, vent, and legs ferruginous. Fabr. Inhabits Virginia.

LUTEICORNIS. Ovate, braſſy-black; antennæ yellow. Fabr.

Inhabits the iſlands of South America. Dr. Pflug. The body is entirely of a braſſy black colour, poliſhed, and impreſſed with ſcattered dots of a ſmall ſize. A variety of this ſpecies has the legs varied with black and yellow.

SEMISTRIATA. Ovate, black; wing-caſes yellow with a black band in the middle; and the anterior and poſterior part ſtreaked with black. Fabr. This is a Braſilian ſpecies.

POPULI. Ovate; thorax bluiſh; wing-caſes red tipped with black. Linn.

This inſect inhabits Europe generally, and deſtroys the leaves of the aſh tree. The larva has ſix feet, and is varied with black and white, with a double row of tubercles, from which a yellowiſh unpleaſant moiſture is exuded. It has been deſcribed by many authors, as Degeer, Merian, Albin, Liſter, &c.

TREMULA. Ovate, bluiſh; wing-caſes teſtaceous. Geoffroy. Inhabits Europe, and reſembles C. *populi,* but is not above half its ſize, and has the tip of the wing-caſes of the ſame colour.

GROSSA. Ovate, blue, poliſhed; wing-caſes teſtaceous, and without ſpots. Fabr. Inhabits Italy. Dr. Allioni.

STAPHYLÆA. Ovate, and dull teſtaceous. Linn. Found on plants in Europe.

FERVIDA. Ovate, teſtaceous; wing-caſes braſſy; margin teſtaceous. Fabr. A native of the iſland of Java. Dr. Mauduit.

POLITA. Ovate; thorax golden; wing-caſes teſtaceous. Linn. Geoffr. Inhabits Europe on the willow.

LUNATA. Ovate; ferruginous; margin of the wing-caſes, ſtripe, and lunate in the middle yellowiſh. Fabr. Deſcribed from the Bankſian cabinet. The country unknown.

GLABRATA. Ovate, teſtaceous, poliſhed; wing-caſes edged with blue. Fabr. Inhabits Surinam.

LURIDA. Ovate, black; wing-caſes cheſnut, with punctured ſtriæ. Linn. Inhabits Europe.

VITTATA. Ovate, thorax black and braſſy; wing-caſes yellow, with nine fuſcous ſtripes. Fabr. Country unknown.

STOLIDA. Ovate, ferruginous; head and thorax yellow; wing-caſes variegated. Fabr. Inhabits South America.

NIGRICORNIS. Ovate, braſſy-black; head, ſides of the thorax, and double ſpot at the baſe of the wing-caſes ferruginous. Fabr.

Inhabits New Holland. Donov. Inſ. N. H. Bankſian cabinet.

COLLARIS. Ovate, violet; margin of the thorax white with a black dot. Linn.

Inhabits Europe and America, on willows. The thorax has two impreſſed dots.

SALICIS. Ovate, blue; thorax ſmooth; margin thick and ferruginous. Fabr. Found in Saxony on the willow.

SENEGALENSIS. Ovate, dull braſſy; the thorax and wing-caſes margined with ferruginous, thorax with a black dot. Fabr. Inhabits Senegal. Olivier.

VININALIS. Ovate, black; thorax rufous and bimaculated; wing-caſes rufous. Linn. Geoffr. Found on willows in Europe.

CYANIPES. Ovate, rufous; wing-caſes with blue dots up the apex. Fabr. Donov. Inſ. New Holland. From the Bankſian cabinet.

CYANICORNIS. Ovate, rufous; thorax with a dorſal ſpot, and two ſpots of blue; wing-caſes with eight blue ſpots, Fabr. Donov. Inſ. New Holland. Bankſian cabinet.

10-PUNCTATA. Ovate; thorax red, behind black; wing-caſes rufous, with about ten black dots. Linn.

Inhabits Europe. Varieties ſometimes occur with a greater number of black dots, others which are deſtitute of them.

6-PUNCTATA. Black; thorax rufous, with two black dots; wing-caſes rufous with three black dots on each. Fabr. A native of Europe.

PALLIDA. Ovate, yellowiſh, with black eyes. Linn. and Geoffr.

An European ſpecies. A variety of this inſect is ſometimes found with indiſtinct black ſpots on the wing-caſes and the body black.

STRIATA. Ovate, black, poliſhed; wing-caſes ſtriated, teſtaceous, with deep black ſuture. Fabr. Inhabits the Cape. Bankſian cabinet.

NOTATA. Ovate, thorax fulvous, with four black dots; wing-caſes pale varied with black. Fabr. A native of the Cape, in the Bankſian cabinet.

RUMICIS. Ovate, thorax fulvous with four black dots; wing-caſes fulvous with the ſuture and ſtripe in the middle black. Fabr. A native of Spain. Vahl.

VULPINA. Ovate, black; margin of the wing-caſes four dots, and apex white; the laſt with three black ſpots. Fabr. Inhabits the Cape.

CRASSICORNIS. Ovate yellowiſh wing-caſes with two black dots. Fabr. Donov. Inſ. New Holland.

LAPPONICA. Ovate; thorax green; wing-caſes red with a blue band between a dot and lunate ſpot. Linn. Inhabits Europe.

UNDULATA. Ovate, rufous, wing-caſes with three blue-waved lines. Linn. A native of India.

18-Guttata. Ovate, wing-caſes fuſcous with eight pale dots, ſome of which are connected. Fabr.

Deſcribed from the Bankſian cabinet. Donov. Inſ. New Holland.

Polygoni. Ovate, blue; thorax, thighs, and vent, rufous. Linn. Common in moſt parts of Europe. Donov. Brit. Inſ. &c.

Russica. Ovate, blue; baſe of the antennæ, thorax, vent, and legs, rufous. Fabr. Inhabits Ruſſia. Bœber.

Brunnea. Ovate, teſtaceous; wing-caſes at the ſuture and ſmall line in the middle fuſcous. Fabr. Donov. Inſ. New Zealand, &c. Bankſian cabinet.

Cerealis. Ovate, golden; thorax with three, wing-caſes with five blue lines. A native of Europe. A moſt beautiful inſect, being varied with ſtripes of blue, green, and crimſon, and marked with ſlender lines of gold. Diſcovered Britiſh on one of the Cambrian mountains by Mr. Hudſon, and inſerted on this authority in Donov. Brit. Inſ. and ſince in Marſh. Ent. Brit. Found on the butcher's-broom.

Fastuosa. Ovate, golden, with three blue lines on the wing-caſes. Linn. A native of Europe; ſometimes found in England. Donov. Brit. Inſ.

Modesta. Ovate, braſſy green; four lines on the thorax and two on the wing-caſes coppery. Fabr. Inhabits the Eaſt Indies.

Marshami. Thorax greeniſh golden; wing-caſes golden, gloſſed with red and irregularly punctured. Donov. Brit. Inſ. A new ſpecies.

Americana. Ovate, braſſy-green; wing-caſes with five ſanguineous ſtreaks. Linn. Found in France. The head is braſſy with a vertical ſcarlet ſpot.

Festiva. Ovate, braſſy-black, with three lines on the wing-caſes, and the anterior part of the ſuture yellow. Fabr. Deſcribed from an American inſect in the Britiſh Muſeum. It is the Chryſomela lineata of Degeer.

Splendida. Ovate, braſſy-green; antennæ and ends of the feet black. Fabr. A native of Tranquebar. Lund.

Gloriosa. Ovate, green, poliſhed; wing-caſes with a blue line. Fabr. *Chryſomela cacaliæ*, Schrank. Inhabits Italy.

Speciosa. Ovate, green, ſilky; wing-caſes with two golden lines. Linn. Inhabits woods in Europe.

Cyanea. Ovate; thorax rotundate, and cylindrical; body blue and poliſhed; legs black. Fabr. Inhabits South America.

Prætiosa. Ovate; thorax globoſe; wing-caſes very ſmooth; body blue. Fabr. Inhabits Germany. Smidt.

Nitida. Ovate; thorax rotundate, braſſy-green; antennæ blue. Fabr. Inhabits Siam.

Aurata. Ovate; thorax rounded and blue; wing-caſes golden, with a blue margin. Fabr. Inhabits Pennſylvania.

Limbata. Ovate, black; wing-caſes ſurrounded with a ſanguineous border. Geoff. Inhabits Europe.

Carnifex. Ovate, black; wing-caſes very ſmooth; exterior margin ſanguineous. Fabr. A native of Germany.

Sanguinolenta. Ovate, black; wing-caſes dotted; exterior margin yellowiſh. Linn. Found on plants in Europe; a rare Engliſh ſpecies. Donov. Brit. Inſ.

Marginata. Ovate, braſſy-black; wing-caſes punctured with yellow margin. Linn. A native of Europe. The wings are ſanguineous.

Schach. Ovate; thorax braſſy-black, and finely poliſhed; wing-caſes duſky, ſmooth, with margin ſanguineous. Fabr. A native of Germany.

Hannoverana. Ovate, blue; margin of the thorax and wing-caſes with a ſtripe on the latter ferruginous. Fabr. The antennæ of this inſect are black; and the wing-caſes ſtriated with dots. One variety of this ſpecies has the ſtripe on the wing-caſes abbreviated. Fabricius conſiders the Chryſomela Hannoverana, Ranunculi, and Potentilla, as the ſame inſect.

Areata. Ovate, black; thorax and wing-caſes very ſmooth, with margin rufous. Fabr. Inhabits Paris. Cabinet of Boſc.

Scutellata. Ovate, rufous; wing-caſes with 5 black ſpots. Fabr. *Chryſomela ſcutellata*, Herbſt. A native of Germany.

5-Punctata. Ovate, black, with rufous thorax; wing-caſes teſtaceous, with five black dots. Fabr. Inhabits Hamburgh. Dr. Schutz.

Crotonis. Ovate, braſſy-black, with yellow antennæ. Fabr. From the cabinet of Dr. Pflug. Inhabits South America.

Pectoralis. Ovate, rufous; breaſt and abdomen at the baſe black. Fabr. *Dermeſtes rufus*, Herbſt. Inhabits Germany.

Litura. Ovate, pale rufous; wing caſes at the ſuture, and a longitudinal line of black. Fabr. Marſh, &c. Inhabits England.

Flavicans. Ovate, yellowiſh; wing-caſes cinereous-green. Fabr. Inhabits Germany. Hybner, &c.

Sacra. Ovate, above rufous; thoracic line, two dots, and ſuture of the wing-caſes black. Linn. Inhabits Paleſtine.

Hæmorrhoidalis. Ovate, black, and poliſhed; antennæ at the baſe, yellowiſh; above red. Linn. Found on the birch and alder in Europe.

Fucata. Ovate, black, thorax, and wing-caſes braſſy-green. Fabr. Inhabits Italy.

Aenea. Ovate, braſſy-green; tail ferruginous; antennæ and ſhanks black. Linn. Geoffr., &c. On plants in Europe.

2-Punctata. Ovate, teſtaceous; wing-caſes with a fuſcous ſpot. Fabr. A native of the Cape. Bankſian cabinet.

Philadelphica. Ovate, green; wing-caſes yellow with green ſpots; antennæ and legs ferruginous. Linn. A native of Pennſylvania.

Armoraciæ. Ovate, bluiſh, poliſhed, beneath black. Linn. A native of Europe.

Cochleariæ. Ovate, bluiſh, beneath black; wing-caſes ſtriated. Fabr. Inhabits plants in Germany.

Pallipes. Ovate, black; wing-caſes and legs very pale. Fabr. An inhabitant of Germany.

Sophiæ. Ovate, blue; ſhanks and ends of the feet yellow. Fabr. Found in Saxony.

Æruginea. Subrotund, braſſy; legs ferruginous. Fabr. *Chryſomela metallica*, Roſſ. Fn. Etr. A native of Italy.

Tenebricosa. Apterous, blackiſh-purple; wing-caſes uniformly punctured. Marſh. Fabr. *Chyſomela tenebrioides*, Gmel. *Tenebrio lævigatus*, Linn.

Ahenea. Braſſy-black, poliſhed; legs pitchy. Marſh. A new Britiſh ſpecies.

Olivacea. Olivaceous-teſtaceous; eyes and ſuture of the wing-caſes black. Forſk. Cent. 22. Inhabits England.

Aterrima. Black, poliſhed; thorax very glabrous; wing-caſes ſtriated; legs ſomewhat ferruginous. Marſh. An Engliſh inſect in the cabinet of Mr. Allen, as is alſo the following ſpecies.

Chalcea. Braſſy; wing-caſes with obſolete ſtriæ of dots. Marſh. Ent. Brit.

Unicolor. Black-blue, ſomewhat gloſſy, with numerous impreſſed dots. Marſh.

Viridi-ænea. Braſſy-green, with numerous dots; antennæ and legs ſame colour. Marſh.

Atro-violescens. Ovate, black-violet; wing-caſes ſtriated; legs pitchy. Marſh. Once taken near Holme, in Norfolk, by the Rev. Mr. Kirby.

* *Saltatoriæ;* having the poſterior thighs thick, and formed for leaping.

Flava. Yellow; thorax dotted with black; wing-caſes violet. Fabr. *Altica thoracica*, Fabr. Syſt. Ent.

Caroliniana. Yellowiſh; thorax with two dots, wing-caſes with five ſtripes of yellow. Fabr. Gmel. *Crioceris caroliniana*, Fabr.

Oleracea. Greeniſh-blue. Linn. Fn. Suec. An European inſect.

Albicollis. Thorax pale; wing-caſes braſſy, with two ſpots and a band of gold. Fabr. A native of New Holland.

Fulvicollis. Thorax reddiſh; wing-caſes pale; future and two ſpots black. Fabr. Country unknown.

Bicolor. Rufous; wing-caſes, and poſterior thighs blue. Degeer, &c. Inhabits America.

Quadrifasciata. Ferruginous, with four white bands on the wing-caſes. Fabr. This is a large inſect and inhabits Cayenne.

Cincta. Black; wing-caſes braſſy-green; margin and two dots white. Fabr. Inhabits Luſitania.

Quadriguttata. Ferruginous; thorax white; wing-caſes black, with four white dots. Fabr. Inhabits Cayenne.

Biguttata. Ferruginous, thorax and wing-caſes with two white dots. Fabr. A native of Cayenne.

Glabrata. Thorax pale, with three black dots; wing-caſes black, with two white ſtripes. Fabr. *Crioceris glabrata*, Fabr. Sp. Inſ.

Nobilitata. Ferruginous, margin of the wing-caſes and baud white. Fabr. A native of Cayenne.

Chrysocephala. Blue-black; head and four anterior legs pale yellow. Linn. Fn. Suec. Inhabits Sweden.

Hyoscyami. Greeniſh-blue; legs teſtaceous, poſterior thighs violet. Linn. Fn. Suec. *Capricornus exiguus ſaltatorius*, Ray. Inhabits Europe.

Quadripustulata. Black; wing-caſes with four rufous dots. Fabr. Inhabits Europe.

Anglicana. Black; wing-caſes and ſhanks pale. Fabr. Found on plants in England.

Atricillæ. Black, thorax, wing-caſes, and ſhanks teſtaceous. Linn. Fn. Suec.

Modeeri. Braſſy, poliſhed; wing-caſes yellow at the tip; anterior legs and ſhanks of the poſterior ones pale yellow. Linn. Inhabits Sweden and other parts of Europe.

Nitidula. Green, ſhining; head and thorax golden; legs ferruginous. Fabr. Inhabits Europe, on the willow.

Trifasciata. Above whitiſh with three brown bands. Fabr. Found on plants in Europe.

Nigripes. Braſſy-green; legs black. Fabr. Inhabits England.

Tabida. Pale, with the eyes black. Fabr. Found on plants in Europe.

Brassicæ. Black; wing-caſes pale, teſtaceous; margin entirely, and a band in the middle black. Fabr. A ſmall ſpecies found in Germany.

Nemorum. Wing-caſes yellow, with the margin entirely black. Fabr. Found on various plants in Europe.

Atra. Black, poliſhed; antennæ at the baſe, and tip of the feet pitchy. Geoffroy, &c. Found in France and Germany.

Rustica. Black; antennæ, legs, and tip of the wing-caſes teſtaceous. Gmel. An European ſpecies. The wing-caſes are very finely punctured.

Pulicaria. Black; wing-caſes with a poſterior ferruginous ſpot. Gmel. Very ſmall. Inhabits Europe.

Rufipes. Obovate, blue; head, thorax, legs, and antennæ rufous. Linn. Inhabits Sweden.

Testacea. Teſtaceous, gibbous; wing-caſes very ſmooth. Fabr. Geoffr. Inhabits Europe.

Fascicornis. Obovate, blue; head, thorax, and legs rufous; antennæ, fuſcous. Hornſt. Inhabits Germany.

Holsatica. Black, poliſhed; a red dot at the end of the wing-caſes. Fabr. A native of Europe.

Æquinoctialis. Thorax red; wing-caſes violet, with four alternate white ſpots. Degeer, &c. Found in South America.

Lens. Entirely blue-back, with dotted wing-caſes. Thunberg. Inhabits Upſal.

Exclamationis. Thorax black; wing-caſes black, with four yellow ſpots. Thunberg. Inhabits Upſal.

Hudsonias. Black, ſomewhat oblong; baſe of the antennæ ferruginous. Forſt. Nov. Inſ. A native of South America.

Quadrinotata. Black, antennæ yellowiſh at the baſe, wing-caſes with four teſtaceous ſpots. Pontoppid. Inhabits Denmark.

Pusilla. Black, antennæ and legs pale. Müll. Inhabits Denmark.

Luteola. Pale yellow, eyes, breaſt, and tip of the antennæ black. Müll. Inhabits Denmark.

Flaveola. Black; thorax and head rufous; wing-caſes, antennæ, and legs pale yellow. Müll. Inhabits Denmark.

Latiuscula. Fuſcous-black; ſhanks and joints of the feet ſomewhat yellowiſh. Müll. Inhabits Denmark.

Cruciferarum. Oblong, braſſy-black; legs black. Geoff. Inhabits France.

Denigrata. Black; thorax and wing-caſes yellow, mouth black. Geoffr. Inhabits France.

Truncata. Black; wing-caſes truncated, the tip ferruginous, legs and antennæ rufous. Scopoli. Inhabits Carniola.

Ovalis. Braſſy-black, legs black. Geoffr. Inhabits France.

Striata. Blue; head, thorax, antennæ, and legs rufous; wing-caſes ſtriated. Degeer. A native of Europe.

Lævigata. Blue; wing-caſes ſprinkled with dots; ſhanks ferruginous. Geoffr.

Crenata. Black; wing-caſes braſſy with crenated ſtriæ, antennæ at the baſe and the ſhanks pitchy. Muſ. Leſk. Linn. Inhabits Europe.

Discolor. Head, and thorax black; wing-caſes teſtaceo-fuſcous, glabrous; four anterior legs, and the ſhanks of the hinder pair ſomewhat teſtaceous. Linn. Muſ. Leſk. Inhabits Europe.

Picipes. Braſſy-green, dotted, legs pitchy, wing-caſes bay-colour, black towards the future. Linn. Muſ. Leſk. Inhabits Europe.

Annulata. Braſſy fuſcous; wing-caſes with crenated ſtriæ; antennæ at the baſe and four anterior ſhanks rufous, the latter with a braſſy-brown ring. Linn. Leſk. Muſ. Inhabits Europe.

A further number of the Linnæan Chryſomelæ will be found under the new genera Cnodulum, Crioceris, Cryptocephalus, Erotylus, and Galleruca.

CHRYSOMITHRES, in *Ornithology*, the name by which ſome call the gold-finch. See Fringilla *carduelis*.

CHRYSOPAGION, in *Natural Hiſtory*, a name by which ſome of the middle age writers have called the gem deſcribed by Pliny under the name of the *chryſolampis.* Salmaſius is of opinion that it was only a foul kind of the *chryſopraſius*, of which Pliny ſays, that ſome of them were full of ſpecks, and of a variable colour.

CHRYSOPETRON, a name given by Pliny, and others, to the yellower kind of the ancient topaz, that is, our chryſolite.

CHRYSOPHRYS, in *Ichthyology*, among the Greek and Latin authors, a name ſynonymous with Aurata, and applied by them to the fiſh called by Linnæus *Sparus auratas*, which ſee.

CHRYSOPHYLLUM, in *Botany*, (from χρυσος, *gold*, and φυλλον, *a leaf*. Golden leaf.) Linn. gen. 263. Schreb. 355. Willd. 400. Juſſ. 152. Vent. 2. 436. Caimitier. Enc. Meth. Claſs and order, *pentandria monogynia*. Nat. Ord. *Dumoſæ*, Linn. *Sapotæ*, Juſſ.

Gen. Ch. *Cal.* Perianth ſmall, permanent; deeply divided into five, roundiſh, obtuſe ſegments. *Cor.* monopetalous, ſhort, bell-ſhaped, five-cleft; ſegments roundiſh, much expanded; accompanied by five ſmall ſcales, which give it the appearance of being ten-cleft. *Stam.* Filaments five, ſhort, attached to the top of the tube; anthers roundiſh, didymous, incumbent. *Piſt.* Germ ſuperior, roundiſh; ſtyle ſhort; ſtigma obtuſe, obſcurely five-cleft. *Peric.* Berry one or ten-celled, large. *Seeds* one in each cell, bony, compreſſed, marked with a ſcar, ſhining.

Eſſ. Ch. Cor. bell-ſhaped, apparently ten-cleft; alternate ſegments ſpreading. Berry one ſeed in each cell.

Sp. C. *cainito*, Linn. Sp. Pl. 1. Mart. 1. Lam. 1. Willd. 1. Jacq. Amer. 51. tab. 37. pict. 30. tab. 51. Lam. Ill. Pl. 120. Broad-leaved ſtar-apple. "Leaves egg-ſhaped, downy and ſhining underneath; fruit roundiſh, ſhaped like an apple." β. Jamaicenſe; with purple fruit, Jacq. Amer. 52. pict. 31. Brown Jam. tab. 14. fig. 2. γ. cæruleum with fruit entirely blue. A tree from thirty to forty feet high, with a large ſpreading head. *Leaves* about five inches long, and two and a half broad, regularly ſtriated with fine lateral parallel nerves, alternate, petioled, egg-ſhaped, rather acute, quite entire, ſmooth, deep green above, covered underneath with a very fine ſilky ſhining down of a ferruginous gold colour. *Flowers* ſmall, axillary and faſcicled upon each peduncle. *Fruit* globular, about the ſize of a common apple, fleſhy, ſoft, with a ſmooth ſkin, and of a roſe colour, with a yellowiſh tint intermingled with a ſhade of green. It contains a milky, glutinous, ſweetiſh pulp, which envelopes from five to ten nuts, brown without, a little flattened, of an even ſurface, with a rude rugged border. The varieties β and γ appear to differ only in the colour of the fruit. Though the germ always contains the rudiment of a nut in each of the ten cells, it moſt frequently happens that ſome of them afterwards prove abortive. A native of the Weſt Indies, where the fruit is eaten, and the wood uſed for building. 2. C. *olivæforme*, Lam. Encyc. 2. Ill. 2471. (C. cainito; β. Linn. Sp. C. monopyrenum; Willd. Cainito foliis ſubtus aureo, fructu olivæforme; Plum. gen. 10. Burm. Amer. tab. 69. Acomas; Nichol. Doming. 141?) "Leaves ovate-oblong, tomentous and ſhining underneath; fruit the ſhape of an olive, with one ſeed." Damſon plum; Brown Jam.? A tree about the ſize of a common apple-tree, with a rough ruſſet bark beſprinkled with ſmall white ſpots. *Branches* ſpreading; ſmaller ones a little zigzag. *Leaves* alternate, ſomewhat reſembling thoſe of the citron; ſmooth, ſhining and dark green above; covered with a ſilky, golden down underneath; traverſed by a longitudinal rib, whence proceed laterally ſeveral parallel nerves a little curved. *Flowers* ſmall, axillary, faſcicled, one on each peduncle; calyx covered with a golden ferruginous down; ſtigma with five ruſſet diviſions. *Fruit* ſoft, the ſhape of an olive, but a little larger, of a dark violet colour when ripe, having a pleaſant vinous flavour, and containing a bluiſh nut, which encloſes a tender, oblong, acute kernel. Plum. MSS. A native of the Weſt Indies, flowering in October and November, and ripening its fruit in May and June. 3. C. *acuminatum*, Lam. Illuſ. 2469. "Leaves egg-ſhaped, acuminate, ſtriated with parallel lines, downy and ſhining, but pale underneath. A native of St. Domingo. La Marck queſtions whether this be not C. monopyrenum of Swartz. If ſo, there are two ſpecies with only one nut, and monopyrenum cannot be properly retained as a ſpecific name. 4. C. *anguſtifolium*, Lam. Ill. 2470. "Leaves lanceolate, ſtriated with parallel lines, ſhining, covered with a ferruginous down underneath; berries the ſhape of an olive." *Leaves* reſembling thoſe of the olive or privet. *Berry* ſometimes with two ſeeds. La Marck doubts whether this be ſpecifically different from his olivæforme. Are not all three merely varieties of the ſame ſpecies? And is there not ſome ground for a conjecture, that, when more accurately examined, they will be found to have a germ with ten cells, though it ripens only one, or at moſt two ſeeds? In this caſe the generic character may remain as it was firſt formed by Linnæus. 5. C. *microcarpum*, Willd. 3. Mart. 5. Swartz. Prod. 49. Ind. occ. 1. 482. "Leaves egg-ſhaped, ſmooth, pubeſcent underneath; berries oblong, oblique, one-ſeeded." *Fruit* very ſweet. Is not this alſo a variety of C. olivæforme? 6. C. *argenteum*, Mart. 2. Lam. Illuſ. 2472? Jac. Amer. 53. tab. 38. fig. 1. "Leaves falcate-ovate, tomentous and ſhining underneath." Swartz. "Leaves egg-ſhaped, acuminate-falcated; younger ones with a ſhining ſilvery down underneath; the older ones ſmooth on both ſides." Lam. A native of the Weſt Indies. 7. C. *pauciflorum*, Lam. Ill. 2473. Jacq. Amer. tab. 38. fig. 2.? "Leaves egg-ſhaped, acuminate, nearly ſmooth on both ſides, with only a few flowers in the axil of each leaf. A native of Martinico. 8. C. *rugoſum*, Mart. 6. Willd. 5. Swartz. Prod. 49. Ind. occid. 1. 484. "Leaves oblong, acuminate, ſmooth on both ſides; fruit acuminate, rough. A native of woods on mountains in Jamaica. 9. C. *pyriforme*, Willd. 6. (C. Macouco; Lam. Encyc. 4. Illuſt. 2475. Aub. guin. 1. tab. 92.) "Leaves oblong, acuminate, ſmooth on both ſides; fruit pear-ſhaped, with an even ſurface. A tree thirty feet high, and two in diameter, with a large much branched head; bark ſmooth, greyiſh, yielding when rounded a milky juice; wood white; hard and brittle. *Leaves* alternate, oval-oblong, pale green on both ſides. *Fruit* orange-coloured, on ſhort peduncles, growing from two to four together; fleſhy, milky, encloſing ſeveral roundiſh nuts, which contain a white, ſweet, eſculent kernel. According to Aublet the fruit has a more pleaſant flavour than that of the firſt ſpecies. 10. C. *glabrum*, Linn. Sp. Pl. 2. Mart. 3. Lam. Encyc. 3. Willd. 7. Jacq. Amer. tab. 38. fig. 2. "Leaves ovate-oblong, acute, ſmooth on both ſides; fruit elliptical, with an even ſurface." A tree fifteen feet high, ſtraight, branched. *Leaves* alternate, petioled, quite entire, a little coriaceous. *Fruit* blue, about the ſhape and ſize of a ſmall olive, with a ſweetiſh vinous flavour. A native of woods in Martinico.

CHRYSOPHYLLUM *carolinenſe*; Jacq. See BUMELIA *tenax*.

CHRYSOPHYLLUM *crinito*; Aubl. See BUMELIA *tenax*.

CHRYSOPHYLLUM *manglillo*; Lam. Illuſt. See BUMELIA *manglillo*.

CHRYSOPHYLLUM *macrophyllum*; Lam. Ill. See BUMELIA *nervoſa*.

CHRYSOPHYLLUM *barbaſco*; Læfl. it. See JACQUINIA *armillaris*.

CHRYSOPILON, in *Natural Hiſtory*, a name given by ſome ancients to a ſpecies of the beryl, which had a yellowiſh tinge.

CHRYSOPIS, more correctly *Chryſops*, in *Entomology*, a name applied by ſome old writers to the inſect called in England the "Golden Eye," from the beautiful gold colour of its eyes. It is of a moderate ſize, with four extremely thin and tranſparent wings of a ſomewhat ſilvery colour, with green ribs or nerves; it is common in gardens, eſpecially about elder trees, and has a remarkably ſtrong ſmell. In the days of Mouffet this inſect was known by the name of *muſca chryſops*; Ray calls it *muſca quadripennis corpore luteo-viridi*, and Petiver, *perla merdam olens*. With Linnæus, and other modern naturaliſts, it is a ſpecies of *hemerobius*. See HEMOROBIUS *perla*.

CHRYSOSPLENIUM, in *Botany*, (from χρυσος, and σπλην, *the ſpleen*, on account of the golden colour of the flowers, and of the ſuppoſed virtue of the plant in diſeaſes of the ſpleen.) Linn. 558. Schreb. 763. Willd. 886. Gært. 252. Tourn. 60. Juſſ. 309. Vent. ii. 284. Dorine, Lam. Encyc. Golden ſaxifrage. Claſs and order, *decandria digynia*. Nat. ord. *Succulentæ*, Linn. *Saxifragæ*, Juſſ.

Gen. Char. *Cal.* perianth one-leafed, ſhort, permanent, coloured, four, or very rarely five-cleft; ſegments oval, obtuſe, ſpreading, oppoſite ones narrower. *Cor.* none. *Stam.* filaments eight, very rarely ten, erect, very ſhort, attached to the lower part of the calyx; anthers ſimple, round. *Piſt.* germ half inferior, ending in two awl-ſhaped ſtyles, the length of the ſtamens; ſtigmas obtuſe. *Peric.* capſule two-beaked, one-celled, half bivalve, ſurrounded at its baſe by the calyx. *Seeds* numerous, ſmall.

Eſſ. Ch. Calyx four or five-cleft, coloured. Corolla none. Capſule two-beaked, one-celled, half inferior, half bivalved, many-ſeeded.

Obſ. Linnæus placed this genus in the claſs *decandria*, on account of the terminating flower, which, in his ideas, determines the true character of the fructification, being ſometimes decandrous; but as this is of very rare occurrence, and as none of our Engliſh botaniſts, after repeated reſearches, have found it ſo in a ſingle inſtance, it has ſcarcely a right to be conſidered as a decandrous plant, notwithſtanding its natural affinity to ſaxifraga. In an artificial ſyſtem octandria ſeems to be its proper claſs, where Dr. Stokes in Withering has accordingly placed it.

Sp. 1. C. *alternifolium*, Linn. Sp. Pl. Mart. Willd. Lam. Encyc. Gært. tab. 44. Flor. Dan. tab. 366. Eng. Bot. 54, but unfortunately taken from an imperfect ſpecimen without root-leaves. (Saxifraga aurea dodonæi, Bauh. Hiſt. S. aurea, foliis pediculis oblongis, Rai Syn. 158. Sedum rotundifolium paluſtra, foliis pediculis longis inſidentibus, Moriſ. Sect. 12. tab. 8. fig. 8.) Alternate-leaved golden ſaxifrage. "Leaves alternate." *Root* perennial, fibrous, throwing out offſets, but no creeping ſuckers. Whole plant ſucculent, tender. *Stem* three-ſided. *Leaves* all deeply notched; root-leaves two or three, kidney-ſhaped, bluntly notched, on long hairy petioles; ſtem-leaves alternate, one of them ſolitary, about the middle of the ſtem, the reſt cluſtered, partly about the root, and partly near the flowers. *Flowers* gold-coloured; in a terminal, dichotomous leafy corymb. A native of England, and other northern parts of Europe, flowering in May; intermingled with the next ſpecies, but much more rare. 2. C. *oppoſitifolium*, Linn. Sp. Pl. Mart. Willd. Lam. Curt. Lond. Faſc. ii. tab. 27. Flor. Dan. tab. 365. Eng. Bot. tab. 490. (Saxifraga aurea, Rai. Syn. 158. Lob. Ic. 612. Sedum paluſtre rotundifolium, Moriſ. tab. 8. fig. 7.) Oppoſite-leaved golden ſaxifrage. "Leaves oppoſite." Habit of the preceding, but paler. *Root* perennial. *Stems* creeping at the bottom, ſquare, or with two oppoſite deep furrows, very tender, beſet with a few ſtiffiſh white hairs about four inches high. *Leaves* petioled, ſpreading, roundiſh, with a few ſtiffiſh white hairs on the upper ſurface, repand, ſomewhat fleſhy, yellowiſh green, whitiſh underneath; the upper ones more deeply notched. *Flowers* yellow, in a ſeſſile faſtigiate corymb. The notched glandular ring, which ſurrounds the baſe of the germ, is placed between that part and the inſertion of the ſtamens, and therefore, as Curtis remarks, cannot be, as Linnæus ſtyles it, a receptacle. It ſeems to be properly a nectary. A native of moiſt places in England and other parts of the north of Europe, flowering, with the preceding, in May.

CHRYSOPOLIS, in *Ancient Geography*, an epiſcopal town of Aſia, mentioned in the council of Conſtantinople.—Alſo, an epiſcopal ſee in Africa, in Mauritania.—Alſo, an ancient town of Aſia Minor, ſituated near Chalcedon, and oppoſite to Byzantium. It had a fine port; and when the Perſians were maſters of it, they collected there the tribute which they drew from the different towns. It was a place of commerce with the inhabitants of Chalcedon. Xenophon ſays, that the Athenians encompaſſed this place with walls; that they impoſed a tenth on the ſhips that came hither from the Euxine ſea; and that they ſtationed here a fleet of 30 ſail for the ſecurity of the port.—Alſo, an ancient epiſcopal town of Aſia, called *Chriſtopolis*, under the metropolitan ſee of Boſtra, in the patriarchate of Antioch.

CHRYSOPRASE. The colour of this mineral is apple-green, paſſing into graſs and olive-green and greeniſh grey. It is found in maſs, in angular fragments, and thick plates. Internally it exhibits a ſlight degree of luſtre. Its fracture is even, paſſing ſometimes into fine ſplintery and flat conchoidal, with indeterminate ſharp-edged fragments. Its hardneſs is ſomewhat leſs than that of chalcedony. Sp. gr. 3.25.

Before the blow-pipe chryſopraſe becomes opake and colourleſs, but it is infuſible *per ſe*. It has been analyſed with great accuracy by Klaproth, and appears to conſiſt of

Silex	-	96.16
Lime	-	0.83
Oxyd of nichol		1
		97.99

It has hitherto been found only at Koſemutz in Lower Sileſia, imbedded in ſerpentine, along with quartz, opal, chalcedony, &c. It paſſes into hornſtone and chalcedony, and appears to differ from this laſt in little elſe than colour.

When kept long in a warm and dry ſituation it loſes the greateſt part of its colour. The apple-green variety is in ſome eſtimation among jewellers, and is cut into ſtones for rings.

CHRYSOPRASUS, in *Chriſtian Antiquity*, the tenth of thoſe precious ſtones which adorned the foundation of the heavenly Jeruſalem; the colour of it was green, much like that of a leek, but ſomething inclining to that of gold, as its name imports.

CHRYSORHOAS, or CHRYSORRHOAS, in *Ancient Geography*, a river of Aſia, in Syria, which ran near the town of Damas, and fertilized the environs of this town. Pliny and Strabo repreſent this river as diſtributing itſelf in ſtreams.—Alſo, a river of Aſia, in the Colchide territory. Pliny.—Alſo, a river of Aſia Minor, in Lydia, the ſource of which is placed by Pliny near mount Tmolus.

CHRYSORRHOES, a river ſituated towards the extremity of the peninſula on the ſouth-eaſt of the Argolide. It watered the town of Trazena; and derived its name of the "River of Gold," from the quantity of this metal which it depoſited.

CHRYSOSTOM, John, in *Biography*, an eminent and very eloquent father of the church, was a native of Antioch about the year 347. The name of Chryſoſtom, ſignifying in the Greek *golden-mouth*, was not applied to him till after his death, when his works had rendered him illuſtrious for eloquence. He was, at a very early age, inſtructed in the principles of the Chriſtian religion, and derived all the advantage which the beſt maſters in human learning could yield him. He was originally intended for the bar, but, being diſguſted with the profeſſion, he applied himſelf to the ſtudy of the Scriptures, and other departments of ſacred literature: he perſuaded alſo two of his friends, Theodorus and Maximus, to purſue the ſame courſe. When he was about twenty-ſeven years of age, he retired from the world to an aſcetic life, firſt in company with a monk upon a mountain near Antioch, and then in a cave by himſelf. The auſterities which he voluntarily inflicted on himſelf, injuring his health, he returned to Antioch, after having paſſed ſix years in the condition of a hermit. He was then ordained a deacon, and afterwards a prieſt, and, devoting himſelf to the labours of the pulpit, he became ſo celebrated for his eloquence, that, upon the death of Nectarius, he was unanimouſly choſen as patriarch or archbiſhop of Conſtantinople, in 397. While Chryſoſtom was at Antioch he wrote ſeveral books, and acquired much reputation as a preacher. He was a man of great ſimplicity of character, ſeverity of manners, and freedom of ſpeech, which brought him many enemies: but, notwithſtanding his virtues, which are admitted on all hands, it is equally notorious, that he was haughty and arbitrary. It was with difficulty that he was forced from Antioch, but when he came to Conſtantinople, he avoided as much as poſſible promiſcuous ſociety; he devoted his time to his ſtudies and profeſſional duties; and all that he ſaved by economy in his own expences, he liberally beſtowed on the poor. He erected new hoſpitals in that metropolitan city, took care of the ſick and the ſtrangers, and provided for widows and virgins. He was an enthuſiaſtic admirer of the monaſtic life, and exhorted the young of both ſexes to a ſtate of celibacy; and, in other reſpects, he preached up a rigour of manners very incompatible with the character of the times. He indulged a perſecuting ſpirit againſt thoſe who did not rank themſelves with Chriſtians, pulling down the pagan temples, and haraſſing, as much as poſſible, thoſe who were deemed heretics. He extended his archiepiſcopal juriſdiction, and, in a viſitation of the Aſiatic provinces, he depoſed thirteen biſhops of Lydia and Phrygia. This temper, and theſe auſtere manners, created him many enemies, and he was at length accuſed of diſreſpect to the empreſs Eudoxia, and cruelty to ſome of the clergy; a ſynod was convened, in the year 403, before which, articles of accuſation were brought againſt Chryſoſtom. He was ſummoned, but, declining to put himſelf into the hands of his profeſſed enemies, he was condemned, depoſed, and baniſhed. When this event was known at Conſtantinople, a dreadful tumult was excited, which created ſo much alarm, that Eudoxia, who was his principal enemy, petitioned for the archbiſhop's return. Another ſynod, conſiſting of ſixty biſhops, aſſembled at Conſtantinople, and reſcinded all that had been done againſt Chryſoſtom, and he was reſtored with great triumph. Toward the end of this year, the empreſs cauſed her own ſtatue to be erected near the church, and the people celebrated public games before it to her honour. Chryſoſtom, confiding, perhaps, in his own popularity, and irritated againſt the empreſs, preached againſt this as an indecency, openly declaring, that the ſtatue had been erected in contempt of the church. The empreſs endeavoured again to aſſemble the ſynod, but the prelate, far from being intimidated, reproached her conduct in ſtill more bitter terms, repreſenting her as another Herodias, who wiſhed to have the head of another John, meaning his own, in a charger. The empreſs now was bent on his deſtruction, in which ſhe ſucceeded. Chryſoſtom was depoſed, and baniſhed. On the day of his departure, the great church and adjoining palace were burnt to the ground. He was firſt taken to Nice, and thence was conveyed to the place aſſigned for his reſidence, which was Cucuſus, a deſolate town among the ridges of mount Taurus, in Leſſer Armenia. The death of the empreſs, ſome peculiar circumſtances in that of Cyrinus, biſhop of Chalcedon, a bitter enemy of Chryſoſtom, and a dreadful hail-ſtorm, which happened ſoon after his baniſhment, were interpreted by his friends as marks of the Divine diſpleaſure at the conduct of his enemies. Chryſoſtom, in the mean time, did not ſuffer his mind to ſink under his misfortunes; he actively employed himſelf in maintaining a correſpondence with the moſt diſtant provinces, in conſoling and exhorting his adherents left behind him in the metropolis, and in ſupporting his cauſe before the ſee at Rome, which had always been diſpoſed to favour him. That he was able to live ſo comfortably was a great mortification to his enemies: they procured an order for his removal ſtill farther from the capital, to Pitycens, a town on the Euxine Sea; but he died on his journey, at Comanis in Armenia, owing to the great hardſhips to which he was expoſed. After his death, the Eaſt and Weſt were for ſome time divided with reſpect to the tribute due to his memory. By the latter, it was held in great reverence; but the eaſtern biſhops refuſed to inſert his name in the regiſters of thoſe who were to be mentioned with honour at the celebration of the euchariſt. Within ten years, he was generally revered as a ſaint, and, in the year 438, at the ſolicitation of the clergy and people of Conſtantinople, his relics were tranſported from their obſcure ſepulchre to the royal city. The emperor Theodoſius advanced to receive them as far as Chalcedon; and falling proſtrate on the coffin, implored, in the name of his guilty parents, the forgiveneſs of the injured ſaint. Chryſoſtom was undoubtedly the moſt diſtinguiſhed of all the Greek fathers, as Auſtin was among the Latins. He is ſaid to have compoſed more than a thouſand ſeparate pieces; but the greateſt part of his writings are ſermons, or expoſitions of ſcripture delivered as ſermons, with practical improvements annexed to them. His ſtyle is free, copious, and unaffected. He is dignified and correct in his phraſeology, varied and abundant in his figures and illuſtrations. His diſcourſes and illuſtrations of ſcripture are often more fanciful than ſolid, but copious, and full of particulars. In his declamations againſt the vices and follies of the times, he has alluded to ſo many circumſtances, that a hiſtory of the manners and cuſtoms of the times may be derived from his works, which is no where elſe to be met with. The moſt regular of his treatiſes, is a dialogue on the duties of a biſhop. The moſt complete edition of his works is that publiſhed by Montfaucon, the learned Benedictine, in 1734, which is accompanied with a life of the author, prefaces, notes, and various readings. Gibbon. Lardner.

CHRYSTAL. See Crystal.

Chrystal *Mineral*, the ſame as *Sal prunella*.

CHRYSTALLINE. See CRYSTALLINE.

CHRYSTALLIZATION. See CRYSTALLIZATION.

CHRYSTALLUS, in *Ancient Geography*, a name anciently given, according to Plutarch, to the river Thermodou of Scythia, becauſe it was frozen even in ſummer.

CHRYSUM, a name given by Ptolemy to the third mouth of the river Indus, reckoning from the weſt.

CHRYSUS, a river of Aſia Minor, which ran towards Laodicea.—Alſo, a river of Spain, placed by Feſtus Avienus in Bœtica.

CHTHONIA, in *Antiquity*, a feſtival kept in honour of Ceres, called *Chthonia*. For the ceremonies obſerved in it, ſee Pott. Archæol. lib. ii. cap. 20.

CHVALINSK, or KHVALYNSK, in *Geography*, a town of Aſiatic Ruſſia, in the government of Saratof, and alſo its adjacent diſtrict, ſituated on the Volga, 350 miles S.E. of Peterſburg. N. lat. 52° 25′. E. long. 57° 54′.

CHUB, in *Ichthyology*. See CYPRINUS *Cephalus*.

CHUBANA, in *Ancient Geography*, a town of Aſia in Meſopotamia, ſeated on the eaſtern bank of the Euphrates.

CHUBB, THOMAS, in *Biography*, a controverſial writer, was born Sept. 21, 1679, at a ſmall village near Saliſbury. He received no other education than the firſt elements of reading and writing, and was obliged at an early age to ſeek a livelihood by the labour of his own hands. He was apprentice to a glover, with whom, and afterwards with a tallow-chandler, he worked as a journeyman. Being poſſeſſed of uncommon natural abilities, and having a very ſtudious turn of mind, he ſpent his leiſure hours in the acquiſition of knowledge of various kinds, but his inclination led him chiefly to the ſtudy of divinity. In 1710, Mr. Whiſton publiſhed the hiſtorical preface to his "Primitive Chriſtianity Revived." The principal point diſcuſſed in this preface was the ſupremacy of God the Father: Chubb read the piece, but not being ſatisfied with the ſtatement of the argument, he drew up his own opinion on the ſubject, which, at the deſire of one of his own friends, was ſhewn to Mr. Whiſton. It ſo well coincided with the opinions of this very learned divine, that by the leave of Chubb, he publiſhed it with a few alterations which did not in the leaſt affect the grand point in queſtion. In the year 1715 it appeared under the title of "The Supremacy of the Father aſſerted; or Eight Arguments from Scripture to prove that the Son is a Being inferior and ſubordinate to the Father, and that the Father is the Supreme God." The perſpicuity and ability with which this tract was written procured Mr. Chubb great reputation, but he was alſo aſſailed from various quarters with much vehement abuſe. He found himſelf called upon to vindicate himſelf and his work, and thus commenced the controverſy that ended only with his life. In the year 1730 he publiſhed a collection of tracts, in a quarto volume, upon various important topics, moral and theological. Of the author, Mr. Pope ſpeaks with great reſpect, and ſays, that "he had read the whole volume with admiration of the writer, though not always with approbation of the doctrine." The next piece publiſhed by Chubb was "A Diſcourſe concerning Reaſon in Matters of Religion, with Reflections upon the comparative excellency and uſefulneſs of Moral and Poſitive Duties." This meeting with oppoſition, he publiſhed a vindication of it, inſiſting more ſtrongly upon the ſufficiency of reaſon to all human beings. In 1734 he publiſhed a volume conſiſting of tracts on the inſpiration of the New Teſtament; and on the reſurrection of Chriſt as a proof of the divinity of the doctrine which he taught; on the caſe of Abraham being ordered to offer up his ſon; and on the parable of the unmerciful ſervant. In the year 1738 he publiſhed "The true Goſpel of Jeſus Chriſt aſſerted," in which he profeſſes to ſeparate the corruptions of Chriſtianity from its eſſence. One of his next pieces was an "Enquiry into the Ground and Foundation of Religion;" in this he vindicates the principles of natural religion. He afterwards proceeded to the examination of miracles, and at length appears to have taken a decided part with thoſe, whom it has been the faſhion to denominate free-thinkers, but who, in truth, reject the truths of revealed religion. In his poſthumous works, publiſhed in 1748, we have his mature thoughts on a variety of topics relative to religion and morality, in which though he ſeems willing to give up the evidences of the Jewiſh and Chriſtian religion, yet he draws the concluſion that Jeſus was probably ſent by God as an inſtructor of mankind. Chubb began, as we have ſeen, to write as a rational Chriſtian, and he never expreſsly denied the divine miſſion of Jeſus; he engaged, however, in controverſies to which his limited knowledge was not equal, though his natural abilities might be well adapted for ſuch important diſquiſitions; there is no reaſon to believe that he ever examined the hiſtorical evidences of revealed religion, yet in his poſtumous works he inſinuates many things calculated to prejudice the young and the thoughtleſs againſt it. He denies a particular providence, and the neceſſity of prayer. With reſpect to a future ſtate, he expreſſes himſelf very variouſly, and without much confidence on either ſide of the queſtion. Mr. Chubb was never anxious to riſe above the humble condition in which fortune had placed him: to the laſt period of life he took pleaſure in aſſiſting in the trade of a tallow-chandler. He met with many friends who aſſiſted him, among theſe was ſir Joſeph Jekyl, who made him his companion in his intervals of leiſure. In this ſituation Chubb had an opportunity of becoming acquainted with many of ſir Joſeph's friends, though it has been aſſerted that on extraordinary occaſions he aſſiſted as a ſervant out of livery. It is certain his ſtay with that gentleman was not long; he choſe to return to Saliſbury. The generoſity of his friends followed him in his retreat. Mr. Cheſelden, the celebrated ſurgeon, was one of his benefactors; and in the latter part of his life, Mr. Samuel Dicker offered to ſettle an annuity of 50 pounds upon him if he would leave Saliſbury, but this offer he declined, as he did not at that time ſpend the income of his fortune. He injured his health by too intenſe ſtudy; however his life was prolonged to his ſixty-eighth year, and agreeably to a wiſh which he had been accuſtomed to expreſs, he was happily exempted from many of thoſe evils which too frequently aggravate the bitterneſs of death. On the eighth of Feb. 1746-7, after a ſhort complaint of an unuſual pain in his ſtomach, he ſuddenly breathed his laſt as he ſat in his chair. He was buried in St. Edmund's church in Saliſbury. The eminence of Mr. Chubb's intellectual abilities is generally allowed, and on this account he was not only admired by the perſons already named, but by Dr. Clarke, biſhop Hoadly, Dr. John Hoadly, and many other diſtinguiſhed divines. With reſpect to his moral character, he was uniformly formed for integrity, ſimplicity and ſobriety of manners, and he attended the ſervices of his pariſh church to the time of his death. Biog. Brit. Leland.

CHUBDARS, a name given in Bengal to thoſe Mooriſh ſervants who are employed to carry meſſages, &c. for ſtate. Thoſe in the Dutch ſervice carry a long ſtaff in their hand, which is entirely covered with ſilver, with which they go before the palankeen of the directors and of the two members of the council next in rank; but the latter are allowed no more than two chubdars, and their ſtaves may be only half plated with ſilver.

CHUCHIA, in *Zoology*, a name given by Cardan, Oviedo, and ſome others, to the opoſſum, *Diadelphis opoſſum* of Schrebers?

CHUCHUNGUA, in *Geography*, a ſmall place of South America, in the country of Jaen de Bracamoros, ſeated on a river of that name, in 25° 29′ S. lat. As the river Maranon is not navigable up to Jaen, this town ſerves as a port to it, and thoſe who wiſh to embark on the Maranon go by land from Juen to Chuchungua, and from hence fall down into the Maranon. This town lies four days journey from the city, but in this mode of reckoning it ſhould be conſidered, that ſuch are the difficulties of the road, as to render it impoſſible to travel in half a day or ſometimes a whole day, an interval which might be paſſed over on good ground in an hour or two.

CHUCKING, among *Rope-makers*, denotes a long, ſtout, coarſe, hemp, rather foul, and uſed for making inferior rope. Short chucking is the foul hemp from the ends of the long chucking.

CHUCUITO, *juriſdiction of*, in *Geography*, a province or juriſdiction of South America belonging to the dioceſe of La Paz and audience of Charcas. It begins about 20 leagues W. of Paz; and as ſome part of it borders on the lake of Titicaca, that collection of waters is alſo called the lake of Chucuito. The extent of this province from N. to S. is between 26 and 28 leagues, its temperature is in general cold and very unpleaſant; the froſts continuing one half of the year, and during the other half either ſnow or hail is continually falling. Accordingly the only eſculent productions of the vegetable kingdom are the papas and quinoas. The inhabitants, however, have a very beneficial trade in cattle, which abound in this juriſdiction, by ſalting and drying their fleſh. The traders who carry it to the coaſt exchange it for brandy and wine, and thoſe who go to Cochabamba carry alſo papas and quinoas, which they barter for meal. The mountains in this province have ſilver mines, which formerly produced large quantities of this metal, but they are at preſent totally abandoned.

CHUCUITO, *lake of*, otherwiſe called the lake of *Titi-caca*, lies between the provinces comprehended under the general name of Calloa, and is of all the known lakes of America much the largeſt. Its figure is ſomewhat oval, inclining nearly from N.W. to S.E.; its circumference is about 80 leagues, and the water in ſome parts 70 or 80 fathoms deep. Ten or twelve large rivers, beſides a great number of ſmall ſtreams, diſcharge themſelves into it. The water, though neither bitter nor brackiſh, is turbid, and has a taſte ſo nauſeous that it cannot be drank; it abounds with fiſh of two oppoſite kinds; the one large and palatable, which the Indians call “Suchis;” the other, ſmall, inſipid, and bony, termed long ſince by the Spaniards “Boyas.” It has alſo a great number of geeſe and other wild fowl, and the ſhores are covered with flags and ruſhes, the materials of which the bridges are made. As the weſtern borders of this lake are called Chucuito, thoſe on the eaſt ſide are diſtinguiſhed by the name of “Omaſcuyo.” It contains ſeveral iſlands, among which is one very large, and was anciently one mountain, but ſince levelled by order of the Incas. It however gave to the lake its own name of Titicaca, which in the Indian language, ſignifies a mountain of lead. In this iſland the firſt Inca, Mango Capac, the illuſtrious founder of the empire of Peru, invented his political fable, that the Sun, his father, had placed him, together with his ſiſter and conſort, Mama Oillo Huaco, there, enjoining them to draw the neighbouring people from the ignorance, rudeneſs, and barbarity, in which they lived, and humanize them by cuſtoms, laws, and religious rites, dictated by himſelf; and in return for the benefits reſulting from this artful ſtratagem, the iſland has been conſidered, by all the Indians, as ſacred; and the Incas determining to erect on it a temple to the ſun, cauſed it to be levelled, that the ſituation might be more delightful and commodious.

This was one of the moſt ſplendid temples in the whole empire. Beſides the plates of gold and ſilver with which its walls were magnificently adorned, it contained an immenſe collection of riches, contributed by all the inhabitants of provinces which depended on the empire, who were under an indiſpenſable obligation of viſiting it once a year and offering ſome gift. Thus were accumulated gold, ſilver, and jewels. The Indians when they perceived the rapacious violence of the Spaniards, are thought to have thrown this immenſe maſs of riches into the lake. Towards the ſouth part of the lake is a kind of bay formed by the approach of the banks to each other; and this bay terminates in a river called “Al Deſaguadero,” or the drain, and afterwards forms the lake of Pavia, which has no viſible outlet, but from which the water is diſcharged by a ſubterraneous paſſage.

CHUDLEIGH, in *Geography*, is a ſmall but neat town in Devonſhire, England, for which the privilege of holding a weekly market, and two annual fairs, was obtained by the biſhops of Exeter, who had a magnificent palace about a quarter of a mile to the ſouth, part of which yet remains. Lord Clifford, of Ugbrooke, now poſſeſſes the manor, which formerly abounded with wood; the north-eaſt ſide of the pariſh ſtill retains the name of Chudleigh-woods. The vicinity preſents ſome very beautiful views; and is celebrated for cyder. The town principally conſiſts of one long ſtreet, at the weſtern end of which is a ſmall white-waſhed church, containing ſome monuments of the Courtenay family. Chudleigh is ſituated 182 miles W. of London, and contains 414 houſes; the number of inhabitants being 1786. The market is held on Saturdays.

CHUDLEIGH *Rock*, about half a mile from the town, is, in the opinion of Mr. Polwhele, “one of the moſt ſtriking inland rocks in the iſland.” Viewed from the weſt, it diſplays a bold broad front, almoſt perpendicular; which, to appearance, is one ſolid maſs of marble; from the ſouth-eaſt, a hollow opens to the ſight, with an impetuous ſtream, which ruſhes over the rude ſtones that impede its paſſage, and forms a romantic water-fall, which

> “In loud confuſion o'er the broken ſteep
> Abruptly pours, and daſhes down the deep.”

Midway down the cliff, is a large cavern, whoſe gloomy receſſes the traditions of the peaſantry have aſſigned for the habitation of Pixies, or Piſgies, a race of ſupernatural beings, or ſort of fairies. The entrance to the cavern is by a natural arch, about twelve feet wide and ten in height; the paſſage continues nearly of the ſame dimenſions for about twenty yards, when it ſuddenly diminiſhes to ſix feet by four, and, ſtill gradually decreaſing in ſize, extends about fifteen yards further. Here it expands into a ſpacious chamber, which divides and runs off into two different directions; but the rock dropping, neither of them can be purſued to any conſiderable diſtance.

About one mile ſouth-weſt of Chudleigh is *Ugbrooke*, the ſeat of lord Clifford, baron of Chudleigh. This demeſne, for internal beauties, ſurpaſſes any in Devon; the park and grounds comprize much beautiful and highly pictureſque ſcenery; conſiſting of cluſtered woods, rugged rocks, and inequality of ſurface; they comprehend a ſpace of between ſeven and eight miles in circumference; and abound with oak, elm, aſh, and cheſnut, of the moſt luxuriant growth. Hiſtory, &c. of Devonſhire, by Polwhele, fol.

CHUDUCA, in *Ancient Geography*, a town of Aſia, placed by Ptolemy in Babylonia.

CHUGANSERAI, in *Geography*, a town of Aſia in the ſoubah of Cabul, or, according to the emperor Baber, at the weſtern extremity of Caferiſtan, on a river of the ſame name; 80 miles N.E. of Cabul. N. lat. 34° 55′. E. long. 70° 8′.

Chuganserai, a river of Aſia, near the above-mentioned town, which flows from the N.E. quarter in reſpect of the town, and from behind, *i.e.* from the north of Bijore, and joins the Bacan river, in the diſtrict of Kameh, where their united ſtreams take an eaſterly courſe.

CHUKA, or Chooka, a caſtle in the country of Bootan, which is a large ſquare building, placed on elevated ground, and having one entrance into it by a flight of ſteps, and through a ſpacious gate-way, with large heavy doors; it is built of ſtone, and the walls are of a prodigious thickneſs. This caſtle is ſeated on the river Tehintchieu, and at a ſhort diſtance above it is a chain-bridge, called Chuka-chazum, ſtretched over the river, and admitting only one horſe to paſs over it at a time. It ſwings as you tread upon it, reacting at the ſame time with a force that impels you, every ſtep you take, to quicken your pace. On the five chains that ſupport the platform are placed ſeveral layers of ſtrong coarſe mats of bamboo, looſely put down, ſo as to play with the ſwing of the bridge; and a fence on each ſide, formed of the ſame materials, contributes to the ſecurity of the paſſenger. Capt Turner, in his "Account of an Embaſſy to Tibet," has given a drawing of the plan and ſections of this bridge, conſtructed from a meaſurement of its different parts, together with a perſpective view of it, and the adjacent ſcenery. There is a ſimilar bridge over the river Tees, deſcribed by Hutchinſon in his "Hiſtory and Antiquities of Durham." The ſuperſtitious inhabitants conſider this bridge as ſomewhat more than mere human production, and aſcribe it to the dewta Tchuptihup, whoſe origin and hiſtory cannot be traced with any degree of certainty. Tradition ſays, that this diſtinguiſhed perſon, in his flight from Bootan to the country of the Racuſſes, whoſe ruler he put to death, and the government of which he aſſumed, paſſed over a mountain at ſome diſtance from Chuka, through a chaſm in the ſolid rock of the depth of 18 or 20 feet, juſt wide enough to admit a man on horſeback, and that in ſcrambling over the rock, he left a deep impreſſion of his hands and feet upon the ſtone. The veſtiges are ſtill pointed out, and the people are credulous enough to believe the ſtory. This mountain communicates with that which is oppoſite to it by a very curious and ſimple bridge, conſtructed for the accommodation of ſingle paſſengers. It conſiſts of two large ropes made of twiſted creepers, ſtretched parallel to each other, and encircled with a hoop. The paſſing traveller places himſelf between the ropes, and ſitting down on the hoop, ſeizes one rope in each hand, and thus ſliding himſelf along, croſſes an abyſs which cannot be viewed without ſhuddering. By this mode of paſſing from one mountain to another, travellers ſave a laborious journey of ſeveral days. In the vicinage of Chuka are many well-cultivated fields of wheat and barley. It is diſtant from Murichom about 18 miles. N. lat. 27° 15′. E. long. 89° 35′.

CHUKOTSKIJA, a province of Siberia, and the moſt eaſterly of the dominions of Ruſſia, extending from 63° to 73° 20′ N. lat. and from 156° 14′ to 189° 14′ E. long. See Tschutski.

CHULAPU, is one of the deſerts of the Andes in South America, in which the Spaniſh aſtronomers, deputed to meaſure the meridian, placed one of their ſignals.

CHULLABIS, in *Ancient Geography*, a town of Africa, according to St. Auguſtine.

CHULUTECA, or Xeres, in *Geography*, a town of Mexico, in the province of Guatimala, on the N. ſide of the river Fonſeca. N. lat. 13° 20′. W. long. 88° 6′.

CHUMANA, or Phumana, in *Ancient Geography*, a town of Chaldæa.

CHUMBI-VILCAS, in *Geography*, a juriſdiction of South America, in the dioceſe of Cuſco; which extends in ſome parts above 30 leagues, and has different temperatures of air, great quantities of corn and fruits, and large herds of cattle, together with ſome mines of ſilver and gold.

CHUMBUL, one of the moſt conſiderable rivers in Hindooſtan. Taking its riſe near the ancient city of Mundu, in the heart of the province of Malwa, within 15 miles of the Nerbudda, it purſues a north-eaſterly direction, and after waſhing the city of Kotah, and receiving the tribute of many ſubordinate ſtreams, at length empties itſelf into the Jumna, 20 miles below Etawa. The whole length of its courſe is about 440 miles. The village of Keyterce ſtands on its ſouthern bank, and the width of its channel is here $\frac{3}{4}$ of a mile.

CHUMDA-TCHIEN, a river of Aſia, in the country of Bootan, which flows from the eaſt and diſcharges itſelf into the Tehintchieu, near its junction with the Patchieu.

CHUMLEIGH, or Chimleigh, is a ſmall market-town, in Devonſhire, England, ſituated on the north bank of the river Dart. The church was formerly collegiate, and four prebends are ſtill annexed to the rectory. This ſtructure was greatly damaged in July 1797, by a tremendous ſtorm; in which the lightning acted with ſuch amazing force, that a ſtone, upwards of 200 pounds in weight, was carried from the ſouth-eaſt pinnacle completely over the tower, without touching it. The number of houſes in this pariſh is 296: of inhabitants 1333. Chumleigh is 194 miles W. from London; has a weekly market on Thurſday; and an annual fair.

CHUMULAREC, the name of a range of mountains in the ſouthern part of Tibet, about N. lat. 28° 5′, and 89° 20′ E. long.; which is covered with ſnow all the year. Many rivers originate in theſe mountains, and flow towards the ſouth, with a rapid deſcent, through Boutan into Bengal; while others, taking a northerly direction, fall into the Berhampooter, and are conveyed with it, to a junction, in the neighbourhood of the ſea, with the waters which flow in a contrary courſe from the ſame general ſource. This fact proves that this part of Little Tibet conſtitutes the higheſt point of land.

CHUN, or Cun, in *Ancient Geography*, a town of Aſia in Syria, conquered by David, and mentioned in the book of Chronicles.

CHUNAGUR, or Junagur, in *Geography*, a city and fortreſs of Hindooſtan, in the heart of the peninſula of Guzerat.

CHUNAM. See *Calcareous* Cement.

CHUNAR, a fortreſs of Hindooſtan, in the country of Benares, ſituated on a rock on the ſouth ſide of the Ganges, and ſurrounded with walls and towers; ceded to the Engliſh by the nabob of Oude; 13 miles S. of Benares. N. lat. 25° 10′. E. long. 83° 5′.

CHUNAUB, or Jenaub, a river of the Panjab in India, the *Aceſines* of Alexander, and the *Sandabalis* of Ptolemy. This river is larger than the Behut, and has its ſources more remote; for it riſes on the eaſt of Kiſhtewar and has two diſtinct heads. Its general courſe is remarkably ſtraight from N.E. to S.W.; and after leaving Jummoo, paſſes through a flat country, gradually approaching the Behut. The junction of theſe rivers is effected with great violence and noiſe, and no leſs danger to navigators; and this circumſtance is peculiarly noticed both by the hiſtorians of Alexander and of Timur. The ſpace between the Chunaub and Behut is no where more than 30 geographical miles, within the limits of the Panjab. The ſpace between the Rauvee and Chunaub, at their entry on the plains, is about 54 geographical miles; and they gradually approach each other, during a courſe of ſeven miles. The junction of the Rauvee with the Chunaub, or rather the Chunaub and Behut collectively, is effected nearly midway between Toulamba and Moultan. The Ayin Acbaree allows 27 coſſes between the junction of the Behut and Chunaub, and that of the Rauvee with the Chunaub: but, from circumſtances, major Rennell concludes, that the diſtance muſt be applied to the *courſe* of the river, not to the road by land. When theſe three rivers are united, they form a ſtream equal to the Indus itſelf, at the place of confluence; which is from 20 to 30 miles below Moultan.

CHUNCOA, in *Botany*, a barbarous name of a tree borrowed from the natives by Pavon, who found it in woods near the river of Amazons, and adopted by Juſſieu as a diſtinct genus with the following character: *Cal.* five-cleft, with a ſpreading border. *Stam.* ten. *Peric.* capſule, five-cornered; angles winged, the two oppoſite ones larger. *Seed* one, not crowned. *Leaves* alternate, diſtant. *Flowers* in axillary ſpikes, hermaphrodite at the baſe, male near the top. The authors of Flor. Peruv. call it gimbernatia, and have figured it under that name in pl. 36. of their work. It would arrange under polygamia monœcia of the Linnæan ſyſtem, and is placed in the natural order elæagni by Juſſieu.

CHUNDNAH, in *Geography*, one of the ſubordinate branches of the Ganges, which ſeparates from it at Moddapour, and terminates in the Hooringolla. This is the only branch of the Ganges that is at all times navigable.

CHUNG, a town of China, of the third rank, in the province of Pe-tche-li; 20 miles N.E. of Peking.

CHUNGAR, in *Ornithology*. In the hiſtory of Timur Beck, mention is made of a fine bird of Tartary, called chon-kui, that was preſented to Gengis-khan by the ambaſſadors of Kadjak. The bird appears to be unknown to the European naturaliſts. Sonnini ſuppoſes it may be the Turkiſh *chungar*, and therefore a heron or bittern. Others affirm that it is a bird of prey, which, being ornamented with a number of precious gems, is preſented by dependent ſtates as a mark of homage. The Ruſſians, as well as the Tartars of the Crimea, Sonnini tells us, are obliged by virtue of certain treaties, with the Ottoman empire, to preſent one of thoſe birds decorated with a certain number of diamonds every year to the Porte.

CHUNI, in *Ancient Geography*, a people of Sarmatia, placed by Ptolemy between the Baſternæ and Roxolini.

CHUN-KING, a city of China, of the firſt rank, in the province of Se-tchuen, comprehending within its diſtrict nine cities, of which two are of the ſecond rank; 760 miles S.S.W. of Peking. N. lat. 30° 50′. E. long. 105° 44′.

CHUN-LIEOU, a town of Aſia, in the kingdom of Corea; 25 miles E.N.E. of Koang-tcheou.

CHUNNA, in the *Salic Laws*, is uſed for an hundred; or rather an hundred pence or *denarii;* the pecuniary penalties of that law are eſtimated by *chunnæ*, and reduced to *ſolidi*, by reckoning forty *denarii* to the *ſolidum*.

CHUN-NGHAN, in *Geography*, a town of China, of the third rank, in the province of Tche-kiang; 11 leagues N. of Kiu-tcheou.

CHUN-NING, a city of China, of the firſt rank, in the province of Yun-nan; 420 leagues S.W. of Peking. N. lat. 24° 37′. E. long. 99° 44′.

CHUN-TCHAN, a town of China, of the third rank, in the province of Fo-kien; 30 miles W.N.W. of Yen-ping.

CHUN-TCHUEN, a town of Aſia, in the kingdom of Corea; 22 miles S.E. of Han-tcheou.

CHUN-TE, a city of China, of the firſt rank, in the province of Pe-tche-li; 200 miles N.N.E. of Peking. This city has but a ſmall diſtrict; for there are only nine cities of the third claſs under its juriſdiction; but they are all very populous. The adjacent country is pleaſant and fertile; on account of the number of lakes and rivers that water and refreſh it. Its craw-fiſh are celebrated; and it produces a fine delicate kind of ſand, uſed in poliſhing precious ſtones, which is ſold all over the empire. It abounds alſo with touch-ſtone, which is reckoned the beſt in China. N. lat. 37° 5′. E. long. 114° 19′.

CHUN-TIAN, a town of Aſia, in the kingdom of Corea; 27 miles S.S.E. of Koang-tcheou.

CHUN-YAN, a town of Aſia, in the kingdom of Corea; 20 miles S. of Han-tcheou.

CHUPKA, or KEPTA, a mountain of Bootan, ſomewhat more northerly than the valley of Punugga, having half-way up its ſide a caſtle, in a bleak, but beautifully romantic ſituation; the mountains in its neighbourhood appearing to captain Turner the higheſt which he had ſeen in Bootan.

CHUPMESSAHITES, a ſect among the Mahometans who believe that Jeſus Chriſt is God, and the true Meſſiah, the redeemer of the world; but without rendering him any public, or declared worſhip.

The word, in the Turkiſh language, ſignifies "Protector of the Chriſtians.

Ricaut ſays, there are abundance of the Chupmeſſahites among the people of faſhion in Turkey, and ſome even in the ſeraglio.

CHUPUAH, in *Geography*, a town of Hindooſtan, in the country of Bahar, on the north coaſt of the Ganges; 25 miles N.W. from Patna.

CHUQUIRAGA, in *Botany*, a barbarous name given by the Peruvians to a ſyngeneſious plant, and adopted by Juſſieu and La Marck as a generic one. Juſſ. 178. Lam. Illuſ. Pl. 691. Nat. Ord. *Corymbyferæ*, Juſſ.

Gen. Ch. *Cal.* large, top-ſhaped, compoſed of very numerous imbricated ſcales; the outward ones growing gradually ſmaller. *Flowers* floſculous; florets numerous, very long, nearly entire at their borders; anthers long, with two briſtles at their baſe; ſtigma one; down feathered, long; receptacle villous.

A branched ſhrub. *Leaves* rigid, like thoſe of ruſcus, acuminate, alternate, denſely imbricated. *Flowers* ſolitary, terminating the branches. Nearly allied to mutiſia, but not radiate; perhaps ſtill more nearly allied to the cinarocaphalæ. Deſcribed from a dried ſpecimen in the herbarium of Joſ. Juſſieu.

CHURAQUER, in *Geography*, a town of Armenia; 48 miles W. of Erivan.

CHURASCH, a town of Arabia; 44 miles S. of Saade.

CHURCH, an aſſembly of perſons united by the profeſſion of the ſame Chriſtian faith, and the participation of the ſame ſacraments. Bellarmin, and the Romiſh divines, to this definition add, "Under the ſame pope, ſovereign pontiff, and vicar of Jeſus Chriſt on earth:" in which circumſtance it is that the Romiſh and Reformed notions of church differ.

Amelotte, and others, make a viſible head, or chief, eſſential to a church: accordingly, among the Catholics, the pope; in England, the king; are reſpectively allowed heads of the church. Biſhop Headly ſets aſide the notion of a viſible head: Chriſt alone, according to him, is head of the church; which poſition he has maintained, with great addreſs, in a celebrated ſermon before king George I. on theſe words, "My kingdom is not of this world;" and in the ſeveral vindications of it. To this purpoſe, he ſays, that as the church of Chriſt is the kingdom of Chriſt, he himſelf is king; and in this it is alſo implied, that he is himſelf the ſole lawgiver to his ſubjects, and himſelf the ſole judge of their behaviour, in the affairs of conſcience and eternal ſalvation. In theſe points he hath left behind him no viſible, or human authority; no vicegerents, who can be ſaid properly to ſupply his place; no interpreters, upon whom his ſubjects are abſolutely to depend; no judges over the conſciences or religion of his people. Mr. Locke, in his "Letters concerning Toleration," deſcribes a church as a voluntary ſociety of men, who join themſelves together, of their own accord, for the public worſhip of God, in ſuch a manner as they judge acceptable to him, and effectual to the ſalvation of their ſouls. Nobody, he ſays, is born a member of any church; otherwiſe the religion of parents would deſcend to children, by the ſame right of inheritance as their temporal eſtates, and every one would hold his faith by the ſame tenure as he holds his lands; than which nothing can be imagined more abſurd. As the entrance of a perſon into any particular church is voluntary, ſo is alſo his continuance in it. No member of any religious ſociety, ſays Mr. Locke, can be tied with any other bonds but what proceed from the certain expectation of eternal life. A church, then, is a ſociety of members voluntarily uniting to this end. This author further adds, that things, never ſo indifferent in their own nature, when they are brought into the church and worſhip of God, are removed out of the magiſtrate's juriſdiction; becauſe in that uſe they have no connection at all with civil affairs. The only buſineſs of the church is the ſalvation of ſouls: and it noways concerns the commonwealth, or any member of it, that this, or the other ceremony be there made uſe of. Neither the uſe, nor the omiſſion of any ceremonies in theſe religious aſſemblies, does either advantage or prejudice the life, liberty, or eſtate of any man.

The term *eccleſia*, εκκλησια, ſynonymous with our church, is uſed in the Greek and Latin profane authors for any kind of public aſſembly called together upon any public buſineſs, to enact laws, &c. (ſee Æſchines, paſſim, and Lucian, who uſes the words Θεων εκκλησια, *q. d.* an aſſembly of the gods); and the term was even uſed for the place where the aſſembly was held. The ſacred and eccleſiaſtical writers ſometimes alſo uſed it in the ſame ſenſe; but ordinarily they reſtrain the term to the Chriſtians; as the term *ſynagogue*, which originally ſignifies nearly the ſame thing, is in like manner reſtrained to the Jews.

Thus, in the New Teſtament, the Greek εκκλησια ſignifies, almoſt always, the aſſembly of the faithful diffuſed over the whole earth, as Epheſ. v. 24. or the faithful of a particular city or province, as Acts, xi. 22. xv. 22. 2 Cor. viii. 1. or even of a ſingle family, as Rom. xvi. 5.

For the meaning of the term εκκλησια, as it was applied by the ſacred writers, ſee alſo Acts, xix. 32. 40. 1 Cor. xiv. 23. Phil. iv. 15. Heb. xii. 23. From the ſeveral places above cited it appears, that the congregation, and not the place, forms the ſcripture idea of a church. The Hebrew word קהל exactly correſponds to the Greek εκκλησια, and is commonly rendered by it in the Septuagint, the only Greek tranſlation of the Old Teſtament in uſe in the time of our Saviour. Its idiom and phraſeology were conſequently become the ſtandard, in all matters that concerned religion, to all the Jewiſh writers who uſed the Greek language, and who were commonly diſtinguiſhed by the name of Helleniſts. From them the term was originally borrowed by the penmen of the New Teſtament. From their manner of uſing it, therefore, the general meaning of the word is to be ſought. But though the phraſes כל קהל ישראל in Hebrew, and πασα ἡ εκκλησια Ισραελ in Greek, the whole church of Iſrael, do frequently occur in the Old Teſtament, there is not a ſingle paſſage in which they are not confeſſedly equivalent to the phraſes כל גוי ישראל, and παν το εθνος Ισραελ, all the nation of Iſrael. The ſame may be ſaid of the phraſes קהל אלהים and עם אלהים, ἡ εκκλησια θεου and ὁ λαος θεου, the church of God, and the people of God. A diſtinction between theſe would have been pronounced by them inconceivable, as being a diſtinction between the church and its conſtituent members. In the Latin tranſlation, called the Vulgate, the date of which is about the beginning of the 5th century, the Greek word is commonly retained, having been long before naturalized among Chriſtians. Accordingly, they rendered theſe phraſes in the Old Teſtament "omnis eccleſia Iſrael," and "eccleſia Dei." Our Engliſh tranſlators, however, have never admitted the word "church" into their verſion of the Old Teſtament, notwithſtanding the frequent uſe they have made of it in the New. They have always rendered the Hebrew word קהל, by the Engliſh words, congregation, aſſembly, or ſome ſynonymous term. Either of theſe Engliſh terms is well adapted to expreſs the ſenſe of the Hebrew: and they were altogether as fit for expreſſing the ſenſe of the word εκκλησια in the New Teſtament as of the word קהל in the Old; the former being the term by which the latter had been rendered almoſt uniformly in the Septuagint, and which had been employed as equivalent by all the Helleniſt Jews. In order to preſerve uniformity, our tranſlators ought conſtantly to have rendered the original expreſſion either "church" in the Old Teſtament, or "congregation" in the New. Terms ſo perfectly coincident in ſignification, as theſe Hebrew and Greek names are, ought to have been tranſlated by the ſame Engliſh word. Indeed, our tranſlators do not refuſe the title of church to the commonwealth of Iſrael, when an occaſion for giving it occurs in the New Teſtament, though they have not availed themſelves of a ſimilar occaſion in the Old. Thus they have rendered the words of Stephen, who ſays, ſpeaking of Moſes, Acts, vii. 38. "This is he that was in the church in the wilderneſs;" Ουτος εστιν ὁ γενομενος εν τη εκκλεσια εν τη ερημω. We do not find, however, ſays Dr. Campbell, in his "Eccleſiaſtical Hiſtory" (vol. i. p. 323.), in the uſe of either the Greek word in the New Teſtament, or of the correſpondent word in the Old, any veſtige of an application of the term to a ſmaller part of the community, their governors, paſtors, or prieſts, for inſtance, as repreſenting the whole. The only paſſage that has been alleged, with any appearance of plauſibility, in favour of this application, is Matt. xviii. 17, where our Lord, in the directions he gives for removing offences between brethren, enjoins the party offended, after repeated admonitions in a more private manner have proved ineffectual, to relate the whole to the church, ειπε τη εκκλησια; but Dr. Campbell aſks, "by what rule of ſound criticiſm can we arbitrarily impoſe here on the word "church" the ſignification of church repreſentative, a ſignification which we do not find it bears in one other paſſage of ſcripture?" But that the meaning of the word is here, as in other places, no more than congregation, and that it ſhould have been ſo rendered, he argues from the conſideration that our Lord gave theſe directions during the ſubſiſtence of the Moſaic eſtabliſhment; and if we believe that he ſpoke intelligibly, or with a view to be underſtood, we muſt believe alſo that he uſed the word in an acceptation with which the hearers were acquainted. All the then known acceptations of the name εκκλησια, were theſe two, the whole Jewiſh people, and a particular congregation. The ſcope of the place ſufficiently ſhews, it could not be the former of theſe ſenſes, and it muſt therefore be the latter. What further confirms this interpretation is, that the Jews were accuſtomed to call thoſe aſſemblies, which met together for worſhip in the ſame ſynagogue, by this appellation; and had, if we may believe ſome learned men converſant in Jewiſh antiquities, a rule of procedure ſimilar to that here recommended, which our Lord adopted from the ſynagogue, and tranſplanted into his church. This learned writer proceeds to adduce another collateral and corroborative evidence, that by εκκλησια is here meant not a repreſentative body, but the whole of a particular congregation; and this is the actual uſage of the church for the firſt 300 years. As far down as Cyprian's time, about the middle of the third century, when the power of the people was on the decline, it continued to be the practice, that nothing relating to matters of ſcandal and cenſure could be concluded without the conſent and approval of the congregation. Upon the whole it ſeems to be evident that the term *church*, denoting, according to its etymology, no more than ſociety or aſſembly, is ſometimes uſed in the New Teſtament, with obvious analogy to the common uſe, to ſignify the whole community of Chriſtians, conſidered as one body, of which Chriſt is denominated the head, and ſometimes only a particular congregation of Chriſtians. When this word is limited, or appropriated, as it generally is in the New Teſtament, by its regimen, as τȣ θεȣ, τȣ κυριȣ, τȣ χριςȣ, or by the ſcope of the place, it is always to be explained in one or other of the two following ſenſes. It denotes either a ſingle congregation of Chriſtians, or the whole Chriſtian community; nor can we hardly ever be at a loſs to know from the context which of the two is implied. The former acceptation of the term is ſometimes evident from the words in conſtruction, as της εκκλησιας τη εν Κεγχρεαις, and τη εκκλησια τȣ θεȣ τη εν Κορινθω, or the like. In the latter ſenſe it ought always to be underſtood, when we find nothing in the expreſſion, or in the ſcope of the paſſage, to determine us to limit it; *e.g.* in the following, Επι ταυτη τη πετρα οικοδομησω μȣ την εκκλησιαν. Ὁ κυριος προσετιθεις τȣς σωζομενȣς καθ᾽ ἡμεραν τη εκκλησια. In this laſt acceptation of the word, for the whole body of Chriſt's diſciples, whereſoever diſperſed, it came afterwards to be diſtinguiſhed by the epithet καθολικη. Accordingly, they ſaid ἡ εκκλησια ἡ καθολικη, the catholic or univerſal church. But, it has been alleged, that in any intermediate ſenſe, between a ſingle congregation and the whole community of Chriſtians, no ſingle inſtance can be brought of the application of the word in ſacred writ. We ſpeak now, indeed (and this has been the manner for ages), of the Gallican church, the Greek church, the church of England, the church of Scotland, as of ſocieties independent and complete in themſelves. Such a phraſeology was never adopted in the days of the apoſtles. They did not ſay, the church of Aſia, or the church of Macedonia, or the church of Achaia, but the churches of God in Aſia, the churches in Macedonia, the churches in Achaia. The plural number is invariably uſed when more congregations than one are ſpoken of, unleſs the ſubject be the whole commonwealth of Chriſt. This is not only the mode of expreſſion adopted by the ſacred writers, but it is the conſtant uſage of the term in the writings of eccleſiaſtical authors for the two firſt centuries: allowing for one exception to the contrary, which occurs in the epiſtles of Ignatius. This language is alſo conformable to the uſage, in relation to this term, which had always obtained among the Jews. The whole nation, or commonwealth of Iſrael, was often denominated πασα ἡ εκκλησια Ισραηλ; and after the revolt of the ten tribes, when they ceaſed to make one people or ſtate with the other two, we hear of πασα ἡ εκκλησια Ιȣδα. This is the large or comprehenſive uſe of the word above noticed. With regard to the more confined application, the ſame term εκκλησια was alſo employed to denote a number of people, either actually aſſembled, or wont to aſſemble in the ſame place. Thus, all belonging to the ſame ſynagogue were called indifferently εκκλησια, or συναγωγη, as theſe words in the Jewiſh uſe were nearly ſynonymous. The limitation of the term "church" to the clergy and the eccleſiaſtical judicatories, and the claims of independency advanced by theſe, as well as certain claims of power and juriſdiction, in ſome things differing, and in ſome things interfering with the claims of the magiſtrate, aroſe after the eſtabliſhment of the Chriſtian religion under Conſtantine; and hence a diſtinction ſubſiſted, in the Chriſtian community, at an early period, between the church and ſtate.

We may here remark, that it is doubtful whether the word εκκλησια ever occurs in the New Teſtament in a ſenſe, in which, indeed, the word "church" is very common with us, as a name for the place of worſhip. There are two paſſages, which ſeem to convey this ſenſe; and they both occur in the 11th chapter of the 1ſt epiſtle to the Corinthians. The 1ſt is v. 18, "when ye come together in the church," συνερχομενων ὑμων εν τη εκκλησια. Here, however, the word is ſuſceptible of another interpretation, as a name for the ſociety. Thus we ſay "The lords ſpiritual and temporal, and the commons in parliament aſſembled," where parliament does not mean the houſe they meet in, but the aſſembly properly conſtituted. The other paſſage is v. 22. "Have ye not houſes to eat and drink in, or deſpiſe ye the church of God?" της εκκλησιας τȣ Θεȣ καταφρονειτε: where, it is alleged, the oppoſition of εκκλησια to οικια, the church to their houſes, adds a probability to this interpretation. This plea, however, though plauſible, is not deciſive. The apoſtle's argument on the contrary hypotheſis would ſtand thus: what can be the reaſon of this abuſe? Is it becauſe ye have not houſes of your own in which to eat and drink? Or is it becauſe ye deſpiſe the Chriſtian congregation to which you belong? This, though it muſt be allowed not to convey ſo exact a verbal antitheſis, is, in the judgment of ſome writers, more in the ſpirit and ſtyle of the New Teſtament, than to ſpeak of deſpiſing ſtone walls. At length, however, the term εκκλησια, by a common metonymy, the thing contained for the thing containing, came to be univerſally employed in this acceptation. Among the extraordinary miniſters of the Chriſtian church, at the period of its firſt eſtabliſhment, we may reckon apoſtles, prophets, and evangeliſts, beſides thoſe who were endowed with ſupernatural gifts, and afterwards biſhops, preſbyters, and deacons. See theſe ſeveral terms.

The word "church," ſays lord chancellor King (Conſtitution, Diſcipline, &c. of the Primitive Church), is both in our modern acceptation, and alſo in the writings of the fathers, equivocal, having different ſignifications, according to the different ſubjects to which it is applied. It is often to be underſtood, 1ſt, of the "Church Univerſal," that is, of all thoſe, who, throughout the face of the whole earth, profeſſed faith in Chriſt, and acknowledged him to be the Saviour of mankind. This is that which they called the "Catholic Church." See Iren. l. i. c. 2. c. 3. Apud Euſeb. l. vi. c. 25. l. vii. c. 10. l. iv. c. 15. 2. The word "church" is frequently to be underſtood of a "particular church," that is, of a company of believers, who, at one time, in one and the ſame place, aſſociated themſelves together, and concurred in the participation of all the inſtitutions and ordinances of Jeſus Chriſt, with their proper miniſters and paſtors. Various inſtances of this uſe of the term occur in Irenæus, Cyprian, Ignatius, Origen, &c. 3. The word "church" is ſometimes uſed for the place where a particular church or congregation met for the celebration of divine ſervice; and it is thus uſed by Paulus Samoſatenus, Clemens Alexandrinus, Tertullian, Origen, &c. &c. 4. The word "church" is once uſed by Cyprian for a collection of many particular churches; but when the fathers have occaſion to ſpeak of the Chriſtians in any kingdom or province, they always uſe the plural, "the churches," and never the ſingular, or the church of ſuch a kingdom or province. 5. The word "church" frequently occurs for that which we commonly call the inviſible church, that is, for thoſe who, by a ſound repentance and a lively faith, are actually intereſted in the Lord Jeſus Chriſt; and it is thus uſed by Tertullian, Irenæus, and others of the fathers. 6. The word "church" is frequently to be interpreted of the faith and doctrine of the chuch. It is alſo uſed, according to its original import, for any congregation in general, as we have already ſtated; ſometimes it is applied to any particular ſect of heretics; at other times it is attributed to the orthodox in oppoſition to the heretics; in both which ſenſes it is uſed by Tertullian; ſometimes it is appropriated to the heathen aſſemblies, as by Origen; at other times, in oppoſition to the Jews, it is aſcribed to the believing Gentiles, as by Irenæus: in other places it ſignifies the aſſembly of the ſpirits of juſt men made perfect in heaven, commonly called "the church triumphant," in oppoſition to "the church militant," or the aſſembly of the faithful on earth. To theſe the Catholics add "the church patient," which, according to their doctrine, is that of the faithful in purgatory. Lord King (ubi ſupra) ſays, that he has once found the term "church" denoting the laity only, in oppoſition to the clergy (Επισκοποι και Πρεσβύτεροι, και Διακονοι, και αἱ ἐκκλησιαι τȣ Θεȣ, Euſeb. l. vii. c. 30.): and once ſignifying only Chriſt as the head of the faithful (Eccleſia veri Chriſtus, Tertullian, de Pænit. p. 302.) After all, this learned writer obſerves, that the uſual and moſt common acceptation of the word is that of a particular church, that is, a ſociety of Chriſtians, meeting in one place, under their proper paſtors, for the performance of religious worſhip, and the exerciſe of Chriſtian diſcipline.

The conſtituent parts of a particular church are the people, who compoſe the body of it, and thoſe perſons who are ſet apart for religious and eccleſiaſtical employments, or, according to our ordinary dialect, the clergy and laity; which is an early diſtinction, being mentioned by Clemens Romanus (Epiſt. 1. ad Corinth.) and after him by Origen (Homil. 11. in Jerem.) and ſeveral others. See Clergy, Bishop, &c.

Every particular church, in ancient times, poſſeſſed the power of exerciſing diſcipline on its own members, without the concurrence of other churches. Accordingly we find, that the exerciſe of this power was formally decreed by two African ſynods, recorded apud Cyprian. Epiſt. 55. § 16. and Epiſt. 72. § 3. Neverthelefs, a particular church was not the whole church of Chriſt, but only a part or member of the church univerſal; and we therefore find, that though the labours and inſpection of the biſhops were more peculiarly reſtricted to their own pariſhes, yet, as miniſters of the univerſal church, they employed a general kind of inſpection over other churches alſo. Cyprian, Epiſt. 67. § 6. Ed. 29. Euſeb. lib. vii. c. 9. See Council.

With regard to the unity of the church univerſal, in primitive times, the learned author, whom we are now citing, ſhews, that it did not conſiſt in an uniformity of rites and cuſtoms, nor in an unanimity of conſent to the non-eſſential points of Chriſtianity; but it conſiſted in an harmonious aſſent to the eſſential articles of religion, or in an unanimous agreement in the fundamentals of faith and doctrine. If we conſider the word "church," collectively, as denoting a collection of many particular churches, in which ſenſe it is once uſed by Cyprian; then its unity may have conſiſted in a brotherly correſpondence with, and affection towards each other, which they demonſtrated by all outward expreſſions of love and concord. See Schism and Heresy.

The worſhip of the primitive church conſiſted in the reading of the Holy Scriptures, the ſinging of pſalms and hymns, the preaching of the word, and public prayers. To theſe acts of public ſervice, they added the adminiſtration of baptiſm and the Lord's Supper. See each of theſe articles.

In adverting to the articles of the eſtabliſhed church in our own country, we find (art. 19.) that "the viſible church of Chriſt" is defined to be a congregation of faithful men, in the which the pure word of God is preached, and the Sacraments be duly adminiſtered according to Chriſt's ordinance, in all thoſe things that of neceſſity are requiſite to the ſame." The expreſſion of "the viſible church of Chriſt," ſeems here to be uſed in contradiſtinction to the myſtical or inviſible church of Chriſt; which latter conſiſts of thoſe perſons who have truly believed and obeyed the goſpel, and who are conceived, although they have lived at different periods, to be united into one body, which is called myſtical or inviſible; not only becauſe they are not now all upon earth, but becauſe the qualities and properties, which gave them a claim to be members of this bleſſed ſociety, were never the objects of ſenſe, and could not be judged of by men from merely external circumſtances. Whereas, "the viſible church," in its moſt extenſive ſenſe, may include all perſons who are or have been, by outward profeſſion, Chriſtians, whether they have or have not believed all the doctrines, or obeyed all the precepts of the goſpel. This may be called the viſible Catholic church. But in the article, above cited, "the viſible church" is uſed in a more limited ſenſe, and comprehends only the Chriſtians of one country or city, or of one perſuaſion; thus, towards the cloſe, it mentions the church of Jeruſalem, of Alexandria, of Antioch, and of Rome; and in like manner we often ſpeak of the church of England, of Holland, of Geneva, and of the Lutheran church; and all theſe different churches are parts of the viſible Catholic church. "The adherence," ſays Dr. Tomline, biſhop of Lincoln, (Elements of Chriſtian Theology, vol. ii. p. 325.) "to the fundamental principles of the goſpel is ſufficient to conſtitute a viſible church; although every doctrine it maintains may not be founded in truth, or all the parts of public worſhip agreeable to Scripture. We conſider all men as Chriſtians, or as members of the viſible church of Chriſt, who have been baptized, and profeſs their belief in the divine miſſion of Chriſt, even if their faith be in ſome reſpects erroneous, and their lives unworthy of their holy vocation."

The Chriſtian church, with regard to its local eſtabliſhment, extent, and influence, is frequently divided into *Eaſtern* or *Greek* and *Weſtern* or *Latin*.

The firſt jealouſies between the Greek and Latin churches were excited at the council of Sardis, in the year 347, and a vindictive ſpirit prevailed for a long time between the biſhops of Rome and Conſtantinople, which occaſionally broke out into acts of violence. The ambition and fury of theſe contending prelates grew ſtill more keen and vehement about the time of Leo the Iſaurian, when the biſhops of Conſtantinople, ſeconded by the authority and power of the emperors, withdrew from the juriſdiction of the Roman pontiff many provinces, over which they had hitherto exerciſed a ſpiritual dominion. However, the ſchiſm, or total ſeparation, did not take place till the time of Photius, who was elected patriarch of Conſtantinople in the year 858 by the emperor Michael, in the place of Ignatius, whom that prince drove from his ſee and ſent into exile. Pope Nicholas I. took part with the exiled patriarch, decreed the election to be unwarrantable in a council held at Rome A. D. 862, and excommunicated Photius. The high-ſpirited patriarch, reſpected as the moſt learned and ingenious perſon of the age in which he lived, aſſembled a council at Conſtantinople, A.D. 866, returned the compliment, and declared Nicholas unworthy of his rank in the church, and of even being admitted to the communion of Chriſtians. The pretext alleged by the Roman prelate, in juſtification of his conduct, was the innocence of Ignatius; but the ſecret and moving ſpring ſeems to have been a deſire of recovering from the Greeks the provinces of Illyricum, Macedonia, Epirus, Achaia, Theſſaly, and Sicily, which the emperor and Photius had removed from the juriſdiction of his ſee. The reſtitution of theſe provinces had been demanded by a ſolemn embaſſy; but his requiſition was treated with contempt, and from hence proceeded his zeal in the cauſe of juſtice and of Ignatius. The exiled patriarch was ſoon after reſtored to his high ſtation by Baſilius, who had paved his way to the imperial throne by the murder of his predeceſſor; and Photius was confined in a monaſtery. Photius continued to feed the flame of diſcord, and, having in the year 866 added the province of Bulgaria to the ſee of Conſtantinople, he now endeavoured to engage the oriental patriarch in his diſpute, and drew up a violent charge of hereſy againſt the Roman biſhops, who had been ſent among the new-converted Bulgarians, and againſt the church of Rome in general. Upon the death of Ignatius in 878, the emperor took Photius into favour, and advanced him again to the patriarchal ſtation from which he had been degraded. The grant of Bulgaria to the Roman ſee was promiſed to the pontiff John VIII., by the emperor and Greek patriarch, and Photius was acknowledged by John as his brother in Chriſt. The emperor and Photius falſified their promiſe, and refuſed to transfer Bulgaria to the Roman pontiff. After ſome ſubſequent occaſions of mutual offence, John was ſucceeded by Marinus, and a new ſentence of excommunication was iſſued againſt Photius. This ſentence was treated with contempt by the haughty patriarch, who, in 886, was depoſed by the emperor Leo from the patriarchal ſee, and confined in an Armenian monaſtery, where he died in 891. The death of Photius might have terminated the diſpute between the eaſtern and weſtern churches, if the Roman pontiff had not been regardleſs of the demands of equity as well as of the duty of Chriſtian moderation. But theſe imperious lords of the church indulged their vindictive zeal beyond meaſure, and would be ſatiſfied with nothing leſs than the degradation of all the prieſts and biſhops who had been ordained by Photius. The Greeks, on the other hand, were ſhocked at the arrogance of theſe unjuſt pretenſions, and would not ſubmit to them on any conditions. Hence the diſpute between the two churches and their partizans was renewed; religious, as well as civil conteſts, occurred; and by adding new controverſies to the old, the fatal ſchiſm took place, which produced a total and permanent ſeparation between the Greek and Latin churches.

The doctrine of the Eaſtern or Greek church, which is, unqueſtionably, the moſt ancient, prevails at this day over a greater extent of country than that of any other church in the Chriſtian world. It is profeſſed through a conſiderable part of Greece, the Grecian iſles, Walachia, Moldavia, Egypt, Nubia, Lybia, Arabia, Meſopotamia, Syria, Cilicia, and Paleſtine; all which are comprehended within the juriſdiction of the patriarchs of Conſtantinople, Alexandria, Antioch, and Jeruſalem; to theſe, if we add the whole of the Ruſſian empire in Europe, great part of Siberia in Aſia, Aſtracan, Caſan, Georgia, and White Ruſſia in Poland, it will be evident that the Greek church has a greater extent of territory than the Latin, with all the branches that are ſprung from it.

The *Greek* or *Eaſtern Church* may be divided into three diſtinct communities. The *firſt* is that of the Greek Chriſtians, who agree, in all points of doctrine and worſhip, with the patriarch reſiding at Conſtantinople, and reject the pretended ſupremacy of the Roman pontiff. The *ſecond* comprehends thoſe Chriſtians, who differ equally from the Roman pontiff and the Grecian patriarch in their religious opinions and inſtitutions, and who live under the government of their own biſhops and rulers. The *third* is compoſed of thoſe who are ſubject to the ſee of Rome.

That ſociety of Chriſtians, that maintains religious communion with the patriarch of Conſtantinople, is, properly ſpeaking, the Greek, though it aſſumes likewiſe the title of the Eaſtern Church. This ſociety is ſubdivided into two branches, of which the one acknowledges the ſupreme authority and juriſdiction of the biſhop of Conſtantinople, while the other, though joined in communion of doctrine and worſhip with that prelate, yet obſtinately refuſes to receive his legates or to obey his edicts, and is governed by its own laws and inſtitutions, under the juriſdiction of ſpiritual rulers, who are independent of all foreign authority.

That part of the Greek church, which acknowledges the juriſdiction of the biſhop of Conſtantinople, is divided, as in the early ages of Chriſtianity, into four large diſtricts or provinces, Conſtantinople, Alexandria, Antioch, and Jeruſalem; over every one of which a biſhop preſides with the title of patriarch, whom the inferior biſhops and monaſtic orders unanimouſly reſpect as their common father. This prelate has the privilege of nominating other patriarchs, though that dignity ſtill continues elective, and of approving the election that is made; nor is any thing of moment undertaken or tranſacted in the church without his expreſs permiſſion, or his ſpecial order. Indeed, in the preſent decayed ſtate of the Greek churches, whoſe revenues are ſmall, and whoſe former opulence is almoſt annihilated, their ſpiritual rulers enjoy little more than the ſplendid title of "Patriarchs," without being in a condition to extend their fame or promote their cauſe, by any undertaking of ſignal importance.

The ſpiritual juriſdiction and dominion of the patriarch of Conſtantinople are very extenſive, comprehending a conſiderable part of Greece, the Grecian iſles, Walachia, Moldavia, and ſeveral of the European and Aſiatic provinces that are ſubject to the Turks. The patriarch of Alexandria reſides generally at Cairo, and exerciſes his ſpiritual authority in Egypt, Nubia, Lybia, and a part of Arabia. Damaſcus is the principal reſidence of the patriarch of Antioch, whoſe juriſdiction extends to Meſopotamia, Syria, Cilicia, and other provinces. In Syria there are three biſhops, who claim the title and dignity of patriarch of Antioch. The *firſt* is the biſhop of the Melchites, a name given to the Chriſtians in Syria who follow the doctrine, inſtitutions, and worſhip of the Greek church; the *ſecond* is the ſpiritual guide of the Syrian Monophyſites; and the *third* is the chief of the Maronites, who hold communion with the church of Rome. This laſt biſhop pretends to be the true and lawful patriarch of Antioch, and is acknowledged as ſuch by, or at leaſt receives this denomination from, the Roman pontiff. Neverthelefs, it is certain, that the pope creates at

Rome a patriarch of Antioch of his own choice, ſo that the ſee of Antioch has, at this day, four patriarchs, one from the Greeks, two from the Syrians, and one created at Rome, who is patriarch, *in partibus*, i. e. titular patriarch, according to the ſignification of that phraſe.

The patriarch of Jeruſalem comprehends, within the bounds of his pontificate, Paleſtine, Arabia, the country beyond Jordan, Cana in Galilee, and mount Sion.

The epiſcopal dominions of theſe three patriarchs are indeed extremely poor and inconſiderable; for the Monophyſites have long ſince aſſumed the patriarchal ſeats of Alexandria and Antioch, and have deprived the Greek churches of the greateſt part of their members in all thoſe places where they gained an aſcendant. And as Jeruſalem is the reſort of Chriſtians of every ſect, who have their reſpective biſhops and rulers, the juriſdiction of the Grecian patriarch is conſequently confined there within narrow limits.

The right of electing the patriarch of Conſtantinople is veſted in the 12 biſhops who reſide neareſt that famous capital; but the right of confirming his election, and of enabling the new-choſen patriarch to exerciſe his ſpiritual functions, belongs only to the Turkiſh emperor. But this inſtitution is ſubject to the groſſeſt perverſion and abuſe by the corruption and avarice of the reigning miniſters. The power of this patriarch among a people diſpirited by oppreſſion, and ſunk into the groſſeſt ſuperſtition by extreme ignorance, muſt be, and actually is, very conſiderable and extenſive. Beſides, his own prerogatives are numerous; for he not only convenes councils by his own authority; but by the ſpecial permiſſion of the emperor, he adminiſters juſtice and takes cognizance of civil cauſes among the members of his communion. His influence is maintained, on the one hand, by the authority of the Turkiſh monarch, and, on the other, by his right of excommunicating the diſobedient members of the Greek church. The revenue of this patriarch is drawn particularly from the churches that are ſubject to his juriſdiction; and its produce varies according to the circumſtances of the Greek Chriſtians, whoſe condition is expoſed to many viciſſitudes.

The Greeks acknowledge, as the rule of their faith, the Holy Scriptures and the decrees of the firſt ſeven *general* councils; but no private perſon has a right to explain, for himſelf or others, either the declarations of Scripture, or the deciſions of theſe councils; the patriarch and his brethren being the only perſons who are authoriſed to conſult theſe oracles, and to declare their meaning. The ſubſtance of the doctrine of the Greek church is contained in a treatiſe, entitled "The orthodox Confeſſion of the Catholic and Apoſtolic Eaſtern Church," drawn up by Peter Mogiſlaus, biſhop of Kiov, in a provincial council aſſembled in that city. This confeſſion, originally compoſed in the Ruſſian language, was tranſlated into Greek, and in the year 1643 publicly approved and adoped by Parthenius of Conſtantinople, and all the other Grecian patriarchs. It was afterwards publiſhed in Greek and Latin ,at the expence of Panagiota, the Turkiſh emperor's interpreter, who ordered it to be diſtributed *gratis* among the Greek Chriſtians; and it was alſo enriched with a recommendatory letter compoſed by Nectarius, patriarch of Jeruſalem. From this confeſſion it evidently appears, that the Greeks differ widely from the votaries of the Roman pontiff, whoſe doctrines they reject and treat with indignation in ſeveral places; but at the ſame time it appears, that their religious tenets are equally remote from thoſe of the other Chriſtian ſocieties.

With reſpect to the doctrine of the Greek church, we have already obſerved, that it is partly derived from the firſt 7 œcumenical or general councils, viz. that of Nice, A. D. 325; the firſt of Conſtantinople, A. D. 381; that of Epheſus, A. D. 431; that of Chalcedon, A. D. 451; the ſecond of Conſtantinople, A. D. 553; the third of Conſtantinople in Trullo, A. D. 680; and the ſecond of Nice, A. D. 787. The Nice and the Athanaſian creeds are allowed by them; and they hold the doctrine of the Trinity, but with this qualification, that the Holy Ghoſt proceeds from the Father only, and not from the Father and the Son. The invocation of ſaints is alike received in the Greek and Roman communion. The Greek church admits the uſe of pictures to inſtruct the ignorant, and to aſſiſt the devotion of others by thoſe ſenſible repreſentations. In the Greek church there are 7 myſteries, or ſacraments, as they are called in the Latin church, viz. baptiſm, the Chriſm, or baptiſmal unction, the euchariſt, confeſſion, ordination, marriage, and the holy oil or extreme unction. As to baptiſm, there is nothing peculiar in it. Chriſm is called the unction with ointment, and extreme unction is called the conſecration with holy oil. The chriſm is a myſtery peculiar to the Greek communion, and holds the place of confirmation in the Roman. It immediately follows the immerſion at baptiſm, when the prieſt anoints the perſon baptized, on the principal parts of the body with an ointment, conſecrated with many curious circumſtances for that purpoſe by a biſhop; this ceremony is always uſed at the reception of a proſelyte from any other church whatever. As to the euchariſt, it has been diſputed whether tranſubſtantiation was the doctrine of the ancient Greek church. The Proteſtants and the eminently learned and eloquent John Claude, maintain the negative; while the Roman Catholics, eſpecially Arnaud, contend for the affirmative; but whether it was maintained in the ancient Greek church or not, it is the doctrine of the preſent Ruſſian church; for in the oath every biſhop now takes at his conſecration, he abſolutely ſwears, that "he believes and underſtands that the tranſubſtantiation of the body and blood of Chriſt, in the holy ſupper, as taught by the eaſtern and ancient Ruſſian doctors, is effected by the influence and operation of the Holy Ghoſt, when the biſhop or prieſt invokes God the Father in theſe words, *and make this bread the precious body of thy Chriſt*. It is held neceſſary in this church to mix warm water with the wine, and the lay communicants receive both the elements together; the bread being ſopped in the cup; but the clergy receive them ſeparate. Children immediately after baptiſm may receive the communion. Predeſtination is a dogma of the Greek church, and a very prevailing opinion among the people of Ruſſia. The Greek church admits prayers and ſervices for the dead as an ancient and pious cuſtom, and even prayers for the remiſſion of their ſins; but it diſallows the doctrine of purgatory, and determines nothing dogmatically concerning the ſtate and condition of departed ſouls. It alſo pays a regard to the relics of ſaints and martyrs of which too ſuperſtitious an uſe is made. Supererogation, indulgences, and diſpenſations are utterly diſallowed in this church; nor does it affect, like the Latin, the character of infallibility, but like moſt other churches, it is guilty of pretending to be the only true and orthodox church. The confeſſion, or catechiſm of Mogiſlaus, above-mentioned, ſeems to have been at one time received as the ſtandard of the principles of the Ruſſian church; yet there are many points in it, which the preſent doctors of the church do not approve, others which they conſider as trivial; nor, indeed, do they allow the book to have any authority at all.

Many attempts have been made to unite the Greeks with the Latin or Romiſh church, and alſo with the Reformed church; but they have hitherto proved unſucceſsful. Nothing more deplorable can be conceived than the ſtate of the greateſt part of the members of the Greek church, ſince their ſubjection to the oppreſſive yoke of the Turkiſh emperors. Since that fatal period, almoſt all learning and ſcience, human and divine, have been extinguiſhed among them. Thoſe of them that are in this abject condition have neither ſchools, colleges, nor any of thoſe literary eſtabliſhments, that ennoble human nature, by ſowing in the mind the immortal ſeeds of knowledge and virtue. This ignorance, that reigns among the Greeks, has the moſt pernicious influence upon their morals. Licentiouſneſs and impiety not only abound among the people, but alſo diſhonour their leaders; the calamities that ariſe from this corruption of manners are deplorably augmented by their endleſs contentions and diviſions. Their religion is a motley collection of ceremonies, the moſt of which are either ridiculouſly trifling or ſhockingly abſurd. Yet they are much more zealous in retaining and obſerving thoſe ſenſeleſs rites, than in maintaining the doctrine, or obeying the precepts of the religion they profeſs.

The Ruſſians, Georgians, and Mingrelians adopt the doctrines and ceremonies of the Greek church; though they are entirely free from the juriſdiction and authority of the patriarch of Conſtantinople. Indeed, this prelate formerly enjoyed the privilege of a ſpiritual ſupremacy over the Ruſſians, to whom he ſent a biſhop whenever a vacancy happened. But towards the concluſion of the 16th century, this privilege ceaſed. The ſervice of the Greek church, as it is performed in Ruſſia, &c. is long and complicated; the greateſt part of it varies every day in the year, and every part of the day, except in the communion office, where the larger part is fixed. They have books in many volumes folio, which contain the hymns and particular ſervices for the ſaints and feſtivals as they occur in the calendar throughout the year; and ſuch is the number of ſaints in this church that every day in the year has ſome ſaint, and frequently one day has ſeveral. They contain alſo particular ſervices for the ſeveral days of the week. The one of theſe, comprized in twelve volumes folio; one volume for each month, is called Μηναιον, Minæon, and the other Οκτωηχος, octoechos, in 2 vols. folio, divided into eight voices or tones, as its name indicates; each tone contains hymns and ſervices for the days of one week, and the whole of which ſerves for eight weeks. The "Common Service" is a book which may be conſidered as a ſupplement to thoſe two, and contains ſervices common to all ſaints, martyrs, biſhops, &c. The "Pſalter and the Hours," employ another volume. The "Book of Prayer or the Service" as it is called, contains the ordinary daily prayers, &c. for the prieſts and deacons in the veſpers, matins, and communion offices. The "Lives of the Saints" are in four volumes folio; theſe are read in pariſh churches, but they are uſually read in monaſteries at the matins or morning ſervice. The "Four Goſpels" make one volume by themſelves. There are alſo extracts from the Old Teſtament, and the epiſtles uſed in the ſervice. The "Ritual or Book of Offices" contains the rites of baptiſm, marriage, the burial-ſervice, &c. Theſe books are all in the Sclavonian language, as is conſequently the whole ſervice. In Ruſſia, at this time, they have ſervice, both in monaſteries and pariſh churches, only three times a day; the veſpers, the matins, and the liturgy or communion. The ſervice of every day begins in the evening of the preceding day, as among the Jews. The greater part of the ſervice of this church conſiſts in pſalms and hymns, which ſhould all regularly, according to the primary inſtitution, be ſung; though on account of the length of the ſervice, ſince the joining many forms together, it became the practice to read the greateſt part of them, eſpecially in pariſh churches; yet ſtill they are read in a ſort of recitative. For other particulars, we refer the reader to Dr. King's "Rites and Ceremonies of the Greek church."

A conſiderable reformation was introduced into the Ruſſian church by the wiſdom and active zeal of Peter I. about the beginning of the 18th century, in conſequence of a ſcheme which was projected towards the cloſe of the century preceding. This great prince made no change in the articles of faith received among the Ruſſians, which contain the doctrine of the Greek church. But he took great pains to have this doctrine explained in a manner conformable to the dictates of right reaſon and the ſpirit of the Goſpel; and he uſed the moſt effectual methods to deſtroy, on the one hand, the influence of that hideous ſuperſtition that ſat brooding over the whole nation; and on the other, to diſpel the ignorance of the clergy and that of the people. In order to accelerate the execution of this laudable plan, Peter became the zealous protector and patron of arts and ſciences; and induſtriouſly endeavoured, by a variety of methods, to excite in his ſubjects a deſire of emerging from their ignorance and brutality, and a taſte for knowledge and the uſeful arts. See his biographical article. In reference to the preſent ſubject we may obſerve, that he extinguiſhed the infernal ſpirit of perſecution; aboliſhed the penal laws againſt thoſe who differed merely in religious opinion from the eſtabliſhed church, and granted to Chriſtians of all denominations liberty of conſcience, and the privilege of performing divine worſhip in the manner preſcribed by their reſpective liturgies and inſtitutions. This liberty, however, was ſo modified as to reſtrain and defeat any attempts that might be made by the Latins to promote the intereſts of popery in Ruſſia, or to extend the juriſdiction of the Roman pontiff beyond the chapels of that communion that were tolerated by law. The Jeſuits were not permitted to exerciſe the functions of miſſionaries or public teachers in Ruſſia; and a particular charge was given to the council, taking cognizance of eccleſiaſtical affairs, to uſe their utmoſt care and vigilance for preventing the propagation of Romiſh tenets among the people. Beſides, a very conſiderable change was introduced into the mode of governing the church. The ſplendid dignity of patriarch was ſuppreſſed; and this ſpirited prince claimed in conſequence of his authority as emperor, an abſolute authority in the church. The functions of this high and important office were intruſted with a council aſſembled at Peterſburgh, which was called the "Holy Synod," and in which one of the archbiſhops, the moſt diſtinguiſhed by his integrity and prudence, was appointed as preſident. The other orders of the clergy continued in their reſpective ranks and offices; but both their revenues and their authority were conſiderably diminiſhed. This council, or college, was appointed in the year 1721, and the emperor declared himſelf head of the church. The patriarchate in Ruſſia expired with Adrian, in the year 1700; and he was ſucceeded by an officer of more limited powers, under the name of exarch, or vicegerent of the patriarchal ſee. The government of the exarchy laſted ſomewhat more than 20 years; and by executing the orders of Peter the Great, led the way to the reformation of the clergy. At length the "Holy Legiſlative Synod" was eſtabliſhed by a ſpecial edict publiſhed through the whole empire. This ſynod or college conſiſted at firſt of twelve members; one preſident, two vice-preſidents, four counſellors, and four aſſeſſors; the 12th was charged with the care of eccleſiaſtical concerns at Moſcow, in a particular office, under the name of the ſynodical chancery, which depended on the ſynod.

The members were taken from the biſhops, archimandrites,

drites, hegumens, and prototypes of the moſt eminent monaſteries and churches. To theſe were ſoon added others, both from the regular and ſecular clergy, who were men of learning and fit to govern the church. In the edict by which Peter founded this eccleſiaſtical college, it is called "the general ſpiritual government;" and in the oath taken by the members, it is expreſsly determined, that no other than the ſovereign ſhould be conſidered as its head. In order to give it a higher eſtimation in the minds of the people, he honoured it with the title of "the holy legiſlative ſynod," a title which formerly belonged to the patriarchs. This ſynod was put upon an equality with the ſenate, and inveſted with the ſame powers. The election of biſhops was entruſted to the ſynod, which nominated two candidates, of whom the ſovereign choſe one. Theſe biſhops were authoritatively inſtructed as to their behaviour, power, and viſitation of their dioceſes, the eſtabliſhment and management of ſchools, and a variety of other particulars. The eccleſiaſtical reformation of Peter comprehended alſo the monks, upon whom the order and welfare of the Ruſſian church very much depended, and likewiſe the ſecular prieſts. See the Appendix to the work above cited.

The Georgians and Mingrelians, or as they were anciently called, the Iberians and Colchians, have declined ſo much ſince the Mahometan dominion has been eſtabliſhed in theſe countries, that they can ſcarcely be ranked in the number of Chriſtians. Theſe nations have a pontiff at their head, called "The Catholic;" they have alſo their biſhops and prieſts; but they are ſo ignorant, avaricious, and profligate, that they are a diſgrace to Chriſtianity.

The eaſtern Chriſtians, who renounce the communion of the Greek church, and differ from it both in doctrine and worſhip, may be comprehended under the two claſſes of *Monophyſites* or *Jacobites*, and *Neſtorians* or *Chaldæans*. See theſe articles.

The *Latin* or *Weſtern Church* comprehends all the churches of Italy, France, Spain, Africa, the North, and all other countries whither the Romans carried their language. In a more reſtricted ſenſe the *Latin* church, in contradiſtinction to the Greek church, denotes

The *Church* of *Rome*, which roſe to a very eminent degree of ſplendour and dominion, and exerciſed for ages an almoſt univerſal authority throughout the weſtern world. The various circumſtances that favoured its firſt advancement, and that contributed to the extent and long duration of its dominion, cannot be minutely detailed within our preſcribed limits. We muſt content ourſelves with briefly noticing ſome of the chief and moſt prominent. Rome, from the firſt foundation of the city, gradually advanced into an empire of ſuch extent, revenue, and permanence, as has been unparalleled in the world, either before or ſince. And from the firſt declenſion of that enormous power, ſhe inſenſibly became the ſeat of a new ſpring of empire, which, though not of equal celebrity with the former, has been much more extraordinary, and perhaps more difficult to be ſurmounted, becauſe it is deeply rooted in the paſſions, prejudices, and intereſts of mankind. Independently of the advantage reſulting from the extent of its ſecular dominion, the votaries of the Romiſh church found their right of ſpiritual empire on the prerogatives which they pretend to have been given by our Lord to the apoſtle Peter, and on the ſucceſſion of their biſhops to that apoſtle, and conſequently to thoſe prerogatives. Againſt theſe pretenſions, however, it has been alleged, that Peter did not poſſeſs the prerogatives which they aſcribe to him, and that their biſhops never had any juſt reaſon for denominating themſelves his ſucceſſors. Indeed, in point of right, whatever might have been the prerogatives of Peter, which were perſonal, and not official, no peculiar privilege can be claimed by any church, as derived from this apoſtle. But if we advert from the queſtion of right to the matter of fact, or the ſpecial relation of the ſee of Rome to the apoſtle Peter, the partiſans of papal ambition have never been able to ſupport their affirmations by any thing that deſerves the name of evidence. It has indeed been queſtioned, whether Peter ever was at Rome. The only ground on which the papiſt builds his aſſertion, that he was in that city, and founded the church in it, is tradition; and ſuch a tradition as muſt appear very ſuſpicious to reaſonable Chriſtians, being accompanied with a number of legendary ſtories, which are totally unworthy of regard. See our biographical article St. Peter. Allowing, however, that Peter ſuffered martyrdom at Rome, his journey thither muſt have been poſterior, not only to the period with which the hiſtory of the Acts concludes, but to the writing of Paul's epiſtles, which are wholly ſilent as to this fact. In this caſe it is manifeſt, that he could not have been the founder, nor even one of the earlieſt inſtructors of the Roman church. Moreover, if we admit that Peter, in the courſe of his peregrinations, viſited Rome, and that he was the founder of that church, yet no ſatisfactory evidence can be offered in order to prove that he was the biſhop of the place, according to the proper acceptation of the term, and that their biſhop, whoever he might have been, was diſtinguiſhed by any prerogative whatever, from any other biſhop. The common opinion leads us, if we ſet aſide the apoſtles, to aſſign to Linus the honour of being firſt biſhop of that ſee, who was ordained before the martyrdom both of Peter and of Paul; and yet the latter, in writing to Timothy, a little before his own death, introduces the name of Linus, notwithſtanding his pretended papal dignity, among other obſcure names, no where elſe to be found in the annals of hiſtory, without any marked diſtinction, and without ſo much as giving the ſovereign pontiff the precedency. Beſides, Paul in his epiſtle to the Galatians (chap. ii. 7, 8, 9.), an epiſtle written from Rome, denominates Peter the apoſtle of the circumciſion, to whoſe care was entruſted the converſion of the Jews, throughout the world, and under this character, his miſſion is contraſted with that of Paul, who is ſtyled, by way of eminence, the apoſtle of the Gentiles. To this reaſoning we may add the teſtimony of hiſtory. Irenæus, in a paſſage quoted from him by Euſebius, (l. v. c. 6.) ſhows clearly, that Peter was not conſidered, in his time, or near the end of the ſecond century, as having been biſhop of the church of Rome, or even as its ſole founder. Many other teſtimonies of a ſimilar kind might be produced, if it were neceſſary in ſo plain a caſe. Pope Innocent, who, about the beginning of the fifth century, appears to have been the firſt that thought of deriving the prerogatives of his ſee from the apoſtle Peter, acknowleges that Antioch, as well as Rome, had been properly the ſee of St. Peter; and that it yields to the ſee of Rome only becauſe Peter had accompliſhed there what he had begun at Antioch. After all, no hiſtorical fact can be more unqueſtionable, than that the origin of the ſuperiority of one epiſcopal ſee over another aroſe from the ſecular diviſion of the empire, and from no other conſideration whatever. Hence the pre-eminence of the ſee of Rome, whoſe biſhop, before the converſion of Conſtantine, had only the precedency among the prelates, as biſhop of the imperial city; but no juriſdiction beyond the bounds of the provinces, lying within the vicariate of Rome, as it was called, which was properly no patriarchate, being but the half of the civil dioceſe of Italy, and conſiderably inferior in extent to ſome of the patriarchates. When Conſtantinople became the ſeat of empire, it acquired correſponding importance; and though the firſt place is given to Rome, in the council of Conſtantinople, A. D. 381, being that from which the emperor ſtill continued to be named, the ſecond was then given to Conſtantinople, becauſe it was then an imperial city as well as the other. In ſhort, had Rome never been the imperial city, its paſtor never could have raiſed himſelf above his fellows. Had it continued the imperial city, he might, and probably would, have had ſuch a primacy as to be accounted the firſt among the patriarchs, but without any thing like papal juriſdiction over church and ſtate. Another circumſtance which contributed to the advancement of the Romiſh church, was the munificence of the emperors, and the miſjudged devotion of ſome great and opulent proſelytes, by means of which its biſhops roſe from a ſtate of obſcurity to the moſt envied opulence and grandeur. Beſides the cauſes already mentioned, viz. the pretended ſucceſſion from St. Peter, the ſuperior dignity of the city of Rome, and the opulence of her church, there were ſeveral others which co-operated in raiſing her to that aſtoniſhing degree of authority and ſplendour to which, in the courſe of a few centuries, ſhe attained. The firſt of theſe, which we ſhall curſorily mention, is the vigilant and unremitting policy which ſhe manifeſted, at an early period, in improving, for her own aggrandizement, every advantage which rank and wealth could beſtow. As ſoon almoſt as Chriſtianity had received the ſanction of the legiſlature, the biſhops of this city began to aſpire after a kind of domination over their brethren, which might in time be rendered univerſal, analogons to the ſecular authority lodged in the emperors over the ſubjects of the empire. The diſtinctions of preſbyter, biſhop, primate, and patriarch, favoured their views. Their firſt acquiſition, and with this they were for ſome time ſatisfied, was the honour of precedency, or primacy, which was conceded to the biſhop of Rome. The council of Sardica, about the middle of the 4th century, encouraged the ambitious ſchemes of theſe prelates, by enacting a canon, which ordered, that if any biſhop ſhould think himſelf unjuſtly condemned by his own provincials and metropolitan, his judges might acquaint the biſhop of Rome, who might either confirm their judgment, or order a re-examination of the cauſe. Of this canon the Romiſh biſhops afterwards availed themſelves to the exaltation of their ſee. Valentinian, not many years afterwards, enacted a law, empowering the biſhop of Rome to examine and judge other biſhops, ſo that religious diſputes might not be decided by profane and ſecular judges, but by a Chriſtian pontiff and his colleagues. However, neither the canon of Sardica, nor the reſcript of the emperor, produced at firſt any very extenſive effect: But the policy of Rome never relinquiſhed any privilege or prerogative which it once obtained; and whilſt it was the primary object to advance the papal power, every other conſideration gave way to this. This eminently appeared on occaſion of the difference which aroſe between the Eaſtern and Weſtern churches in the buſineſs of Acacius, who, in a matter of controverſy, oppoſed the Roman pontiff; and hence aroſe a ſchiſm between the oriental and occidental churches, which laſted 35 years, and from which the latter, or rather the ſee of Rome, derived conſiderable advantage in its progreſs towards abſolute ſupremacy. In other controverſies that occurred, however trivial in themſelves, the church of Rome found that, by poſſeſſing the prerogative of deciding, ſhe gained acceſſion of authority. The exerciſe of this power occaſioned appeals to the Roman pontiff, which eſtabliſhed and extended his influence. It was by flattery of the emperor Phocas, who murdered his ſovereign and family, and thus enſuring his favour, that the Roman pontiffs obtained the revocation of the edict which had conferred the title of "Univerſal biſhop" on the patriarch of Conſtantinople, and a new decree entailing this title in perpetuity on the occupier of the ſee of Rome, who was actually veſted with the primacy of all the biſhops of the empire. With ſimilar views of aggrandizement, pope Zachary, in the middle of the 8th century, aſſiſted, with his council and influence, the uſurper Pepin to depoſe his maſter and benefactor Childeric, king of France, with all his family, and to poſſeſs himſelf of his crown and kingdom. This favour, Pepin, in the next pontificate, retaliated, by aiding the pope to uſurp the imperial dominions in Italy. Indeed, it was a maxim on which the Roman pontiffs very uniformly acted, and particularly ſanctioned by Gregory, one of the beſt of them, that every thing, which ſerved to advance the papal power and ſecure the ſupremacy of Rome, might be reckoned juſt and lawful.

Another circumſtance, which deſerves to be mentioned, becauſe it tended at an early period to advance the authority of the Roman pontiff, was the following: To the vicarage of Rome belonged 10 provinces, including the iſlands of Sicily, Corſica, and Sardinia; but as in theſe there were no metropolitans, the vicar of Rome, or pope, had not only the power of an exarch over the whole 10 provinces, but that alſo of the primate in every province. In him, therefore, coaleſced the metropolitical and patriarchal juriſdictions; and he had the charge, either by himſelf or his delegates, of ordaining every biſhop within the provinces of his vicariate. Theſe rights he gradually extended, as circumſtances favoured his views, firſt to the whole prefecture of Italy, which included Weſt Illyricum, and Weſt Africa; afterwards to all the occidental churches, Gaul, Spain, and Britain; and laſtly, as of divine right, and, therefore, unalienable, over the whole Catholic church. It was alſo a great advantage enjoyed by Rome, in conſequence of her vaſt opulence and rich domains, that ſhe was able to employ and ſupport miſſions, in diſtant parts of Europe, for the propagation of the goſpel; and, of courſe, when churches were planted in any country by means of miſſions and expence, they were always counted dependent on that as the mother church by whom the miſſionaries were employed. Another excellent piece of policy, by which the church of Rome extended and ſecured its authority, was the legatine power; introduced by Damaſcus near the end of the 4th century. The general ambition of the clerical order ſerved alſo to promote the ſelf-aggrandizing ſchemes of Rome. The monarchical form of the church, ſupported by the prejudices and ſuperſtition of the people, was the only adequate means both of preſerving and of extending the high privileges, honours, titles, and immunities claimed univerſally by the ſacred order, and for which they ſtrenuouſly contended. This could not fail to induce them to put themſelves under the protection of the only biſhop in the weſt, who was both able and willing to ſupport their bold pretenſions. The ambition of ſecular princes alſo concurred in the eſtabliſhment and exaltation of the papal hierarchy. The biſhop of Rome by his extenſive influence had it in his power to excite and foment, or to compromiſe and terminate internal diſcord, or foreign conteſts in all the ſtates, which acknowledged his authoriry. We muſt not omit to mention another great engine of papal policy, by which its authority and intereſt were upheld and promoted, and that is the exemption granted by the pontiffs to particular eccleſiaſtics or communities, by which their ſubjection to the ordinary was diſpenſed with, and their immediate dependance on Rome preſerved. From the various circumſtances that have been recited, and many others of a ſimilar nature, which our limits conſtrain us to omit, the riſe, eſtabliſhment, extenſive influence, and long duration of the church of Rome may be accounted for without difficulty. Moreover, it is eaſy to perceive that, when Rome had every thing at her diſpoſal, all canons, in regard to diſcipline, and all decrees, in relation to doctrine, would point invariably to the ſupport of this power. Hence, ſprung the convenient doctrines of tranſubſtantiation, purgatory, prayers, and maſſes for the dead, auricular confeſſion, and the virtue of ſacerdotal abſolution. Hence alſo were derived, and, with this view, were enforced the canons extending ſo immenſely the forbidden degrees of marriage, the peculiar power in the popes of diſpenſing with theſe, and other canons; the power of canonization, the celibacy of the clergy, the ſupererogatory merits of the ſaints, indulgences, and many others. See the ſeveral articles, and Popery.

For the ſupport of ſuch an immenſe fabric as that of the Romiſh church, very ample revenues were neceſſary; and its ſources of ſupply were as various and extenſive as the different modifications of its influence and dominion. Every country in which it prevailed, contributed, in a variety of ways, not only to its ſubſiſtence, but to its magnificence and to all the coſtly undertakings in which it engaged. Princes and kingdoms were its tributaries; by impoſitions and by benevolences; by donations and bequeſts, it filled its treaſures, and amaſſed wealth ſufficient to anſwer all the purpoſes of its numberleſs eſtabliſhments. It would be endleſs to recount the various claims which it ſet up under the names of annats, tythes, peter-pence, reſervations, reſignations, expectations, graces, &c. beſides the caſualties ariſing from pilgrimages, jubilees, indulgences, the dues of appeals, confirmations, diſpenſations, inveſtitures, &c. &c. which were ſo many ſorts of tribute.

After this brief ſketch of the principal circumſtances that contributed to the riſe and eſtabliſhment of the church of Rome, or Romiſh hierarchy, we ſhall terminate this article, with a conciſe account of the cauſes that brought about the declenſion of this wonderful empire over the conſciences, the perſons, and the property of mankind. The opinions, we may obſerve, which are the great bulwarks of ſpiritual tyranny, are founded in ignorance and ſuperſtition; and theſe are always accompanied with great credulity. We may add, that the three great engines which Rome has employed for maintaining the ignorance of her votaries, and for preventing every acquiſition in knowledge that might prove ſubverſive of her high pretenſions, are the concealment of Scripture from the people, and even of the import of the forms of public worſhip, by the daily uſe of a dead language; the prohibition, under the ſevereſt penalties, of every thing which might ſerve to enlighten and undeceive the world; and the ſyſtem of perſecution. The firſt two were chiefly calculated for preventing all intercourſe with that moſt formidable enemy of ſuperſtition, knowledge; and the third intended principally for checking its progreſs wherever it appears to have made any advances. By the noble diſcovery of the art of printing, knowledge has been diffuſed; and this has proved more baneful to the cauſe of ſuperſtition and tyranny than any event that has happened ſince the firſt promulgation of the goſpel. Although knowledge had been gaining ground for ſome centuries before, its progreſs was ſlow; but the art of printing ſerved to accelerate its progreſs to an inconceivable degree. When learning was thus brought within the reach of the middle ranks, the dead languages became a very general ſtudy. The Scriptures were read by moſt ſtudents in the Latin vulgate, and by ſome few in the Greek. The early writers of the church were alſo read: reading occaſioned reflection, and compariſon. To this purpoſe, it is ſaid, that a picture which Huſs, one of the firſt reformers, had procured, and exhibited to the people, in which the entry of our Lord into Jeruſalem, riding on an aſs, attended by his diſciples on foot, in a very homely garb, was contraſted by a proceſſion of the pope and cardinals, in their pontifical habits, and magnificently mounted on the fineſt horſes, richly capariſoned, and adorned with gold, and ſilver, and jewels, did not a little contribute to excite the indignation of ſpectators againſt their ſpiritual lords, as bearing no reſemblance to thoſe meek, humble, and unaſſuming men, from whom they pretended to derive all their high powers and prerogatives. But the diſparity was not leſs remarkable in diſpoſition and character than in external circumſtances. The dignified clergy of the Romiſh church, as they were both wealthy and powerful, were generally indolent, proud, ambitious, envious, vindictive, and ſometimes profligate. Thoſe again, on whom the burden of the ſervice was devolved, as they were both needy and dependent, and often ignorant, had a ſhare of the vices, which commonly accompany theſe circumſtances. They were falſe, mercenary, and ſervile. This general charge admits, however, of various exceptions; for in the higher and lower ranks of clergymen, there were many perſons whoſe characters were irreproachable, and lives exemplary. It will alſo be admitted, as a circumſtance of additional importance, that the different kingdoms and ſtates of Europe had, at length, attained a better and more ſettled conſtitution than formerly; ſtateſmen began to entertain more extenſive views of policy, and princes to underſtand better their own rights and intereſts. As men's eyes were opened, they ſaw more clearly the encroachments and uſurpations of the Romiſh prieſthood. This diſcovery, concurring with the abhorrence and contempt they entertained of many of the prieſts themſelves on perſonal accounts, namely, the neglect or proſtitution of their ſacred functions, and the diſſoluteneſs of their lives, led them to inquire a little into the foundations of the high powers and privileges which they claimed. This was a ſubject which would not bear examination. As the great foundations of the papal hierarchy were the people's ignorance, ſuperſtition, and credulity; when theſe were removed, the whole fabric began to totter and gradually fell to pieces. Accordingly, in all the hereſies which ſprang up in the different parts of Europe, ſince the revival of letters, church power ſeems to have been the principal object at which the reputed heretics aimed. This will appear manifeſt to any one who conſiders the accuſations brought againſt Waldo of Lyons, and his followers, Wickliff of England, Huſs of Bohemia, Luther of Germany, and Zuinglius of Switzerland; and compares them with thoſe brought againſt the hereſiarchs of the primitive ages, ſuch as Arius, Pelagius, Neſtorius, Eutychius, in none of whom was there any direct attack againſt eccleſiaſtics. The uſurpation and tyranny of eccleſiaſtical ſuperiors, and the ignorance in which they kept the people, were at firſt almoſt the only topics. Hence, they proceeded to cenſure practical abuſes in ceremonies and diſcipline. The third and laſt ſtep of their progreſs was to expoſe errors in doctrine. For ſome centuries before the time of Luther, the corruptions that had found their way into the church had been the ſubject of complaint and murmur in various places. From the time of Wickliff, preaching in England and publiſhing his ſentiments to the world in Latin tracts, which was near a century and a half before the reformation, men's attention was rouſed to ſuch topics, and people grew bolder every day in ſpeaking out their opinions. In the remote kingdom of Bohemia, Wickliff's doctrine extended its influence, and the fate of his two famous diſciples, John Huſs and Jerome of Prague, afforded melancholy inſtances of it. In what related to the corruptions of the church and of the clergy, together with the exorbitance and abuſe of eccleſiaſtical power; they were evidently the followers of Wickliff, however they might have differed from him in other particulars; and at length emboldened by his writings and example, they bore an open teſtimony to the truth in their native country, and ſealed it with their blood at Conſtance. This happened about a century before the public remonſtrances of Luther, and paved the way for the reformation. Thus previouſly diſpoſed, as Europe ſeemed to be, towards the cloſe of the 15th and beginning of the 16th century, nothing could be more evident to any perſons of diſcernment, than that Chriſtendom was ripe for a revolution in its eccleſiaſtical polity, and ſeemed only to wait for a favourable occaſion. Such an occaſion the avarice of pope Leo X., and the impiety, as well as indiſcretion, of his miniſters and agents, ſoon furniſhed. Campbell's Eccleſ. Hiſt. paſſim. See *Lutheran* Church, *Reformed* Church, Luther, and Reformation.

Church, *Gallican*, denotes the church of France, as it ſubſiſted before the revolution, under the direction and government of its biſhops and paſtors. This church has always enjoyed certain immunities and franchiſes, not as grants from the popes, but derived to her from her firſt original, which ſhe has carefully maintained. Theſe privileges depend on two maxims; viz. 1. That the pope has no authority or right to command or order any thing, general or particular, in which the temporalities and civil rights of this kingdom are concerned. 2. That notwithſtanding the pope's ſupremacy is owned in caſes purely ſpiritual, yet in France, his power is limited and regulated by the decrees and canons of ancient councils, received in that realm. A ſcheme of union between the church of England and the Gallican church was projected by the doctors of the Sorbonne in the beginning of the 18th century; and a correſpondence was carried on, in 1717 and 1718, between archbiſhop Wake and Dr. Du Pin on the ſubject; which terminated without ſucceſs.

Church, *Reformed*, in a general ſenſe, comprehends all thoſe churches that have ſeparated from the church of Rome, and that have renounced the ſpiritual juriſdiction and ſupremacy of the Roman pontiff. Accordingly, the Romaniſts call it the "Weſtern Schiſm," as they denominate the Greek church the "Eaſtern Schiſm."

The denomination of "reformed" is often reſtricted to thoſe Proteſtant churches which did not embrace the doctrine and diſcipline of Luther. The title was firſt aſſumed by the French Proteſtants, and afterwards became the common denomination of all the Calviniſtical churches on the continent. But in England the term "reformed" is generally uſed in its genuine and extenſive ſenſe, as ſtanding in oppoſition to popery alone; and in this large ſenſe it comprehends the Lutheran church in all its modifications, the Calviniſt church, the church of England, the church of Scotland, &c. When this epithet of "reformed" is uſed in oppoſition to the community founded by Luther, it repreſents not a ſingle church, as the epiſcopal, Preſbyterian, or Independent, but rather a collection of churches; which, though they be inviſibly united by a belief and profeſſion of the fundamental doctrines of Chriſtianity, yet frequent ſeparate places of worſhip, and have, each of them, a viſible centre of external union peculiar to themſelves, which is formed by certain peculiarities in their reſpective rules of public worſhip and eccleſiaſtical government. This matter may be illuſtrated by an attentive examination of the diſcipline, polity, and worſhip of the churches of England, Scotland, Holland, and Switzerland. The firſt of theſe churches, being governed by biſhops, and not admitting the validity of the Preſbyterian ordination, differs from the other three more than any of theſe differ from each other. There are, however, peculiarities of government and worſhip, that diſtinguiſh the church of Holland from that of Scotland. The inſtitution of deacons, the uſe of forms for the celebration of the ſacrament, an ordinary form of prayer, the obſervation of the feſtivals of Chriſtmas, Eaſter, Aſcenſion-day, and Whitſuntide are eſtabliſhed in the Dutch church; and, it is well known, that the church of Scotland differs from it extremely in theſe reſpects. For an account of the origin, progreſs, and eſtabliſhment of the "reformed church," in the more general ſenſe of the term; ſee Reformation.

The founder of the "reformed church," in a more reſtricted ſenſe, was Ulrick Zuingle, a native of Switzerland, who combined, with uncommon penetration and acuteneſs, an ardent zeal for truth. Zuingle wiſhed to remove out of the churches, and to aboliſh in the ceremonies and appendages of public worſhip, many things which Luther was diſpoſed to treat with toleration and indulgence; ſuch as images, altars, wax-tapers, the form of exorciſm, and private confeſſion. What he aimed at eſtabliſhing in his country was a method and form of divine worſhip diſtinguiſhed by its ſimplicity, and as far remote as could be from every thing that might have the ſmalleſt tendency, according to his ideas, to nouriſh a ſpirit of ſuperſtition. Moreover, his ſentiments concerning ſeveral points of theology, and more eſpecially his opinions relating to the ſacrament of the Lord's Supper, were very different from thoſe of Luther. Of theſe ſentiments and opinions ſeveral were adopted in Switzerland by thoſe who concurred with Zuingle in promoting the cauſe of the reformation, and were tranſmitted by them to all the Helvetic churches that threw off the yoke of Rome. From Switzerland theſe opinions were propagated among the neighbouring nations by the friends and diſciples of Zuingle; and thus the primitive reformed church, that was founded by this eminent eccleſiaſtic, and whoſe extent at firſt was not very conſiderable, gathered ſtrength by degrees, and made daily new acquiſitions. After the death of Zuingle, ſeveral Lutheran doctors of the more moderate ſort, and particularly Martin Bucer, made an attempt to form a kind of reconciliation between the partizans of the Lutheran and reformed churches; but their endeavours were unſucceſsful. The breach between them was widened by Calvin, who, by his activity and zeal, conſiderably enlarged the boundaries of the reformed church, propagated his doctrine, and gained proſelytes and patrons to his theological ſyſtem, in ſeveral countries of Europe. The plan of doctrine and diſcipline, which Zuingle had formed, was altered and corrected by Calvin, particularly in relation to three points. Zuingle, in his form of eccleſiaſtical government, had given an abſolute and unbounded power, in religious matters, to the civil magiſtrate, to whom he had placed the clergy in a degree of ſubjection, with which many were offended. He allowed, however, certain ſubordination and difference of rank among the miniſters of the church, and thought it expedient to place at their head a perpetual preſident, or ſuperintendant, with a certain degree of inſpection and authority over the whole body. Calvin, on the contrary, reduced the power of the magiſtrate, in religious matters, within narrow bounds. He declared the church a ſeparate and independent body, endowed with the power of legiſlating for itſelf. He maintained that it was to be governed by two eccleſiaſtical bodies, viz. "the venerable company" of the paſtors and profeſſors, and the "conſiſtory;" and he left to the civil magiſtrate little elſe beſides the privilege of protecting and defending the church, and providing for what related to its external exigencies and concerns. Thus this eminent reformer introduced into the republic of Geneva, and endeavoured to introduce into all the reformed churches throughout Europe, that form of eccleſiaſtical government, which is called "Preſbyterian," from its neither admitting the inſtitution of biſhops, nor any ſubordination among the clergy; and conformably to this principle, that all miniſters of the Goſpel are, by the law of God, declared to be equal in rank and authority. In conſequence of this principle, he eſtabliſhed at Geneva a conſiſtory, or eccleſiaſtical judicatory, over which he himſelf preſided (though at his death he adviſed the clergy not to give him a ſucceſſor), compoſed of ruling elders, partly paſtors and partly laymen; and he inveſted this eccleſiaſtical body with a high degree of power and authority. He alſo convened ſynods, compoſed of the ruling elders of different churches, and in theſe conſiſtories and ſynods had laws enacted for the regulation of all matters of a religious nature, and among other things reſtored to its former vigour the ancient practice of excommunication. All theſe things were done with the conſent of the greateſt part of the ſenate of Geneva. Calvin alſo, with a view, as it is ſaid, of facilitating the deſired union with the Lutheran church, ſubſtituted, inſtead of the ſyſtem adopted by Zuingle with regard to the euchariſt, another, which appeared more conformable to the doctrine of that church, and which, in reality, differed little from it. The doctrine of Zuingle ſuppoſed only a ſymbolical, or figurative, preſence of the body and blood of Chriſt in the euchariſt, and repreſented a pious remembrance of Chriſt's death, and of the benefits it procured to mankind, as the only fruits that aroſe from the celebration of the Lord's Supper; whereas Calvin acknowledged a real, though ſpiritual, preſence of Chriſt in this ſacrament; or, in other words, he maintained, that true Chriſtians were, by this ordinance, in a certain manner united to the man Chriſt; and that from this union the ſpiritual life derived true vigour in the ſoul, and was ſtill carried on, in a progreſſive motion, to greater degrees of purity and perfection. See CONSUBSTANTIATION, EUCHARIST, and IMPANATION. Moreover, Calvin zealouſly inculcated the abſolute decree of God, with reſpect to the future and everlaſting condition of the human race, which formed no part of the theological creed of Zuingle. The firſt of the above-mentioned points was not univerſally allowed, notwithſtanding the credit and influence of Calvin, in the reformed churches. The Engliſh and Germans rejected it, and even the Swiſs refuſed to adopt it. It was, however, received by the reformed churches in France, Holland, and Scotland. Several churches, more eſpecially thoſe of Zurich and Bern, obſtinately maintained the doctrine of Zuingle in relation to the euchariſt; neither could they be eaſily perſuaded to admit, as an article of faith, the doctrine of predeſtination, as it had been taught by Calvin. His followers, nevertheleſs, in proceſs of time, aided by his high reputation and learned writings, induced almoſt all the reformed churches to adopt his theological ſyſtem. In various provinces of Germany, the tenets, rites, and inſtitutions of the church of Geneva, were adopted and enforced by the ruling powers. This was the caſe, particularly, with the palatinate and the republic of Bremen. The French Proteſtants, very generally, entered into the bonds of fraternal communion with the church of Geneva. See CHURCH of *Scotland* and CHURCH of *England*.

CHURCH, *Lutheran*, derives its appellation from Luther, who, having been eminently inſtrumental in bringing about the reformation (which ſee), formed the project of founding a church upon principles entirely oppoſite to thoſe of Rome, and of eſtabliſhing in it a ſyſtem of doctrine and eccleſiaſtical diſcipline, which he conceived to be agreeable to the ſpirit and precepts of the Goſpel. Accordingly, the riſe of this church muſt be dated from that remarkable period, when the pontiff Leo X. drove Martin Luther, with his friends and followers, from the boſom of the Roman hierarchy, by a ſolemn and violent ſentence of excommunication; and it began to acquire a regular form, and a conſiderable degree of ſtability and conſiſtence, from the year 1530, when the ſyſtem of doctrine and morality it had adopted was drawn up and preſented to the diet of Augſburg. It was raiſed to the dignity of a lawful and complete hierarchy, totally independent on the laws and juriſdiction of the Roman pontiff, in conſequence of the treaty concluded at Paſſau in the year 1552, between Charles V. and Maurice, elector of Saxony, relating to the religious affairs of the empire. The great and leading principle of the Lutheran church, ſays Moſheim (Eccl. Hiſt. vol. iv.) is, that the Holy Scriptures are the only ſource from whence we are to draw our religious ſentiments, whether they relate to faith or practice; and that theſe inſpired writings are, in all matters eſſential to ſalvation, ſo plain, and ſo eaſy to be thoroughly underſtood, that their ſignification may be learned, without the aid of an expoſitor, by every perſon of common ſenſe, who has a competent knowledge of the language in which they are compoſed. There are, alſo, certain formularies adopted by this church, which contain the principal points of its doctrine; but the books, containing theſe formularies, have no authority beyond what they derive from the ſcriptures of truth, whoſe ſenſe and meaning they are deſigned to convey; nor are the Lutheran doctors permitted to interpret or explain theſe books ſo as to draw from thence any propoſitions that are inconſiſtent with the expreſs declarations of the word of God. The principal of theſe human productions is the "Confeſſion of Augſburg," with the annexed "Defence" of it. In the next rank may be placed the "Articles of Smalcald," together with the ſhorter and larger "Catechiſms of Luther." To theſe ſtandard books moſt churches add the "Form of Concord." The ſupreme civil rulers of every Lutheran ſtate are inveſted with the dignity and perform the functions of ſupremacy in the church; but they are effectually reſtrained, by the fundamental principles of the doctrine they profeſs, from any attempt to change or deſtroy the eſtabliſhed rule of faith and manners, to make any alteration in the eſſential doctrines of their religion, or in any thing that is intimately connected with them, or to impoſe their particular opinions upon their ſubjects in an arbitrary and deſpotic manner.

The councils, or ſocieties, appointed by the ſovereign to watch over the intereſts of the church, and to govern and direct its affairs, are compoſed of perſons verſed in the knowledge both of civil and eccleſiaſtical law, and, according to a very ancient denomination, are called "conſiſtories." The internal government of the Lutheran church ſeems equally removed from epiſcopacy on the one hand, and from Preſbyterianiſm on the other, if we except the kingdoms of Sweden and Denmark, in which the church is ruled by biſhops and ſuperintendents, under the inſpection and authority of the ſovereign. The archbiſhop of Upſal is primate of Sweden, and the only archbiſhop among the Lutherans; and his revenues do not amount to more than 400l. annually; and thoſe of the other biſhops are proportionably ſmall. Every country has its own liturgies which preſcribe every thing that relates to external worſhip and the public exerciſe of religion. Aſſemblies for the celebration of divine worſhip meet every where at ſtated times. The Holy Scriptures are publicly read, prayers and hymns are addreſſed to the Deity, the ſacraments are adminiſtered, and the people are inſtructed in the knowledge of religion, and excited to the practice of virtue by the diſcourſes of their miniſters. Among the days that are held ſacred in the Lutheran church, beſides Sunday, we may reckon all ſuch as were ſignalized by the glorious and important events that proclaim the celeſtial miſſion of the Saviour, and the divine authority of his holy religion. The Lutheran church has extended itſelf to Aſia and America; and formed ſeveral congregations in thoſe remote parts of the world. Moſheim's E.H. vol. iv.

CHURCH *of England* is that branch of the reformed church which was eſtabliſhed in England after the ſeparation from the Romiſh church; which took place in the reign of Henry VIII. who renounced the pope's ſupremacy. The Engliſh, who firſt threw off the yoke of Rome, ſeemed to be more inclined to the ſentiments of Luther concerning the euchariſt, the form of public worſhip, and eccleſiaſtical government, than to thoſe of the Swiſs churches. But after the death of Henry VIII. the ſcene changed; when, by the induſtrious zeal of Calvin and his diſciples, more eſpecially Peter Martyr, the cauſe of Lutheraniſm loſt ground conſiderably; and the univerſities, ſchools, and churches, became the oracles of Calviniſm, which alſo acquired new votaries among the people. Accordingly, when it was propoſed, in the reign of Edward VI. to give a fixed and ſtable form to the doctrine and diſcipline of the church, Geneva was acknowledged as a ſiſter church; and the theological ſyſtem, then eſtabliſhed by Calvin, was adopted, and rendered the public rule of faith in England. This, however, was done without any change of the epiſcopal form of government which had always taken place, and was entirely different from that of Geneva; and ſeveral religious rites and ceremonies were retained, which many of the reformed conſidered as ſuperſtitious. This latter circumſtance gave riſe to many diſſenſions in ſubſequent ages, which proved detrimental both to the civil and eccleſiaſtical conſtitution of Great Britain. The controverſy concerning the ceremonial part of divine worſhip, commenced with thoſe exiles who, in 1554, fled from the bloody rage and inhuman tyranny of queen Mary, and took refuge in Germany. After the acceſſion of queen Elizabeth, theſe exiles returned to their own country, and renewed the conteſt at home which had begun abroad. Queen Elizabeth, unwilling to ſtrip religion of the ceremonies which remained in it, was rather inclined to bring the public worſhip ſtill nearer the Romiſh ritual; and had a great propenſity to ſeveral uſages in the church of Rome, which were juſtly looked upon as ſuperſtitious. She publicly thanked one of her chaplains, who had preached in defence of the real preſence; ſhe was fond of images, and retained ſome in her private chapel, and would undoubtedly have forbidden the marriage of the clergy, if Cecil, her ſecretary, had not interpoſed. Having appointed a committee of divines to review king Edward's liturgy, ſhe gave them an order to ſtrike out all offenſive paſſages againſt the pope, and to make people eaſy about the corporal preſence of Chriſt in the ſacrament. For an account of the diſputes that agitated the country on this occaſion, ſee the article PURITANS.

From the time of Henry VIII. the kings of England have conſidered themſelves as ſupreme heads of the church, in relation both to its ſpiritual and its temporal concerns; and on the ground of this title, both Henry VIII. and his ſon Edward aſſumed an extenſive authority and juriſdiction in the church, and ſeemed to conſider their ſpiritual power as equal to that which had been unworthily poſſeſſed and exerciſed by the Roman pontiff. Accordingly the conſtitution of the church of England reſembled that of the ſtate, and a ſtriking analogy ſubſiſts between the civil and eccleſiaſtical governments eſtabliſhed in this country. The clergy, conſiſting of the upper and lower houſes of convocation, are aſſembled (whenever they do aſſemble) by the archbiſhop of Canterbury, in conſequence of an order from the ſovereign, and in theſe meetings are propoſed, in common council, ſuch meaſures as ſeem to be neceſſary to the well-being of the church: theſe meaſures are laid before the king and parliament, and derive from their approbation and authority the form of laws.

The 37th article of the church of England expreſsly declares and ordains that "the queen's majeſty hath the chief power in this realm of England, and other her dominions, unto whom the chief government of all eſtates of this realm, whether they be eccleſiaſtical or civil, in all cauſes, doth appertain, and is not, nor ought to be, ſubject to any foreign juriſdiction." It is well known, however, that for the firſt three centuries, the Chriſtian religion was not embraced or protected by any Roman emperor. But after the converſion of Conſtantine, this firſt Chriſtian emperor, and many of his ſucceſſors, enacted laws which are now extant in the codes of Theodoſius and Juſtinian, relative to eccleſiaſtical matters. When the empire of Rome was divided into independent kingdoms, the ſovereigns exerciſed the ſame authority over all their ſubjects, without any diſtinction, and made ſuch regulations, free from all foreign controul, as appeared to them expedient for the good government of their reſpective churches. This continued to be the caſe till the aſpiring ambition of the biſhops of Rome prompted them to claim univerſal dominion, not only over eccleſiaſtics, but over ſovereign princes, throughout the Chriſtian world. Of the fact there is no queſtion; and it has been alleged by the advocates of the ſupremacy of the ſovereign, that the authority which the conſtitution of Great Britain gives to our ſovereign in eccleſiaſtical affairs, is founded in Scripture; is conformable to the practice of the times previous to the corruptions and uſurpations of popery; and is perfectly agreeable to the reaſon and nature of things. This claim, however, was conteſted, on the grounds both of reaſon and Scripture, ſoon after it was aſſumed; and it has been conſidered by many perſons in later times as inconſiſtent with the evangelical conſtitution of the Chriſtian church, and with the ſole legiſlative, judicial, and ſovereign authority of Chriſt, the head of the church, in all religious matters. It has been alſo maintained, that the ſubjection to higher powers, and obedience to magiſtrates, which the Scripture enjoins on Chriſtians, relate only to civil, but not at all to religious matters; for this obvious reaſon, that the magiſtracy at that time was every where Pagan. See SUPREMACY.

Moreover, the 20th article of the church of England declares and ordains, "that the church hath power to decree rites and ceremonies, and authority in controverſies of faith; and yet it is not lawful for the church to ordain any thing that is contrary to God's word written, neither may it ſo expound one place of Scripture, that it be repugnant to another." This article, from the time of its firſt introduction to the preſent day, has been the occaſion of great difference of opinion and of diſpute between its defenders on the one hand, and its oppoſers on the other. By the former it has been argued, that, the church being a ſociety of men united for the moſt important purpoſes, it is neceſſary that its affairs, like thoſe of every other ſociety, ſhould be conducted by certain rules; and that, although the New Teſtament does not contain any particular directions upon the ſubject of rites and ceremonies, every church is left at liberty to preſcribe ſuch to its own members as are conſiſtent with the general precepts enjoined by the ſacred writers; ſuch as "Give none offence;" "Let all things be done decently and in order;" "Let all things be done unto edifying, &c."

This liberty, it is ſaid, was allowed under the Jewiſh diſpenſation; and hence it is concluded that it is lawful for a ſociety of Chriſtians, whoſe religion is deſigned for all ages and countries, to make any regulations which may tend to promote the great objects for which they have formed themſelves into one body. In vindication of the authority aſcribed to the church in controverſies of faith, reference has been made to the decree of the apoſtles and elders aſſembled at Jeruſalem, which was communicated to the churches then eſtabliſhed in different parts of Aſia, and to which their obedience was required; and it has been ſaid, that this was an inſtance of authority exerciſed by the church, under the direction of the inſpired apoſtles, in a controverſy of faith. Two paſſages have alſo been cited (viz. 1 Tim. i. 3, and Titus iii. 10.) in order to ſhew, that Timothy and Titus had authority given them to regulate the faith of the churches over which they were appointed to preſide; and hence it has been inferred, that there muſt have been, at that very early period, ſome fixed teſt, by which the faith of profeſſed Chriſtians was to be judged: the conſequence of not conforming to which teſt was, by apoſtolical authority, excommunication. It is further added, that this practice appears, from eccleſiaſtical hiſtory, to have been uſual in every period of the Chriſtian church. See the lord biſhop of Lincoln's Elements of Chriſtian Theology, vol. ii. On the other hand, it has been pleaded, that this authority claimed by the church of England is lodged in the king and parliament of theſe realms, and not with the church, conſidered as compoſed of the biſhops and clergy. It has been ſaid, that all the clergy of this kingdom, with all the biſhops at their head, have not the leaſt authority to enjoin one ceremony or rite of worſhip; or to either eſtabliſh or annul one article of faith. All power and juriſdiction pertaining to theſe matters is lodged chiefly in lay-hands; it is ſolely in the king and parliament, under whoſe direction and controul the clergy are to act. It has been alſo ſaid, that the biſhops and clergy were ſo far from having any hand in the firſt forming of our preſent eſtabliſhed church, or in ordering its rites and articles of faith; that it was done not only without, but in actual oppoſition to them: for in the 1ſt of queen Elizabeth the parliament alone eſtabliſhed the queen's ſupremacy and the common-prayer book, in ſpite of all oppoſition from the biſhops in the Houſe of Lords; and the convocation then ſitting was ſo far from having any hand in thoſe church acts for reformation, that it preſented to the parliament ſeveral propoſitions in behalf of the tenets of popery, directly contrary to the proceedings of the parliament. It has been alſo queried, who gave the civil magiſtrate this power to decree rites in Chriſtian worſhip, which Chriſt never decreed, and to make articles of faith which Chriſt never made? See Mr. White's Three Letters, and the Diſſenting Gentleman's Anſwer.

It was the general opinion of the Britiſh divines that lived in the earlieſt period of the Reformation, and though it was firſt abandoned by archbiſhop Whitgift, it has been maintained by later writers of the higheſt rank in the church, (ſee Elem. of Theology, above cited,) "that Jeſus Chriſt has left upon record no expreſs injunctions with reſpect to the external form of government that is to be obſerved in his church; and, conſequently, that every nation hath a right to eſtabliſh ſuch a form, as ſeemeth conducive to the intereſts, and to the peculiar ſtate, circumſtances, and exigencies of the community, provided that ſuch an eſtabliſhment be in no reſpect prejudicial to truth, or favourable to the revival of ſuperſtition." See BISHOP.

The doctrines of the church of England are contained in the 39 articles. (See ARTICLE *of Faith.*) Theſe articles were principally compiled by archbiſhop Cranmer; and it appears, from ſome paſſages quoted by the biſhop of Lincoln, (*ubi ſupra,*) from a publication, entitled, "Neceſſary Doctrine and Erudition for any Chriſtian Man," which was confirmed by act of parliament, that his ſentiments on the ſubject of predeſtination and grace inclined more to thoſe afterwards inculcated by Arminius and the ſynod of Dort, than to thoſe of Calvin; and in this reſpect the ſentiments of Ridley, Latimer, and Hooper, coincided with thoſe of Cranmer. The worſhip of the church of England was directed by a liturgy, for an account of which, ſee LITURGY. When James I. aſcended the throne on the death of Elizabeth, the Puritans entertained hopes, from his having received his education in Scotland, that he would mitigate the vexations they had ſuffered from their attachment to the diſcipline and worſhip of the church of Geneva. But they ſoon found that their expectations were unfounded. An epiſcopal hierarchy was more favourable to his views than the Preſbyterian form of eccleſiaſtical government; and he, therefore, diſtinguiſhed the biſhops with peculiar expreſſions of his favour, extended their authority, increaſed their prerogatives, and publicly adopted and inculcated the following maxim, "No biſhop, no king." When the Britiſh divines returned from the ſynod at Dort, the king, together with the greateſt part of the epiſcopal clergy, diſcovered their inclination to the ſentiments of Arminius, relating to the divine decrees, which they thought preferable to thoſe of Calvin and Gomarus. His ſon and ſucceſſor, Charles I., who had imbibed his father's political and religious principles, directed the whole ſcope of his adminiſtration towards the three following objects: "The extending of the royal prerogative, and the raiſing of the power of the crown above the authority of the law—the reduction of all the churches of Great Britain and Ireland under the juriſdiction of biſhops, whoſe government he looked upon as of divine inſtitution, and alſo as the moſt adapted to guard the privileges and majeſty of the throne—and, laſtly, the ſuppreſſion of the opinions and inſtitutions that were peculiar to Calviniſm, and the modelling of the doctrine, diſcipline, ceremonies, and policy of the church of England, after the ſpirit and conſtitution of the primitive church." The inſtrument he employed for the execution of his plan was biſhop Laud of London, afterwards archbiſhop of Canterbury. (See the article LAUD.) After the death of Laud, when the diſſenſions between the king and parliament arrived at their height, the great council of the nation, inſtigated by the Puritans and Independents, aboliſhed epiſcopal government; and proceeded to condemn and abrogate every thing in the eccleſiaſtical eſtabliſhment that was contrary to the doctrine, worſhip, and diſcipline of the church of Geneva. As ſoon as Charles II. was re-eſtabliſhed on the throne of his anceſtors, the ancient forms of eccleſiaſtical government and public worſhip were reſtored; and in 1662, a public law, intitled, the "Act of Uniformity," was enacted, by which all who refuſed to obſerve the rites, and ſubſcribe the doctrines, of the church of England, were entirely excluded from its dominion. In the reign of king William, and particularly in 1689, the diviſions among the friends of epiſcopacy ran high, and terminated in that famous ſchiſm, if it may be ſo called, in the church of England, which produced the two parties denominated "High Church," or "Non-Jurors," and "Low-Churchmen."

The Church of England which is now the chief and leading branch of the great community diſtinguiſhed by the denomination of the Reformed Church, continues much in the ſame ſtate and is governed by the ſame principles, which it aſſumed at the revolution, under the reign of king William III. The eſtabliſhed form of church-government is epiſcopacy, which is embraced by the ſovereign, the nobility, and the greateſt part of the people. The Preſbyterians and other numerous ſects comprehended under the general appellation of non-conformiſts, enjoy the ſweets of religious liberty, under the influence of a legal toleration; and whatever may be the private ſentiments or governing diſpoſitions of a few individuals, the dignitaries of the church and the rulers of the ſtate manifeſt a liberal and candid temper; nor is there any reaſon to apprehend any ſpecies or degree of perſecution, in the preſent enlightened age, either from the church or the ſtate. Thoſe who are comprehended within the pale of the church, and thoſe who are without it, enjoy, as far as the civil or eccleſiaſtical government is concerned, unmoleſted freedom and tranquillity. The members of this church may be divided into two claſſes, according to their different ideas of the origin, extent, and dignity of epiſcopal juriſdiction. Whilſt ſome look upon the government of biſhops to be founded on the authority of a divine inſtitution, and are zealous for extending the power and prerogatives of the church, of which deſcription, the number, we conceive, is very inconſiderable; others, and they form the very decided majority, of a more mild and ſedate ſpirit, though they conſider the epiſcopal form of government as far ſuperior to every other ſyſtem of eccleſiaſtical polity, and recommend all the precautions that are neceſſary for its preſervation and the independence of the clergy, yet do not carry this attachment to ſuch an exceſſive degree, as to refuſe the name of a "church" to every religious community that is not governed by a biſhop, or to defend the prerogatives and pretenſions of the epiſcopal order with an intemperate zeal. To the ſpirit of the eſtabliſhed church of England, in relation to thoſe who diſſent from its rule of doctrine and government, we have already paid our tribute of reſpect and commendation. We ſhall cloſe this part of our article with the words of the learned and amiable Dr. Jortin, (Diſſ. ii. p. 3.) as they are cited by the biſhop of Lincoln *(ubi ſupra)*, without taking upon us to determine whether the articles of the church are Calviniſtic or Arminian, or what is the proportion of thoſe who adopt either ſcheme of interpreting them, or vouching for the juſtice of the repreſentation: "In England, at the time of the ſynod of Dort, we were much divided in our opinion concerning the controverted articles; but our divines having taken the liberty to think and judge for themſelves, and the civil government not interpoſing, it has come to paſs, that from that time to this, almoſt all perſons here, of any note for learning and abilities, have bid adieu to Calviniſm, have ſided with the Remonſtrants, and have left the Fataliſts to follow their own opinions, and to rejoice (ſince they can rejoice) in a religious ſyſtem conſiſting of human creatures without liberty, doctrines without ſenſe, faith without reaſon, and a God without mercy."

The revenue of the church of England has been ſtated by two late writers, from whoſe publications we ſhall extract the following particulars. The biſhop of Landaff (Dr. Watſon) in his "Letter to the Archbiſhop of Canterbury," printed in 1783, aſſures us, that the whole income of the church, including biſhoprics, deans and chapters, rectories, vicarages, dignities, and benefices of all kinds, and even the two univerſities with their reſpective colleges, doth not amount, upon the moſt liberal calculation, to 1,500,000 *l.* a year. Conſequently, if we had no biſhops to inſpect and govern the church; no deaneries, prebendaries, or canonries, to ſtimulate the clergy to excel in literary attainments; no univerſities or colleges to inſtruct our youth; nothing but parochial clergy, and all of theſe provided for by an equal partition of the preſent eccleſiaſtical revenues, there would not be, eſtimating the number of the clergy at ten thouſand, above 150 *l.* a year for each individual. The learned prelate adds, that though the whole revenue of the church is ſo inconſiderable, as not to admit any diminution of it, yet a ſomewhat better diſtribution of it might be introduced, with much advantage to the ſtate, and without the leaſt injuſtice to any individual. For an account of the plan which he propoſes, ſee AUGMENTATION. Another writer, Mr. Cove, vicar of Sithney in Cornwall, in his "Eſſay on the Revenues of the Church of England," 2d ed. 1797, ſays, that though the cathedral revenues, throughout the kingdom, amount to the groſs ſum of 140,000 *l. per annum*, there are in all, not leſs than 1700 perſons who, in a greater or ſmaller proportion, participate theſe revenues. The parochial clergy, he adds, have been more fortunate and ſucceſsful than either their epiſcopal or dignified brethren. Their incomes, being chiefly dependent on the ſtate of landed property, whoſoever might be the poſſeſſors of it, have been neceſſarily more augmented by the increaſed value of the rental of that property; and their rights and claims, not being of a fleeting nature, but immoveably affixed to the ſoil of each pariſh, have ſuffered little diminution, except from the eaſineſs, inattention, and neglect of the clergy themſelves.

It appears from the "Liber Regis," according to archdeacon Plymley in his "Charge to the Clergy of Salop, in the year 1793," that there are in England and Wales 5,098 rectories, 3,687 vicarages, and 2,970 churches, which are neither rectorial nor vicarial; in all 11,755 churches, contained in about 10,000 pariſhes, at which number the pariſhes throughout the kingdom are uſually eſtimated.

Of theſe rectories many are, without doubt, highly valuable. The ſame may be ſaid in reſpect to ſome of the vicarages, from being poſſeſſed of large glebes or large endowments, or from both cauſes united; but however there are many rectories, and vicarages, in particular, whoſe tithes are wholly impropriated, and without even any parſonage houſe. Of the churches, which are neither rectorial nor vicarial, perhaps two-fifths are merely chapels of eaſe, and appendant to ſome extenſive and valuable benefices, or elſe built on ſpeculation in populous parts of the kingdom, in which diſtricts they are chiefly to be found. And of the remaining churches to which neither houſes, glebes, nor tithes moſt commonly belong, the incomes muſt neceſſarily be very inconſiderable, as they can alone proceed from trifling contingencies.

From the aggregate amount of the incomes of 3,181 livings, now and formerly in charge in the king's books, ſituated in every county in the kingdom, and whoſe value hath been collected almoſt entirely within the laſt ten years, from various ſources of public and private information, it appears that each of theſe livings is now worth, on the average, 141 *l.* per annum, and that when compared with the value annexed to them in the king's books, they have all increaſed in the general proportion of about ten to one, ſince the time of the reformation; but that the rectories have increaſed in the ratio of nearly eleven to one, and are at preſent of the yearly value of 162 *l.* each, and that the vicarages have increaſed in the ratio of rather more than nine to one, and are at preſent of the yearly value of 106 *l.* each. The number of rectories included in this calculation, is 2,037, and of the vicarages 1,144; the collective value of the former in the king's books being 30,158 *l.* and of the latter 13,379 *l.*, and the collective value of the former at preſent being 330,754 *l.* and of the latter 121,403 *l.* per annum.

According, then, to the preſent average value of theſe rectories and vicarages, and to the number of the rectorial, vicarial, and other churches throughout the kingdom, as before given from the "Liber Regis," the revenues of the parochial clergy will be increaſed to the amount of 1,313,000*l.* per annum, as thus appears: 5,098 rectories, at 162 *l.* each, will give 825,876*l.*—3,687 vicarages, at 106*l.* each, will give 398,222*l.* And 1782 (that is, three-fifths of 2,970) churches, which are neither rectórial nor vicarial, but are preſumed to be parochial cures, at, ſuppoſe the ample allowance of—50 *l.* each, will give 89,100*l.* And, when to theſe ſums are added the epiſcopal, cathedral, and univerſity revenues amounting, to 392,000*l.* per annum, it will be ſeen that the biſhop of Landaff's valuation of the church and univerſity revenues is exceeded by the ſum of 205,000*l.*

From the revenues, this author proceeds to form an eſtimate of the number of the eſtabliſhed clergy:

They have been variouſly eſtimated, as much above 20,000 as below 15,000; a medium between both, or 18,000, is, moſt probably, the correcteſt ſtatement of them, as it will allow a ſupernumerary or curate to about one half of the before ſtated number of 11,755 churches.

Theſe eighteen thouſand perſons, whether beneficed or expectant, with their families and dependents, make up poſſibly near 100,000 ſouls, reckoning at the rate of five and an half perſons to a family. However, as a part of the clergy, like thoſe of other profeſſions, may be ſuppoſed to be ſingle men, this computation will therefore at firſt ſight appear exaggerated; but, when it is conſidered that the clergy are an exception to thoſe of other profeſſions, and are for the moſt part married men with numerous families in general, the calculation, in eſtimating the whole body of them with each a family of five and an half perſons, may turn out neither raſh nor ill-founded; and more eſpecially, ſince computing two-thirds of them to be married men, with families and dependents of ſeven perſons each, the ſame groſs product will almoſt appear, as ſeven times twelve thouſand amount to 84,000, and the remaining one-third, (or 6,000 ſingle men) with one dependent each, will make up the whole number to be 96,000.

And thus, taking the population of the kingdom at 8,000,000 of perſons, the clergy, with their families and dependents, are about an eightieth part of the people.

It appears that, by the addition of the cathedral and the equalization of the parochial incomes, the revenue to be enjoyed by each pariſh prieſt would not exceed 172 *l.* per annum.

Church *of Scotland*, is that branch of the reformed church which was eſtabliſhed in Scotland. One of the principal agents in accelerating and completing the progreſs of the reformation in Scotland was John Knox, who, with better qualifications of learning, and more extenſive views than any of his predeceſſors in Scotland, poſſeſſed a natural intrepidity of mind, which ſet him above fear. He began his public miniſtry at St. Andrew's, in the year 1547, with that ſucceſs which always accompanies a bold and popular eloquence. Inſtead of amuſing himſelf with lopping the branches, he ſtruck directly at the root of popery, and attacked both the doctrine and diſcipline of the eſtabliſhed church, with a vehemence peculiar to himſelf, but admirably ſuited to the temper and wiſhes of the age. The great revolution in England, which followed upon the death of Henry VIII. contributed no leſs than the zeal of Knox towards demoliſhing the popiſh church in Scotland. Several noblemen of the greateſt diſtinction having about this time openly eſpouſed the principles of the reformer, they were no longer under the neceſſity of inculcating their ſentiments with the reſerve which they had before practiſed; and with greater ſecurity and encouragement, they had likewiſe greater ſucceſs. The ambition of the houſe of Guiſe and the bigotry of Mary of England haſtened the ſubverſion of the papal throne in Scotland; and by a ſingular diſpoſition of Providence, the perſons who oppoſed the reformation in every other part of Europe with the fierceſt zeal, were made inſtruments for advancing it in that kingdom. It was not, however, till about the year 1560 that the Proteſtant church of Scotland began to aſſume a regular form. But the model introduced by the reformers differed extremely from that, which had been ſo long eſtabliſhed. As the vices of the clergy had, at firſt, ſays Dr. Robertſon (Hiſt. of Scotland), excited the indignation of mankind, and rouſed that ſpirit of inquiry, which proved ſo fatal to the whole popiſh ſyſtem; as this diſguſt at the vices of eccleſiaſtics was ſoon transferred to their perſons, and ſhifting from them, by no violent tranſition, ſettled at laſt on the offices which they enjoyed; the effects of the reformation would naturally have extended not only to the doctrine, but to the government of the popiſh church; and the ſame ſpirit which aboliſhed the former would have aboliſhed the latter. But, in a great part of Germany, in England, and in the northern kingdoms, its operations were checked by the power and policy of their princes; and the ancient epiſcopal juriſdiction, under a few limitations, was ſtill continued in thoſe churches. The epiſcopal hierarchy appears to be more conformable to the practice of the church, ſince Chriſtianity became the eſtabliſhed religion of the Roman empire. The eccleſiaſtical government was, at that time, plainly copied from the civil; the firſt not only borrowed its form, but derived its authority from the latter; and the dioceſes and juriſdictions of patriarchs, archbiſhops, and biſhops, correſponded with the diviſion and conſtitution of the empire. In Switzerland, and the Low Countries, the nature of the government allowing full ſcope to the genius of the reformation, all pre-eminence of order in the church was deſtroyed, and an equality eſtabliſhed more ſuitable to the ſpirit of republican policy. The ſituation of the primitive church ſuggeſted the idea, and furniſhed the model of the latter ſyſtem, which has ſince been called "Preſbyterian." The firſt Chriſtians, oppreſſed by continual perſecutions, and obliged to hold their religious aſſemblies by ſtealth, and in corners, were contented with a form of government extremely ſimple. The influence of religion concurred with the ſenſe of danger in extinguiſhing among them the ſpirit of ambition, and in preſerving a parity of rank, the effect of their ſufferings, and the cauſe of many of their virtues. Calvin, whoſe deciſions were received, among the Proteſtants of that age, with incredible ſubmiſſion, was the patron and reſtorer of this ſcheme of eccleſiaſtical policy. The church of Geneva, formed under his eye, and by his direction, was eſteemed the moſt perfect model of this government; and Knox, who, during his reſidence in this city, had ſtudied and admired it, warmly recommended it to the imitation of his countrymen. Among the Scottiſh nobility, ſome hated the perſons, and others coveted the wealth of the dignified clergy; and by aboliſhing that order of men, the former indulged their reſentment, and the latter hoped to gratify their avarice. The people, inflamed with the moſt violent deteſtation of popery, and approving every ſcheme that departed fartheſt from the practice of the Romiſh church, were delighted with a ſyſtem, ſo admirably ſuited to their predominant paſſion. While the friends of civil liberty beheld, with pleaſure, the Proteſtant clergy pulling down, with their own hands, that fabric of eccleſiaſtical power, which their predeceſſors had reared with ſo much art and induſtry; and flattered themſelves, that by lending their aid to ſtrip churchmen of their dignity and wealth, they might entirely deliver the nation from their exorbitant and oppreſſive juriſdiction. However, on the firſt introduction of his ſyſtem, Knox did not deem it expedient to depart altogether from the ancient form. Inſtead of biſhops, he propoſed to eſtabliſh 10 or 12 ſuperintendents in different parts of the kingdom. Theſe, as the name implies, were empowered to inſpect the life and doctrine of the other clergy. They preſided in the inferior judicatories of the church, and performed ſeveral other parts of the epiſcopal function. Their juriſdiction, however, extended to ſacred things only; they claimed no ſeat in parliament; and pretended to no right to the dignity, or revenues, of the former biſhops. The number of inferior clergy, to whom the care of parochial duty could be committed, was ſtill extremely ſmall, and much diſperſed through the different provinces of the kingdom; and in a few places only, were they formed into regular claſſes or ſocieties. The firſt general aſſembly of the church was held this year (December 20, 1560.) See *General* ASSEMBLY. In order to give greater ſtrength and conſiſtence to the Preſbyterian plan, Knox, aſſiſted by his brethren, compoſed the firſt book of diſcipline, which contains the model or platform of the intended policy. From this period to the preſent times, the form of doctrine, worſhip, and diſcipline, that had been eſtabliſhed at Geneva by the miniſtry of Calvin, and introduced with certain modifications by Knox into Scotland, has been maintained with invincible ſteadineſs and zeal; and every attempt to introduce into that kingdom the rites and government of the church of England, or to re-eſtabliſh popery, has proved impotent and unſucceſsful.

The church of Scotland is, of courſe, conſidered by its members as founded upon the principle of the primitive church, in which they perceive no diſtinction between preſbyters and biſhops. A body of preſbyters having a moderator, who conducts the proceedings, and executes the ſentences, is regarded as competent to perform all the acts which, in an epiſcopal government, belong excluſively to the biſhop. It tries the qualifications of candidates for the office of the miniſtry; it confers orders by the impoſition of hands; to thoſe who are nominated by perſons having right of nomination, it grants the inveſtiture of the ſacred office, or induction into the charge of a particular pariſh; and it exerciſes inſpection and juriſdiction over the paſtors of all the pariſhes within its bounds.

In the exerciſe of his ſpiritual functions a paſtor acts within his pariſh, according to his own diſcretion: and for the diſcharge of the paſtoral duties, he is accountable only to the preſbytery from whom he received the charge of the pariſh; but in every thing which relates to *diſcipline*, he is aſſiſted by lay-elders. Theſe, like the deacons of the primitive church, attend to the intereſts of the poor. But their peculiar buſineſs is expreſſed by the name *ruling-elders;* in every queſtion of juriſdiction within the pariſh, they form a ſpiritual court, of which the miniſter is moderator. In the preſbytery alſo they ſit as repreſentatives of ſeſſions or conſiſtories.

Miniſters are admitted into a church by a preſbytery. When a ſtudent has gone through his univerſity education, according to certain preſcribed rules, he may be propoſed to a preſbytery, in order to be taken upon his trials; the conſent of a ſuperior court, called a ſynod, having been firſt obtained; to which court an appeal lies, if the preſbytery ſhould be oppreſſive. A perſon entered upon his trials, having obtained a licence to preach, is called a probationer; and in this character has no fixed charge, though he is allowed to aſſiſt a clergyman diſabled by age or ſickneſs. When he receives a preſentation, he undergoes a ſecond trial before the preſbytery, to whom the preſentation is addreſſed: if they find that he is not qualified in reſpect of doctrine, literature, or moral character, their ſentence declaring him unqualified, unleſs it be reverſed by their eccleſiaſtical ſuperiors, renders his preſentation void. If, upon a vacancy in the living, the patron do not preſent within ſix months, the preſbytery take ſuch ſteps as they judge proper to ſupply the vacancy. None but *licentiates* or probationers, or thoſe who have been previouſly inducted to another living, can be preſented. The people have no right to elect a perſon to be preſented to the preſbytery; this right being reſerved to the patrons, except when it is transferred by the patron to the pariſhioners. Yet the people are not overlooked; but have two ways allowed them of expreſſing their ſentiments of the perſon who is to miniſter to them, either by ſubſcribing or refuſing to ſubſcribe a paper, named a *call*, inviting him to be their miniſter; or by ſupporting a charge of immorality of conduct or unſoundneſs of doctrine. The former of theſe ſeems of little importance, as a *call* may be ſuſtained, however ſmall the number of ſubſcribers. If no objection occur, the perſon is ordained, by impoſition of the hands of the preſbytery, who aſſemble at a time appointed for the purpoſe; the preſentee having firſt anſwered the queſtions, and made the promiſes and engagements required by the law.

The loweſt judicatory in the church of Scotland is the *kirk-ſeſſion*, compoſed of the miniſter of the pariſh and of lay elders. New elders are choſen by the ſeſſion, but are liable to be objected againſt by any member of the congregation. If the objections be not valid, they are at an appointed time ſet apart to their office by prayer; having firſt declared their aſſent to all that is contained in the confeſſion of faith.

A preſbytery is compoſed of an indefinite number of pariſhes; in ſome populous diſtricts of not leſs than thirty, in ſome more remote of not more than four. This judicatory conſiſts of the miniſters of all the pariſhes within the diſtrict; of the profeſſors of divinity, if they be miniſters, in any univerſity that is within the ſame diſtrict; and of one elder from each pariſh. A moderator, who muſt be a miniſter, is choſen twice a year. At preſent there are ſeventy-eight preſbyteries in Scotland.

Three or more preſbyteries, as the matter happens to be regulated, compoſe a *provincial ſynod*. There are at preſent fifteen of theſe judicatories, moſt of which meet twice in the year. This court is formed of every miniſter of all the preſbyteries within the bounds of the ſynod, and the ſame elder who had laſt repreſented the kirk-ſeſſion in the preſbytery.

The next and higheſt eccleſiaſtical court is the *general* ASSEMBLY. It is compoſed in the following manner: all preſbyteries conſiſting of twelve pariſhes, or under that number, ſend two miniſters and one ruling elder; all preſbyteries conſiſting of eighteen or fewer, but above twelve, ſend three miniſters and one ruling elder; all preſbyteries conſiſting of twenty-four pariſhes, or fewer, but above eighteen, ſend four miniſters and two elders; all of above twenty-four, but under thirty pariſhes, ſend five miniſters and two ruling elders; and all that conſiſt of more than thirty pariſhes, ſend ſix miniſters and three ruling elders. The ſixty-ſix royal burghs of Scotland are repreſented in the general aſſembly by ruling elders: Edinburgh ſending two, and every other burgh one; and each of the five univerſities is repreſented by one of its members. The general aſſembly, therefore, is compoſed of two hundred miniſters repreſenting preſbyteries, eighty-nine elders repreſenting preſbyteries, ſixty-ſeven elders repreſenting royal burghs, five miniſters or elders repreſenting univerſities: in all 361. In this aſſembly, the ſovereign is repreſented by the lord high commiſſioner. This aſſembly meets annually in the month of May, and continues to ſit for ten days. But as it may be impoſſible, in that ſpace of time, to decide all the queſtions that are brought before it, and circumſtances may occur in the intervals between general aſſemblies requiring the interpoſition of this ſupreme court, a commiſſion is annually formed of the general aſſembly: which differs from the general aſſembly chiefly in not being honoured by the repreſentation of the ſovereign, and may be conſidered as a committee of the whole houſe. Thirty-one members, of whom twenty-one are always to be miniſters, conſtitute a quorum, which meets four times in the year, or oftener, for the diſpatch of buſineſs.

Theſe four courts are ſo conſtituted, that each inferior court is ſubject to the controul of its ſuperior. The power of the ſuperior court may be exerciſed at its own pleaſure, upon reference from an inferior court, and upon appeal or complaint. In matters purely eccleſiaſtical, the civil power does not interfere with theſe ſpiritual courts; but in every queſtion of a civil nature, ſuch as reſpect glebes, &c. the deciſion of a preſbytery is cognizable by a civil judicatory.

The judicial power of the church of Scotland appears in the infliction or removal of ſuch cenſures as are thought to belong to a ſpiritual ſociety. The objects of theſe cenſures are groſs immorality, hereſy, and ſchiſm. The miniſter of the pariſh has no power of this nature, but as a member of the kirk-ſeſſion: and he again is ſubject to no control leſs than that of the preſbytery by whom he was ordained, and by whom alone he may be ſuſpended or depoſed. The nature of theſe cenſures, and the method of inflicting them, are defined in a code of laws, confeſſedly imperfect, called the form of proceſs.

General laws were formerly made and repealed by the general aſſembly alone. The barrier act enables an individual to propoſe to the preſbytery new laws, or the amendment or repeal of old laws. Such propoſals muſt be tranſmitted to the general aſſembly, and by them are either diſmiſſed, or ſent to all the preſbyteries for their approbation. The reſult is returned to the next general aſſembly, and paſſes into a ſtanding law, if not leſs than forty preſbyteries have approved. To prevent the delay which muſt thus be occaſioned, the general aſſembly, if it thinks fit, can order the propoſed meaſure to be obſerved as a law, during the term which intervenes between its firſt being propoſed, and the rejection or confirmation of it by the preſbyteries at its ſucceeding meeting.

The church of Scotland receives annually from the exchequer of that country, 2000 *l.* Of this, 500 *l.* are ſet apart for the ſalaries of the procurator and agent of the church, the law-officers, clerks, &c.; and the remaining 1500 *l.* for the defraying of the expences incident to the dignified ſtation of the repreſentative of the ſovereign of the general aſſembly. Emoluments are alſo annexed to the offices of his majeſty's chaplains for Scotland, and the deans of the chapel-royal. The ſtipends of the miniſters ariſe chiefly from the teinds or tythes, paid either in money or in kind by the titular of the teinds, who is not always the landholder, but in ſome caſes the crown, in others an individual or a corporation. The landholder in Scotland enjoys a privilege in reſpect of the payment of tythes, which is not known in other Chriſtian ſtates: he may value his teinds before a court of ſeſſion; and that valuation being eſtabliſhed, how much ſoever the rent of his lands may riſe by the improvements of agriculture, &c. the increaſe is entirely his own, becauſe the teinds never go beyond the rate at which the valuation had fixed them. The landholder, if he be not titular, as is frequently the caſe, may compel the titular to ſell the teinds to him; excepting where the teinds are held by the crown, or when they have been granted for the ſupport of public inſtitutions. If the titular does not pay the whole of the teinds, according to their valuation, to the miniſter, the court of ſeſſion may grant an augmentation, but never beyond the quantity or ſum fixed when the teinds were valued. Beſides the teinds, the miniſter of every country pariſh is provided with a dwelling houſe, or manſe; with a garden; with a glebe of not leſs than four acres of arable land; with graſs for one horſe and one cow, and with the out-houſes neceſſary for the management of his ſmall farm. By another legal proviſion, called the ann, the half year's ſtipend that becomes due after the death of a miniſter, is paid to his widow or executors. See Dr. Hill's Theological Inſtitutes, part ii.

In a parallel drawn between the church eſtabliſhments of England and Scotland (ſee Cove's Eſſay on the Revenues of the Church of England), we learn, that the whole proviſion of the miniſters of the Kirk of Scotland, was eſtimated, about the year 1755, at about 68,500 *l.* per annum; which, being divided between 944 miniſters, afforded to each of them, on an average, an annual income of 72 *l.* This proviſion may, indeed, have been augmented ſince; but it appears to be very incompetent to a decent and comfortable maintenance, even in Scotland, and diſcourages the youth of reſpectable families and connections from entering, as they formerly did, into the miniſtry.

Church, *High*, was a denomination originally given to thoſe, otherwiſe called *Nonjurors*, who refuſed to acknowledge the title of William III. to the crown of Great Britain, under a notion that James II. though excluded, was ſtill their rightful ſovereign. This appellation was given them, becauſe they entertained high notions of the dignity and power of the church, and the extent of its prerogatives and juriſdiction. And thoſe, on the contrary, were called *low-church* men, who diſapproved of the ſeceſſion and obſtinacy of the Nonjurors, diſtinguiſhed themſelves by their moderation toward diſſenters, and were leſs ardent in extending the limits of church authority. The denomination of *high-church* men is now more generally applied to all who form pompous and ambitious conceptions of the authority and juriſdiction of the church, and who would raiſe it to an abſolute independence on all human power.

The non-jurors, or high-churchmen, who boaſt with peculiar oſtentation of their orthodoxy, and treat the Low-church as unſound and ſchiſmatical, differ in ſeveral things from the members of the epiſcopal church, in its preſent eſtabliſhment; but they are more particularly diſtinguiſhed by the following principles: 1. "That it is never lawful for the people, under any provocation or pretext whatever, to reſiſt the ſovereign." This is called in England "paſſive obedience," and is a doctrine warmly oppoſed by many, who think it both lawful and neceſſary, in certain circumſtances, and in caſes of an urgent and momentous nature, to reſiſt the prince for the happineſs of the people. They maintain further, 2. "That the hereditary ſucceſſion to the throne is of divine inſtitution, and therefore can never be interrupted, confounded, or annulled, on any pretext." 3. "That the church is ſubject to the juriſdiction—not of the civil magiſtrate, but of God alone, particularly in matters of a religious nature." 4. "That conſequently Sancroft and the other biſhops, depoſed by king William III. remained, notwithſtanding their depoſition, *true biſhops* to the day of their death; and that thoſe who were ſubſtituted in their places were the unjuſt poſſeſſors of other men's property." 5. "That theſe unjuſt poſſeſſors of eccleſiaſtical dignities were rebels againſt the ſtate, as well as ſchiſmatics in the church; and that all, therefore, who held communion with them were alſo chargeable with rebellion and ſchiſm." 6. "That this ſchiſm, which rends the church in pieces, is a moſt heinous ſin, whoſe puniſhment muſt fall upon all thoſe who do not return ſincerely to the true church, from which they have departed." Moſheim's Eccl. Hiſt. vol. v.

Church is alſo uſed for a Chriſtian temple, built and conſecrated to the honour of God; and, anciently, under the invocation of ſome particular ſaint, whoſe name it aſſumed.

In this ſenſe, churches are variouſly denominated, according to the rank, degree, diſcipline, &c. as metropolitan church, patriarchal church, cathedral church, parochial church, cardinal church, &c. See each under its proper article, Metropolis, Patriarch, Cathedral, Parochial, Cardinal, &c. In eccleſiaſtical writers, we meet with grand church, for the chief church of a place, particularly in the Greek liturgy, for the church of St. Sophia at Conſtantinople, the ſee of the patriarch, founded by Conſtantine, and conſecrated under Juſtinian. It was at that time ſo magnificent, that Juſtinian is ſaid to have cried out in the conſecration thereof, Ενικησα σε, Σολομων; *I have out-done thee, Solomon.* The dome, which is ſaid to have been the firſt that was built, is 330 feet diameter.

The firſt church publicly built by the Chriſtians, ſome authors maintain to be that of St. Saviour at Rome, founded by Conſtantine: others contend, that ſeveral churches abroad, called by the name of St. *Peter Vivus,* were built in honour of that apoſtle during his life-time.

In the firſt ages the Chriſtians aſſembled for ſocial worſhip in private houſes and ſequeſtered places: and therefore if any are pleaſed to give the name of a church to a houſe or part of a houſe, which, though appointed as the place of religious worſhip, was neither ſeparated from common uſe, nor conſidered as holy in the opinion of the common people, it muſt be granted that the moſt ancient Chriſtians had churches. It is the opinion of many learned men, particularly Suicer (ad vocem Ναος) that the Chriſtians had no public edifices during the three firſt centuries, as they have ſhewn from the authorities of Origen, Minutius Felix, Arnobius, and Lactantius. Tillemont, in diſcuſſing the antiquity of Chriſtian churches (Mem. Eccl. tom. iii. part 2) refers the firſt conſtruction of them to the peace of Alexander Severus; but Mr. Moyle (vol. i.) aſcribes it to the peace of Gallienus. Between the years 211 and 249, during a calm of 38 years, Chriſtians, it has been ſaid, were permitted to erect and conſecrate convenient edifices for the purpoſe of religious worſhip; to purchaſe lands, even at Rome itſelf, for the uſe of the community; and to conduct the elections of their eccleſiaſtical miniſters in ſo public, but at the ſame time in ſo exemplary a manner, as to deſerve the reſpectful attention of the Gentiles. Under the perſecuting edicts of Diocleſian, the Chriſtian churches were generally demoliſhed; and though in ſome places the magiſtrates contented themſelves with ſhutting up the places of religious worſhip, in others they proceeded to a more ſevere extreme; and after taking away the doors, the benches, and the pulpit, which they burnt, as it were in a funeral pile, they completely deſtroyed the remaining edifice. In the age of Conſtantine, the Chriſtian temples of Antioch, Alexandria, Jeruſalem, Conſtantinople, &c. diſplayed the oſtentatious piety of a prince, ambitious in a declining age to equal the perfect labours of antiquity. The form of theſe religious edifices was ſimple and oblong; though they might ſometimes ſwell into the ſhape of a dome, and ſometimes branch into the figure of a croſs. The timbers were framed for the moſt part of cedars of Libanus; the roof was covered with tiles, perhaps of gilt braſs; and the walls, the columns, the pavement, were incruſted with variegated marbles. The moſt precious ornaments of gold and ſilver, of ſilk and gems, were profuſely dedicated to the ſervice of the altar; and this ſpecious magnificence was ſupported on the ſolid and perpetual baſis of landed property. In the ſpace of two centuries, from the reign of Conſtantine to that of Juſtinian, the 1800 churches of the empire were enriched by the frequent and unalienable gifts of the prince and people. In the 10th century all Europe was alarmed with a terrifying apprehenſion, that the day of judgment was at hand, and that the world was approaching to its final diſſolution; and, among the other effects of this general panic, the churches and monaſteries were ſuffered to fall into ruin, or at leaſt to remain without repair, from a notion that they would ſoon be involved in the general fate of all ſublunary things. But when theſe apprehenſions were removed, the tottering temples were rebuilt, and the greateſt zeal, attended with the richeſt and moſt liberal donations, was employed in reſtoring the ſacred edifices to their former luſtre, or rather in giving them new degrees of magnificence and beauty. Accordingly, during the whole of the 11th century, all the European nations were diligently employed in rebuilding, repairing, and adorning their churches.

The churches of the firſt ages, however magnificent and ſplendid thoſe of ſome favoured countries and places might have been, were generally plain and ſimple ſtructures. Sulpicius Severus deſcribes one of the churches of Cyrene in the deſerts of Libya, which, he ſays, was made of ſmall rods interwoven, not much more ſtately than his own houſe, in which a man could hardly ſtand upright; and the deſcription given by our venerable Bede of the church which Finan, the ſecond biſhop of Lindisfarne, or Holy Iſland, ſince called the biſhopric of Durham, built, will furniſh a juſt idea of the ſimplicity of many of our oldeſt churches.

Places appropriated to religious worſhip were diſtinguiſhed by a variety of names, both in the Eaſt and Weſt. Εκκλησια and εκκλησιαστηριον, whence the French "Egliſe," and the Britiſh "Eglwys," are often uſed indiſcriminately, though ſometimes, as we have already ſhewn in a preceding article, the former ſignified the aſſembly of Chriſtians, and the latter the place where they aſſembled. One of the earlieſt names is "oratory" or "houſe of prayer," προσευκτηριον and οικος ευκτηριος, which names were afterwards reſtricted to chapels in private families. The Latins called the church "Dominicum" or "domus Dei," God's houſe; which anſwers to the Greek κυριακον, whence the Saxons derived their name "kyrick" or "kyrch," and the Scots and Engliſh "kyrk" and "church." Tertullian called it "domus Columbæ." The word "temple," which was not uſed during the three firſt ages, was introduced after the heathen temples were converted into churches for the worſhip of the true God. Mr. Bingham, in his "Antiquities," has collected a variety of other names, which we need not recite. Churches, which were built, after the perſecutions ceaſed, over the grave of any martyr or ſaint, from reſpect to their memory, were called "martyrium" and "memoria," and thence the word "cemetery" came alſo to ſignify a church. This practice, perhaps, ſuggeſted the idea of dedicating theſe ſtructures to ſome particular ſaint, and gave riſe to the cuſtom of putting ſome portion of the relics of a martyr into the foundation of every church, with a view of encouraging men to ſubmit to a fate which was likely to befal them in thoſe ages; and thence they proceeded to dedicate them to the honour of the Virgin, or to ſome remarkable circumſtance in the life or ſufferings of our bleſſed Lord. Mr. Bingham ſays that the word "menſa" was uſed for a church, becauſe an altar or communion-table was erected at the place where the martyr ſuffered, at which ſermons were preached; but this part ſeems rather to have anſwered to the "trapeza," a refectory in monaſteries, where thoſe diſcourſes were held; theſe were never preached at the altar, which would have been very inconvenient for the auditors; the laity being never permitted to enter there.

A *church*, in order to be adjudged ſuch by our laws, muſt have adminiſtration of the ſacraments and ſepulture annexed to it. If the king founds a church, he may exempt it from the juriſdiction of an ordinary; but it is otherwiſe in caſe of a ſubject.

The manner of founding churches in ancient times was as follows: after the founders had made their application to the biſhop of the dioceſe, and had his licence, the biſhop or his commiſſioners ſat up a croſs, and ſettled the boundaries of the church-yard where the church was to be erected, and then the founders might proceed with the building; and when the edifice was completed, the biſhop conſecrated it; then, and not before, the ſacraments were to be adminiſtered in it. (See Stillingfleet's Eccleſiaſtical Caſes.) But by the common law and cuſtom of this realm, any perſon, who is a good Chriſtian, may build a church without licence from the biſhop, ſo that it be not prejudicial to any ancient churches; though the law takes no notice of it as a church, till it is conſecrated by the biſhop, which is the reaſon why *church*, and *no church*, &c. is to be tried and certified by the biſhop. And in ſome caſes, though a church has been conſecrated, it muſt be conſecrated again; as in caſe any murder, adultery, or fornication be committed in it, by which it is defiled; or if the church be deſtroyed by fire, &c.

The ancient ceremonies uſed in conſecrating the ground on which it was propoſed to build a church, and the church itſelf, were as follow: when the materials were provided for building, the biſhop came in his robes to the place, &c. and having prayed, he perfumed the ground with incenſe, and the people ſung a collect in praiſe of that ſaint to whom the church was dedicated; then the corner ſtone was brought to the biſhop, which he croſſed and laid for the foundation; and a great feaſt was made on that day, or on the day of the ſaint to whom it was dedicated; but the form of conſecration was left to the biſhop, as it is at this day.

A *Church* in general, legally conſidered, conſiſts of three principal parts, viz. the belfry or ſteeple, the body of the church with the aiſles, and the chancel; and not only the freehold of the whole church, but of the church-yard, are in the parſon or rector; and the parſon may have an action of treſpaſs againſt any one that ſhall commit a treſpaſs in the church or church-yard; as in the breaking of ſeats annexed to the church, or the windows, taking away the leads, or any of the materials of the church, cutting the trees in the church-yard, &c. But church-wardens may, by cuſtom, have a fee for burying in the church; the church-yard is a common place of burial for all the pariſhioners. Moreover, the actions for taking away the ſeats muſt be brought in the name of the church-wardens, the pariſhioners paying the expence. If a perſon erect a pew in a church, or hang up a bell, &c. in it, they then become church goods, though not expreſsly given to the church; and he may not afterwards remove them. The parſon only is to grant licence for burying in the church; but for defacing a monument in a church, &c. the builder or heir of the deceaſed may have an action. And a man may be indicted for digging up the graves of perſons buried and taking away their burial dreſſes, &c. Although the parſon hath the freehold of the church and church-yard, he hath not the fee-ſimple, which is always in abeyance; but in ſome reſpects the parſon hath a fee-ſimple qualified. (Litt. 644, 645.) The chancel of the church is to be repaired by the parſon, unleſs there be a cuſtom to the contrary; and for theſe repairs he may cut down trees in the church-yard, but not otherwiſe. (Stat. 35 Ed. I. ſt. 2.) The church-wardens are to ſee that the body of the church and ſteeple are in repair; but not any aiſle, &c. which any perſon claims by preſcription, to him or to his houſe. Concerning theſe repairs the canons require every perſon who hath authority to hold eccleſiaſtical viſitation to view the churches within their juriſdiction once in three years, either in perſon, or to cauſe it to be done; and they are to certify the defects to the ordinary, and the names of thoſe who ought to repair them; and theſe repairs muſt be done by the church-wardens, at the expence of the pariſhioners. Can. 86.

By the common law, pariſhioners of every pariſh are to repair the church; but by the canon law, the parſon is obliged to do it; and ſo it is in foreign countries, (1 Salk. 164.) In London the pariſhioners repair both the church and the chancel. The ſpiritual court may compel the pariſhioners to repair the church, and excommunicate every one of them till it be done; but thoſe that are willing to contribute ſhall be abſolved till the greater part agree to a tax, when the excommunication is to be taken off; but the ſpiritual court cannot aſſeſs them towards it. (1 Mod. 194. 1 Vent. 367.) For though this court hath power to oblige the pariſhioners to repair by eccleſiaſtical cenſures; yet they cannot appoint in what ſum, or ſet a rate, for that muſt be ſettled by the church-wardens, &c. (2 Mod. 8.) If a church be down, and the pariſh is increaſed, the majority of the pariſh may raiſe a tax for the neceſſary enlargement of it, as well as the repairing of it, &c. (1 Mod. 237.) But in ſome law-books it is ſaid, that if a church falls down, the pariſhioners are not obliged to rebuild it; though they ought to keep it in due repair. (1 Vent. 35.) On the rebuilding of churches, it is now uſual, on the petition of the pariſhioners, to obtain briefs. See BRIEFS.

By ſtat. 37 Hen. VIII. c. 21, churches, not above ſix pounds a year in the king's books, may, by the aſſent of the ordinary, patron, and incumbent, be united; and by ſtat. 17 Car. II. c. 3, in cities and corporations, &c. churches may be united by the biſhop, patrons, and chief magiſtrates, unleſs the income exceeds 100 *l. per annum*, and then the pariſhioners are to conſent, &c. By ſtat. 9 Ann. c. 22. (See alſo ſtat. 10 Ann. c. 11.) 50 new churches were built in or near London and Weſtminſter, for which purpoſe a duty of two ſhillings per chaldron was laid on coals; the rectors of theſe churches are to be appointed by the crown, &c. A duty is alſo granted on coals imported into London, to be appropriated for the maintenance of miniſters for the new churches. Stat. 1 Geo. I. c. 23.

No man ſhall cover his head in the church, in time of divine ſervice, except with a cap if he have ſome infirmity; and all perſons are to kneel or ſtand, &c. as directed by the Common Prayer, during ſervice. Can. 18. No ill language is to be uſed, or noiſe made in churches or church-yards; and perſons ſtriking, or laying violent hands on others there are to be excommunicated; and for ſtriking with a weapon, or drawing a weapon with an intent to ſtrike, ſhall loſe one of his ears; nor may a man lawfully return blows in his own defence in theſe circumſtances, ſtat. 5 and 6 Ed. VI. c. 4. 1 Hawk. P. C. c. 63, §. 24, &c. See BURGLARY and LARCENY.

No fairs or markets ſhall be kept in church-yards. Stat. 13 Ed. I. ſt. 2, c. 6.

Any perſon may be indicted for indecent or irreverent behaviour in the church; and thoſe that offend againſt the acts of uniformity, are puniſhable either by indictment upon the ſtatute, or by the ordinary.

Church, *Mother*, *Matrix eccleſia*. See Mother-*churches*.

Church, with regard to *Architecture*, Daviler defines a large oblong edifice, in form of a ſhip, with nave, choir, aiſles, chapel, belfry, &c. See each part under its proper head.

Church, *ſimple*, is that which has only a nave and a choir.

Church *with aiſles*, that which has a row of porticos, in form of vaulted galleries, with chapels in its circumference.

Church *in a Greek croſs*, that where the length of the tranſverſe part is equal to that of the nave; ſo called, becauſe moſt of the Greek churches are built in this form.

Church *in a Latin croſs*, that whoſe nave is longer than the croſs part, as in moſt of the Gothic churches.

Church *in rotundo*, that whoſe plan is a perfect circle, in imitation of the Pantheon.

As to the form of the ancient Greek churches, when they had all their parts, it was as follows: firſt was the *narthex*, porch, or portico, and then the part called the *vaunt-nave*, ϖροναος; this was adorned with columns on the outſide, and on the inſide ſurrounded with a wall; in the middle whereof was a door, through which they paſſed into a ſecond portico. The firſt of theſe porticos was deſtined for the *energumeni*, and penitents in the firſt ſtage of their repentance; the ſecond was much longer, deſtined for penitents of the ſecond claſs, and the catechumens, and hence, called ναρθης, *ferula*, becauſe thoſe placed in it began to be ſubject to the diſcipline of the church. Theſe two porticos took up about one third of the ſpace of the church. From the ſecond portico, they paſſed into the nave, ναος, which took up near another third of the church. In the middle, or at one ſide of the nave, was the *ambo*, where the deacons and prieſts read the goſpel, and preached. The nave was deſtined for the reception of the people, who here aſſiſted at prayers.

Near the entrance of this was the Baptistery, or Font. Beyond the nave was the choir, χορος, ſet with ſeats, and round: the firſt ſeat on the right, next to the ſanctuary, being for the chantor, or *choragus*.

From the choir, they aſcended by ſteps to the ſanctuary, which was entered at three doors. The ſanctuary had three apſides in its length; a great one in the middle; under which was the altar, crowned with a baldachin, ſupported by four columns. Under each of the ſmall apſides, was a kind of table, or cupboard, in manner of a beaufet. Nevertheleſs, of the Greek churches now remaining, few have all the parts above deſcribed; moſt of them having been reduced to ruins, or converted into moſques.

M. Frezier, engineer to the French king, and F. Cordemoy, a regular canon, have diſputed the form of the ancient and modern churches, and the beſt manner of building them, with a good deal of learning, in the Journals de Trevoux.

For the form of the Latin churches, though it be various, yet may all the variety be reduced to two heads; viz. thoſe in form of a ſhip, and thoſe of a croſs.

Churches, *round*. Among the more ancient architectural ſtructures of Great Britain which appear to have been connected in their origin as well as in their form, is one claſs, of which but few inſtances, if they were ever numerous, remain; known by the appellation of the Round Churches. Dr. Stukeley hazarded a conjecture, (Itin. Curioſ. p. 35.) that they were the moſt ancient churches in England; and were either erected in the later time of the Romans for Chriſtian ſervice, or in the earlier periods of the Saxons. Another opinion, equally ſtrange, but far more general, was that which attributed the conſtruction of them to the Jews.

The firſt writer who ſeems to have treated their real hiſtory with ſucceſs, was Mr. Eſſex, whoſe "Obſervations" are to be found in the ſixth volume of the Archæologiæ. But Mr. Britton, to whom more numerous ſources of intelligence were open, appears almoſt to have exhauſted the ſubject, in his "Architectural Antiquities," in which the principal of the round churches are both engraved and accurately deſcribed.

That the circular form for the temple was a very ancient one in the heathen world, may be proved from a variety of inſtances. Though nothing will be gained by comparing it either with the irregular ſtructure of the Druid circle, or with the occaſional temples of that form, which are found among the buildings of the Romans.

The round churches of this country appear to have been indebted for their origin to thoſe who returned from the cruſades; on whoſe minds the venerable form of the church of the ſepulchre at Jeruſalem had left a ſtrong and durable impreſſion.

The parent model had been rebuilt by Charlemagne about the year 812, to a certain extent, in imitation of the church of Santa Sophia at Conſtantinople: and the devotees of the croſs, either conſidering it as the original work of Helena, the mother of Conſtantine the Great, or from the ſacred relics it was ſuppoſed to have contained at a former period, appear to have adopted its form, not only in this country, but in others; conſidering it as one which was likely to exhibit a character of peculiar ſanctity.

Santa Sophia, however, has at different times received acceſſions, and is now ſurrounded by a multitude of minarets which confuſe the exterior outline of the rotunda. The church of the ſepulchre at Jeruſalem alſo has been enlarged: a ſecond rotunda was added in the eleventh century by Godfrey of Bulloigne; and a tower at the weſt end, at a period much later. The beſt idea of it may be obtained from ſir Robert Ainſlie's Views in Egypt, Paleſtine, &c.

But a church ſtill nearer to our own, both in deſign and character, is deſcribed by the German writer of "Voyage en Sicile et dans la Grande Gréce, addreſſé a l'Abbé Winckelman," 8vo. 1773. The account anſwers exactly to the churches of the ſame deſcription in England.

"On donne l'Egliſe du S. Sepulcre pour un temple antique; c'etoit une rotonde; cet edifice n'eſt point du bon tems de l'architecture: ſa forme n'eſt pas parfaitement circulaire, et il n'y a point de portique à l'entrée, et il decrit un demi circle différent, qui ne fait point corps avec le reſte du batiment; ce que lui donne une irregularité déſagreable. L'on reconnoit auſſi le mauvais goût du tems de la decadence des arts aux ornemens de l'ancienne porte qui eſt murée aujourd'hui. Cet edifice eſt vouté et ſoutenu entierement par des colonnes de marbre."

Of the Engliſh round Churches, that of St. Sepulchre's, Cambridge, is ſuppoſed by Mr. Eſſex to be the oldeſt: he dates it between the firſt and ſecond cruſades, in the reign of Henry I. From the ground plan, with the interior and exterior views of the building, given by Mr. Britton, we perceive that it originally conſiſted of a circular wall perforated with ſix ſemicircular-headed windows, and an ornamented door-way of the ſame ſhape. The latter is ſtill perfect; but the former appear to have been materially altered by widening, and the introduction of mullions. Within is a circular colonnade of eight columns. Theſe are ſhort and maſſy, without any baſe, and with a narrow ornamented capital, which varies in different columns. The tower appears to have been raiſed one ſtory, for the reception of bells, in the reign of Edward the Second; and the eaſt end or chancel, with the north aiſle, were added as late as 1313.

In regard to the hiſtory of St. Sepulchre's Church, Northampton, we are without authentic documents. It is univerſally aſſerted, that the circular part of the church was built by the knights templars, who obtained their organization and their fame in the vicinity of the church of the Holy Sepulchre at Jeruſalem. Mr. Britton obſerves, that it advances a little in beauty of proportion from the church at Cambridge, and dates it at the end of the twelfth or the beginning of the thirteenth century. By the ground-plan and exterior view, he obſerves, it may be perceived that the walls of the circular building are thicker than thoſe of the round church at Cambridge; that the columns are ſmaller and higher; that they have baſes and capitals, ſome ſquare and ſome round; that the circular aiſle has no arched roof, but is merely covered with timber; and that, immediately above the columns, the wall becomes octangular. Theſe are peculiarities which diſtinguiſh it from the other circular churches, and render it an unique example of ancient architecture.

In elegance of conſtruction, the Temple church in London is far ſuperior to thoſe we have already mentioned. It ſeems to have been built upon the ſame plan with the old temple church in Holborn, the circular walls of which are ſaid to have been diſcovered about a century ago, and was conſecrated in 1185. The ground-plan and exterior wall of the round part are probably thus old; but the interior, with the ſix cluſtered columns, and their incumbent arches, as well as the choir, appear to have been erected about 1244, (when Sir William Dugdale tells us the church was again dedicated,) and correſpond with the generality of thoſe examples of eccleſiaſtical architecture which are known to have been erected in the reign of Henry the third. In raiſing the ſuperſtructure of the circular part, the architects appear to have mixed the new with the old ſtyle of arches.

Another church of the circular kind occurs at Mapleſtead in Eſſex; and ſtill more inſtances may probably be found in remote corners of the kingdom. It is not unlikely, that the old church of St. Selpulchre, by Newgate, had the ſame form: and ſome allowance muſt probably be made for copies from the church of the Sepulchre taken at different periods.

According to a curious manuſcript in the Bodleian Library at Oxford, a pilgrim who viſited the Holy Land in 1462, upon his return, depoſited the following curious articles in the abbey of Edyngton, in Wiltſhire: "*A chapel made to the likeneſs of our Lord's ſepulchre at Jeruſalem*, and a variety of veſtments, with imitations in wood of the chapel of Calvary, the church at Bethlem, the Mount Olivet, and the valley of Jehoſaphat."

CHURCH, *diſcipline*, *government*, *policy*, *revenue*, &c. See theſe articles, and the preceding articles of *church of England*, &c. &c.

CHURCH *lands*, in *Agriculture*, are all ſuch lands as belong to and are held under religious eſtabliſhments. It has been obſerved by the author of "Modern Huſbandry," that lands held by corporations, whether civil or religious, experience has proved are, in ſcarcely any inſtance, managed in ſuch a way as to inſure their permanent improvement. The writer of the "Report of the County of Lancaſter" alſo remarks, that glebe or church lands, or any other appropriated to the ſupport of meeting houſes, and thoſe lands which appertain to ſmall livings purchaſed by the bounty of queen Anne, are generally under a bad ſtate of cultivation, the uncertainty of leaſe depending on a contingency of a ſingle life operating as a ſtrong obſtacle to any degree of even modern improvements, and, in conſequence, they are in general under the very worſt ſort of management. This account of the management of church lands Mr. Donaldſon thinks is ſtrictly true, when applied to other parts of England as well as to the county of Lancaſter. This, in ſome degree, proceeds from the want of ſome proper regulations in reſpect to the tithes. And he ſuppoſes that the modes of leaſing lands, either for a term of twenty-one years, renewable on payment of a fine at the end of every ſeven, or on one or two lives, renewable on the demiſe of one of the perſons named in the leaſe, on the payment alſo of an arbitrary fine, as practiſed by the dignitaries of the church of England, are well known to operate powerfully againſt the improvement of church-lands. It is impoſſible, ſays he, it ſhould be otherwiſe, for who in his ſenſes will think of expending money on the improvement of land, when theſe very improvements are to operate againſt himſelf at the renewal of a leaſe, which, in one caſe, is limited to ſeven years, and, in the other, is held on a very precarious tenure? Such regulations in regard to leaſing church-lands, ought, he thinks, to be made, as would leave the tenants at liberty to expend part of their capitals in the improvements of their farms, without being compelled to pay a ranſom at the end of every ſeven years for the improvements which their own money, labour, and induſtry, have effected in the intervals.

That ſomething is neceſſary to be done in theſe caſes, cannot be diſputed by thoſe who have ſeen the comparatively bad ſtate in which much of the lands under ſuch tenures ſtill remains.

CHURCH *Bay*, in *Geography*, a bay on the S.W. coaſt of the Iſle of Rathlin, at the N.W. extremity of Ireland. The ground in this bay is clean, and veſſels can ride ſafe, except with weſterly winds, which cauſe a great ſwell of ſea there. M'Kenzie.

CHURCH *Creek Town*, a town of America, in the county of Dorcheſter, and ſtate of Maryland, lying at the head of Church-creek, a branch of Hudſon's river, 7 miles ſouth-weſterly from Cambridge.

CHURCH *Point*, a cape on the weſt coaſt of the iſland of Barbadoes; ¾ of a mile north of Hole Town.

CHURCH-*rate*. See CHURCH-*wardens*.

CHURCH-*reves*. See CHURCH-*wardens*.

CHURCH *Rock*, in *Geography*, a rock in the bay of Bengal, near the coaſt of Ava. N. lat. 17° 32′ E. lon. 94° 14′.

CHURCH-*ſcot*, or CHURCH-*eſſet*, in *Eccleſiaſtical Hiſtory*, a payment, or contribution, ſo denominated in domeſday, and by the Latin writers frequently called *primitiæ ſeminum*; being, at firſt, a certain meaſure of wheat, paid to the prieſt on St. Martin's day, as the firſt fruits of harveſt.

This was enjoined by the laws of king Malcolm IV. and Canut. c. 10. But after this, church-ſcot came to ſignify a reſerve of corn-rent paid to the ſecular prieſts, or to the religious; and ſometimes it was taken in ſo general a ſenſe as to include poultry, or any other proviſion that was paid in kind to the religious. From theſe cuſtomary oblations to the pariſh prieſt, the religious ſometimes purchaſed an exemption for themſelves and their tenants.

CHURCH-*Stretton*, in *Geography*, a ſmall market town of Shropſhire, England, is ſituated in a narrow, deep vale, between ſeveral high mountains: here are not above 100 houſes, the greater part of which are occupied by day-labourers and ſmall farmers. A free-ſchool, church, and a decayed market-houſe or town-hall, are the only public buildings in this place. The mountainous ridges here are of great altitude, and furniſh food to numerous flocks of ſmall ſheep: the wool and lambs of which conſtitute the chief incomes of the farmers and yeomen. On the top of the higheſt hill, called

Caer-Caradoc, is a large fortified entrenchment, which is traditionally ſaid to have been the celebrated camp of Caractacus, the Britiſh monarch who ſo valiantly defended his kingdom againſt the warlike Romans. See CARACTACUS.

Here are a ſmall weekly market on Thurſday, and two fairs annually. It is 158 miles N.W. from London, and 13 S. from Shrewſbury.

CHURCH-*wardens*, anciently called CHURCH-*reves*, or *eccleſiæ guardiani*, the guardians or keepers of the church, and repreſentatives of the body of the pariſh, are officers choſen yearly in Eaſter week, by the parſon, and his pariſhioners, according to the cuſtom of the place; to look to the church, church-yard, church-revenues, &c. obſerve the behaviour of the pariſhioners with regard to faults that come under the juriſdiction of the eccleſiaſtical court; preſent ſcandalous livers to the biſhop; take care none preach without licence, &c. Theſe officers are choſen by the joint conſent of the pariſhioners and miniſter; but by cuſtom, on which the right of chuſing them depends, the miniſter may chuſe one, and the pariſhioners another; or the pariſhioners may elect both. In moſt of the pariſhes in London, the pariſhioners chuſe both church-wardens by cuſtom: but in all pariſhes erected by ſtat. 9 Ann, c. 12, the canon (Can. 89, 90.) ſhall take place, and this directs the choice to be made by the joint conſent of the miniſter and the pariſhioners; or, in caſe of diſagreement, the miniſter ſhall chuſe one, and the pariſhioners another. When the pariſhioners chuſe, the majority of thoſe who meet at the veſtry, upon a written notice for that purpoſe, ſhall bind the reſt: and by cuſtom, the choice of church-wardens may be by a ſelect veſtry, or a particular number of the pariſhioners. The validity of the cuſtom of chuſing church-wardens is to be decided by the courts of common law, and not by the ſpiritual court.

All peers of the realm, and clergymen, members of parliament, aldermen, counſellors and attornies, phyſicians, ſurgeons and apothecaries, and diſſenting miniſters, are exempt from this office; and perſons who have ſued a felon to conviction, and the firſt aſſignee of the certificate thereof, are exempted from the office of church-warden, in the pariſh where the offence was committed. The ſame exemption extends to perſons ſerving in the militia, during ſuch ſervice. Diſſenters are allowed to execute the office by a ſufficient deputy. No perſon living out of the pariſh, although he occupies lands within the pariſh, is eligible. A perſon, refuſing the office, is liable to excommunication. They are ſworn into their office by the archdeacon, or ordinary of the dioceſe, who is compellable by a mandamus to admit thoſe whom the pariſh appoint.

The church-wardens are a kind of corporation: and are enabled by law to ſue, and be ſued, for any thing belonging to the church, or the poor of the pariſh.

They may purchaſe goods, but not lands, except by cuſtom, in London, where they, with the miniſter, form a corporation for lands as well as goods, and may hold, purchaſe, and take lands for the uſe of the church, &c. If they waſte the goods of the church, the new church-wardens (but not the pariſhioners) may have action againſt them, or call them to account. They have a certain ſpecial property in the organ, bells, pariſh-books, bible, chalice, ſurplice, &c. belonging to the church; of which, they have the cuſtody on behalf of the pariſh, whoſe property they really are; and they may bring an action at law againſt thoſe who ſteal or damage them. To them belongs the office, with the conſent of the miniſter, of giving ſeats to the pariſhioners in the body of the church, reſerving thoſe who belong by preſcription to particular meſſuages, &c. They have alſo the care of the benefice during its vacancy, and, as ſoon as there is any avoidance, they are to apply to the chancellor of the dioceſe for a ſequeſtration: and when this is obtained, they are to manage all the profits and expences of the benefice for him that ſucceeds, and appoint a curate, approved by the biſhop, to ſerve the benefice, and pay him out of the profits. It is their buſineſs alſo to ſummon a veſtry, in order to ſettle any rates. Their duty comprehends a great variety of particulars, already noticed in the beginning of this article. To them it belongs to repair the church, and to make rates, and levies, with the conſent of the pariſhioners, for this purpoſe. It is their province to provide, in conjunction with the overſeers, for thoſe who need aſſiſtance; to keep the key of the belfry, and to prevent the bells being rung without proper cauſe; to collect charity-money upon briefs; to give conſent for burying a perſon in a different pariſh from that in which he dies; not to allow ſuicides or excommunicated perſons to be buried in the church or church-yard, without licence from the biſhop; and, by ſtat. 30 Car. II. c. 3. to apply to the magiſtrates for convicting offenders who do not bury their dead in woollen. They are alſo to take care that the church be well aired, as well as in good repair; to provide the proper books, as a large bible, a common prayer, and a book of homilies, a font of ſtone, a decent table, and other articles for the communion, and to ſee that the ten commandments are ſet up at the end of the church, &c. They are to ſign the certificates of perſons taking the ſacrament as a qualification for offices. It is alſo their duty to prevent any irreverence or indecency in the church; and they may pull off a perſon's hat in the church, or turn him out if he diſturb the congregation. They may refuſe to open the church at the inſtance of any perſon, except the parſon, or any one acting under him; they are not to ſuffer any one to preach, unleſs he appears qualified, by producing a licence. To them belongs the care of the church-yard as well as of the church; and they are to prevent all games and feaſts, and profane uſages, from taking place in either. Churchwardens are to levy the penalty of 12 *d.* on perſons not coming to church each Sunday under ſtat. 1 Eliz. c. 2. They are to obſerve, whether the parſon reads the thirty-nine articles twice a year, the canons once a year, preaches every Sunday good doctrine, reads the common prayer, adminiſters the ſacraments, &c. &c. They are alſo to ſuperintend the conduct of the pariſhioners, with regard to their coming to church, having their children baptized, women churched, perſons not marrying within the prohibited degrees, or without banns or licence, &c. &c. They are alſo by their oath to preſent, or certify to the biſhop or his officers, all things preſentable by the eccleſiaſtical law, which relate to the church, to the miniſter, and to the pariſhioners. To them belong the care and inſpection of the pariſh regiſter; and they are to levy penalties on thoſe who profane the Sunday, under ſtat. 1 Car. I. c. 1. and 29 Car. II. c. 7. At the end of every year they are to deliver juſt accounts to the miniſter and pariſhioners; over which accounts, however, juſtices of the peace have no juriſdiction.

CHURCH-*yard*, a place adjoining to a church, employed commonly for the interment of the deceaſed. See COEMETERIUM.

CHURCHILL, JOHN, in *Biography*, duke of Marlborough, a prince of the holy Roman empire, one of the ableſt ſtateſmen and politeſt courtiers, as well as one of the moſt illuſtrious heroes that this, or, perhaps, any country ever produced, was the ſon of ſir Winſton Churchill, diſtinguiſhed for his monarchical principles during the reigns of Charles I. and II. John was born at Aſhe in Devonſhire, on Midſummer-day, 1650, and was educated in his father's houſe under a clergyman. When he was only twelve years old, his father took him to court, where the beauty of his perſon, the brilliancy of his underſtanding, and the modeſty of his behaviour recommended him to general notice. He became page and favourite to the duke of York, and in the year 1666, he was preſented with a pair of colours in the guards. His firſt military ſervice was at the ſiege of Tangier, and from this time he ſeems to have devoted himſelf to the profeſſion of arms. Upon his return to England, he continued his attendance at court, and received from the king, as well as from the duke, repeated marks of kindneſs and favour. He gained an intereſt with the fair ſex, though with ſuch prudence as not to excite the jealouſy of any one. The ducheſs of Cleveland, the king's favourite miſtreſs, made him a preſent of 5000 *l.*, with which he immediately purchaſed an annuity; and his favour with the duke of York was ſecured by means of his ſiſter, who was miſtreſs to that prince. In 1672, the duke of Monmouth commanding a body of Engliſh auxiliaries in the ſervice of France, Mr. Churchill attended him, and was ſoon after captain of the grenadiers in his grace's own regiment. He was engaged in all the actions of that campaign which humbled the republic of Holland. At the ſiege of Nimeguen, captain Churchill ſo diſtinguiſhed himſelf, that he obtained the particular notice of the great Turenne, who beſtowed upon him the name of the "Handſome Engliſhman." For his conduct at the ſiege of Maeſtricht he received the public thanks of the king of France; and the duke of Monmouth, in relating to his father what had happened at the attack, acknowledged that he was indebted to captain Churchill for much of his glory, and for his ſafety altogether, ſince his life had been preſerved by his bravery. This good fortune, which began in his twenty-ſecond year, attended all his ſucceeding undertakings. The laurels which he brought from France, entitled him to preferment at home; he was accordingly promoted to a lieutenant-colonelcy by the king, and the duke made him gentleman of his bedchamber, and ſoon after maſter of the robes. As a courtier he acted his part with great warineſs, making his way through all the contending factions. In 1679, he accompanied the duke of York to the Low Countries; and in the next year he attended him into Scotland, where, as a declared favourite, he received every reſpect from the nobility who wiſhed to pay their court to the duke. While he waited upon the duke, a regiment of dragoons was given him, and, in a ſhort time afterwards he married Sarah Jennings, a lady of great beauty and good connections, then an attendant upon the princeſs, afterwards queen Anne. In the ſpring of 1682, he ſuffered ſhipwreck with the duke of York in a paſſage to Scotland, and obtained a ſignal proof of his maſter's regard, in his ſolicitude to ſave him, while a great part of the crew, and ſeveral perſons of quality were left to periſh. In the ſame year, he obtained other preferments and a title, and on the acceſſion of James II. to the throne he was ſent ambaſſador to notify the event to the court of France, and in a ſhort time afterwards he was raiſed to an Engliſh peerage by the title of baron Churchill of Sundridge. Through the whole of this reign lord Churchill's conduct was regulated by the principles of prudence, and an invariable attention to his own intereſt. He avoided public buſineſs, and, for a conſiderable time, never declared himſelf. At length, when it was impoſſible for a perſon of his rank and conſideration to remain neuter, he made his deciſion, and joined in the invitation to the prince of Orange. To obviate the charge of ingratitude, it is generally believed that he had often declared, if the king attempted to overturn the eſtabliſhed religion he would leave him; he never diſſembled his zeal for the church of England, and had been taught from his infancy to regard it with the greateſt reverence. The king, however, had no doubt of his fidelity, and entruſted him even with the command of 5000 men to oppoſe the progreſs of the prince of Orange. James was advertiſed of his diſloyalty, but gave no credit to the report, till he, with the duke of Grafton, and ſome other officers withdrew from the king's quarters, and joined the prince of Orange at Axminſter. By his advice, prince George of Denmark and the princeſs Anne took the ſame ſtep. Lord Churchill was received with marks of eſteem and reſpect by the prince of Orange, and was, in the enſuing year, rewarded with the earldom of Marlborough. He aſſiſted at the coronation of their majeſties, and was ſoon after appointed to command the Engliſh forces that were ſent over to Holland, in order to make part of the army of the allies. He diſplayed great military talents at the battle of Walcourt: and in the next year he ſerved in Ireland with great reputation. The enſuing campaign he paſſed on the continent with king William, where he exhibited great ſagacity, by penetrating into the enemy's deſigns of beſieging Mons, in which the Dutch deputies were deceived. While he was proceeding by haſty ſteps to the pinnacle of fame and of fortune, he received a meſſage, without any warning, that the king had no further occaſion for his ſervices. This ſudden deprivation of all his employments was followed by his commitment to the Tower, on a charge of high treaſon. No evidence was brought againſt him; he was bailed, and the principal author of the accuſation, then a priſoner in Newgate, was convicted of perjury and puniſhed, and the earl cleared. It is now generally believed that though no proofs were then brought forward againſt the earl, yet a correſpondence had been carried on between him and the exiled king with a view of reſtoring him to the throne. It is certain that, during the life of queen Mary, Churchill kept at a diſtance from court, and attended, with his lady principally, to the princeſs Anne, whoſe influence probably prevented his intrigues from being inquired into. After the death of Mary, Churchill was made a privy counſellor, and, in 1698, was appointed governor to the duke of Glouceſter: on this occaſion the king very handſomely ſaid to the earl, "My lord, make him but what you are, and my nephew will be all I wiſh to ſee him." He continued in favour during the remainder of the reign, and received more than once the moſt unequivocal marks of the king's eſteem.

Immediately upon the acceſſion of queen Anne to the throne in 1702, the earl of Marlborough was raiſed to that height of power and greatneſs which left no ſubject in Europe his equal. He attained to every honour to which ambition itſelf could aſpire, and he gained lucrative appointments for his friends. He was created a duke, had a penſion granted him by the queen for her life, and received the thanks of parliament for his conduct abroad. This courſe of good fortune was balanced by the loſs which he ſuſtained in the death of an only ſon, a youth of eighteen, then at Cambridge, but the duke ſought and found relief in an active performance of the high duties of his ſtation. We cannot follow this great and illuſtrious general through all his campaigns, in which it has been ſaid, that he never drew his ſword but victory purſued him. The buſineſs of 1704 was, however, ſo celebrated, and was ſo ſignalized by the duke's maſterly execution of his own plans of puſhing to the Danube, that it muſt not be paſſed over. After a march of fifty days from the frontiers of Holland, he arrived, unexpectedly, at the lines of Schellenburgh, defended by 20,000 men, which he inſtantly attacked, and forced, after an obſtinate reſiſtance. This ſucceſs brought on the famous battle of Hochſtett, or as it is more generally called by us, the battle of Blenheim, fought Auguſt 2d, between the allied army commanded by the duke of Marlborough and prince Eugene, and the French and Bavarians, commanded by marſhall Tallard and the elector of Bavaria. Nothing could be more complete than the victory on the ſide of the allies. The pride of Louis XIV. received a check which it never afterwards recovered, and the battle of Blenheim may be reckoned the date of that reverſe of fortune which embittered the latter years of that monarch's life. The French were purſued till they croſſed the Rhine, Landau was taken, and France trembled for its own ſafety. It is not poſſible to enumerate all the popular triumphs of the duke of Marlborough upon his return to England. The more ſubſtantial expreſſions of the nation's gratitude conſiſted in the public gift of the honour of Woodſtock and hundred of Wotton, and the erection of a magnificent palace for his reſidence. The next campaign produced nothing worthy of public expectation, on which account diſcontents began to manifeſt themſelves in England. The duke employed the latter end of the year in viſiting the courts of Berlin, Hanover, and Vienna, where his talents for negociation were equally uſeful to the common cauſe, as his military talents in the field. No man ever diſplayed happier powers in conciliating different tempers and intereſts; to which a perfect command of himſelf, and the habitual practice of all the engaging arts of good-breeding greatly contributed. The emperor Joſeph preſented the duke with the principality of Mindelheim, which accompanied his title of prince of the empire. By great exertions he was able to meet the French army under marſhal Villeroy, and on the 11th of May, 1706, he gained the deciſive battle of Ramillies, and with that the reduction of all Brabant, with Antwerp and its territory. Oſtend, Menin, Dendermonde, and Aeth, were added to the conqueſts of the year. On account of his ſucceſſes, a bill was paſſed to ſettle his honours upon the male and female iſſue of his daughters.

The duke of Marlborough had now attained to the zenith of his glory. In the campaign of 1707, his antagoniſt was the celebrated duke of Vendome, by whom he was ſo well matched as to be able to gain no material advantage, and he was mortified in being unable to infuſe a ſpirit of zeal, at a conference at Frankfort, in the German part of the confederacy. On returning to England, he had the ſtill further mortification of finding his ducheſs ſupplanted in the affections of her miſtreſs, by a new and more obſequious favourite. His own preſence reclaimed the queen's attentions for a time, but the impreſſion was made which at length put an end to his conſequence. In the campaign of 1708, the French, under the dukes of Burgundy and Vendome, were defeated at the battle of Oudenard, by the ſuperior ſkill of prince Eugene and the duke of Marlborough. Liſle was afterwards inveſted, which, though it reſiſted ſeveral months, at length, with its citadel, ſurrendered. The duke alſo recovered Ghent, Bruges, and other places taken by the French at the beginning of the campaign. France was now obliged to ſet on foot a negociation, and the duke of Marlborough, who had ſo often met and defeated her generals in the field, was appointed the queen's plenipotentiary, and went to Holland. The preliminaries propoſed by the duke, in which he had carefully regarded the intereſts of the allies, were ſuch as the French miniſter could not agree to, and the war was again renewed. The duke of Marlborough was now to contend with marſhal Villars, a general of great experience and ſkill. The battle of Malplaquet was fought on the 31ſt of Auguſt, the French lines were completely broken, and the reſult was one of the moſt deſtructive actions of the whole war. It coſt the allies 18,000 men, killed and wounded. The city of Mons was captured, but the purchaſe was reckoned too dear, even by thoſe who were not accuſtomed to ſet a proper value upon human lives. The Engliſh nation, long accuſtomed to victory, began to loſe its reliſh for triumphs, in which itſelf had no real or very apparent concern. The war became unpopular; the tory part of the country were loud in the clamours againſt its continuance, and the duke himſelf was ſlighted. His winter viſit, though attended with public honours, was very inauſpicious to the expectations which he had formed; he found that a total breach had been made between the queen and his ducheſs. He took the field again early in 1710, and, in conjunction with prince Eugene, conducted a campaign againſt marſhal Villars, in which they captured ſeveral places of ſtrength and importance. The duke's victories on the continent could not prevent the machinations of his enemies at home. The queen had called to her council men wholly inimical to his views. They wiſhed and expected his reſignation; but either private intereſt, or a deſire of being abſent from the ſcene of things in which he could take no part, or, perhaps, from a regard to the public intereſts of his country, he diſſembled his indignation, and again met his antagoniſt Villars. In this campaign he maintained his ſuperiority, but the advantages gained were neither very brilliant nor of very great conſequence. His influence at court was now completely gone, ſtill he ſeemed willing to retain his command in the army, but as he did not reſign, the honour was taken from him. In the Houſe of Commons he was charged with peculation, for which there was no ſuch ſtrong ground as ſhould have induced his enemies to have purſued him with ſo much indignity. They were jealous of his power, and were determined to keep no terms with the man who had been ſo long and ſo deſervedly regarded as the firſt perſon in the nation, and who, whatever might be his failings, merited the eſteem and veneration of his country. To eſcape the mortification that he was liable to experience in his own country, he paid a viſit, in the winter of 1712, to the Low Countries, where he was received with the honours due to his high character. In two years he returned, and upon the acceſſion of George I. was again ſummoned to the court, and enjoyed the ſmiles of royal favour. He was re-inſtated in the ſupreme military command, and his advice was taken and acted upon with regard to the ſuppreſſion of the rebellion in 1715. This was the laſt public buſineſs in which he took a part. His mental faculties began to droop, and he at length experienced thoſe changes which are ſo humiliating to the human underſtanding, and which induce the ſtate of complete ſecond infancy. He died at Windſor lodge on the 16th of June, 1722, in the 73d year of his age, leaving behind him a numerous poſterity by his four daughters, married into families of the greateſt conſequence in the kingdom. Biog. Brit.

CHURCHILL, CHARLES, was the eldeſt ſon of the rev. Mr. Churchill, rector of Rainham in Eſſex; and when about eight years old he was ſent to Weſtminſter ſchool. His proficiency in claſſical learning was conſiderable, but not ſo extraordinary as to entitle him to any pre-eminence over ſeveral of his ſchool-fellows in the ſame claſs with himſelf. At the age of fifteen he became a candidate to be admitted on the foundation at Weſtminſter, and went in head of the election. On entering his nineteenth year he quitted Weſtminſter ſchool, and applied for matriculation at the univerſity of Oxford, but was refuſed on account of a deficiency in claſſical learning; he was however admitted of Trinity College, Cambridge, in the year 1749. Immediately after his admiſſion he returned to Weſtminſter, but quickly put an end to his education, by an imprudent marriage with a young lady in the neighbourhood. To this premature and highly inconſiderate meaſure, moſt of the difficulties in which our author was afterwards involved may be aſcribed; and in his endeavours to forget or elude thoſe difficulties he acquired ſuch habits of diſſipation, as indirectly terminated his life. His father, who had been reluctantly reconciled to this imprudent match, received this youthful couple into his houſe, where they reſided about a year, during which the conduct of the ſon was exemplary and domeſtic. In the year 1751 he retired to the north of England, and applied himſelf to thoſe ſtudies which ſhould qualify him for his future deſtination in the church. At the age of twenty-two he again viſited the metropolis to take poſſeſſion of a ſmall fortune to which he became entitled in right of his wife. He no ſooner was inducted into the office of clergyman than he earneſtly laboured from principle to diſcharge the important duties incumbent on him. At twenty-five he was ordained prieſt by Dr. Sherlock, biſhop of London; his family however increaſing, he found the ſcanty income of a curacy very inadequate to ſupply his wants, and he opened a ſchool and obtained conſiderable encouragement; but in 1758, by the death of his father, he quitted the profeſſion of an inſtructor, and was elected his ſucceſſor to the curacy and lectureſhip of St. John the Evangeliſt, and in connection with this he engaged in private tuition, and gave leſſons to the young ladies at Mrs. Dennis's boarding-ſchool in Queen's ſquare, and likewiſe in his leiſure hours attended ſeveral young gentlemen in order to aſſiſt them in their claſſical ſtudies.

Such was the laudable conduct of this young man until he was twenty-ſeven years of age, when a total alteration took place in his general ſyſtem of conduct and behaviour in life. The anxiety ariſing from domeſtic infelicity unhinged his mind, though naturally of a firm texture, and ſeemed to give an entirely new bias to his diſpoſition. At this time the friendſhip between Churchill and Robert Lloyd, which had been formed at ſchool, revived with all the glow of ſenſibility and ardour of attachment characteriſtic of men of ſtrong paſſions and of warm imaginations. Urged on by the ſame motive, a reſtleſs inquietude of mind, they hurried together into ſcenes of diſſipated conviviality. "The future, ſays one of Mr. Churchill's biographers, is rarely ſacrificed to the preſent, without producing conſequences of the moſt diſtreſſing nature." A few months only had elapſed before the young man experienced, in the moſt ſenſible manner, the juſtice of this obſervation. He found that by his extravagance and fondneſs for theatrical amuſements he wantonly plunged himſelf into an abyſs of miſery, from which he had no hope of being ever able to extricate himſelf. At this critical and alarming juncture, Dr. Lloyd, father to his friend and companion, became his deliverer, and by his aid, Churchill was enabled to effect a compromiſe with his creditors, who upon receiving one fourth only of their ſeveral demands, fully liberated him from all the terrors of a priſon. He now ſeriouſly thought of exerting thoſe talents which he well knew were latent in his mind; and his firſt ſubject was derived from the ſtock of obſervation his habits of life had afforded him. The excellencies and defects of the actors in both houſes were the topics of his Roſciad, a poem publiſhed in March, 1761, without his name. It was greatly admired, and was attributed to the moſt celebrated names of the time; but a ſecond edition declared the real author. Churchill was raiſed to a conſiderable ſhare of eminence. As the characters he had drawn were public ones, the public at large became intereſted in the diſcuſſion of their merits; and the ſeverity of the author's ſatire was no impediment to the popularity of his work. Beſides this, it had a very conſiderable ſhare of intrinſic merit. Equal energy and vivacity were diſplayed in the delineations; the language and verſification, though not without inequalities, were ſuperior to the ordinary ſtrain of current poetry; and many of the obſervations were ſtamped with ſound judgment and correct taſte. The theatrical performers increaſed the celebrity of the piece by the impatience which many of them ſhewed under its cenſure. The author juſtified himſelf in a new piece of ſatire, entitled the "Apology." Theſe works made him many enemies, but they brought him into the moſt flattering notice among wits and men of pleaſure. This produced its natural conſequence of looſe and licentious manners. His nocturnal revels and frequent abſence from home rendered every return to it the more irkſome, and the frequent altercations between him and Mrs. Churchill, who poſſeſſed but little of the ſpirit of conciliation, and whoſe imprudence is ſaid to have kept too near a pace with that of her huſband, ended in February, 1761, in a total ſeparation. This circumſtance, together with the general outcry raiſed againſt him by his pariſhioners for the total diſregard of his religious functions, and the unbecoming mode of his dreſs, induced him to reſign the curacy and lectureſhip of St. John's, which, but a few years before, had been conferred upon him, in conſequence of the high character which he then poſſeſſed for learning and morality. He now totally renounced all claim to the clerical character, became a man of the town, and indulged in all the exceſſes to which youth and unbridled licentiouſneſs could prompt. To vindicate his conduct from the juſt cenſure of the public, Churchill publiſhed a poem, entitled "Night." The diſgraceful impoſture of the Cock-lane ghoſt furniſhed him with another topic of perſonal ſatire, which, however, did not greatly intereſt the public.

In the year 1762, Churchill plunged deeper and more irrecoverably in the mire of debauchery and faction, by commencing an acquaintance with Mr. Wilkes, and by becoming a coadjutor in the North Briton, and it was given in evidence by the bookſeller, that the profits ariſing from the ſale of this publication were received by Churchill. He was included in the general warrant with Mr. Wilkes, and only eſcaped, owing to the meſſenger's ignorance of his perſon, and to the preſence of mind with which Wilkes addreſſed him by the name of Thompſon. The political occurrences at the beginning of the preſent reign had inſpired among the people a rancorous hatred againſt the Scotch; and Churchill adminiſtered food to this paſſion by the "Prophecy of Famine," the materials of which were propoſed to him as the ſubject of a paper for the North Briton; but on more mature conſideration, he determined on converting it into a poem, in which the powers of deſcription are exhauſted in humorous exaggeration of the defects of the country, and acrimonious abuſe of its inhabitants. The poem was received with avidity, and gave the author that precedence as a political ſatyriſt, which he long maintained at the expence of candour and decorum, and to the final debaſement of his poetical as well as his moral character. Hogarth was the next victim immolated at the ſhrine of party, on account of the attempts he had made to expoſe the failings of the earls Temple and Chatham, and his coarſe caricature of Churchill himſelf. This epiſtle was written in the author's beſt manner, and is ſaid to have accelerated the death of the ingenious artiſt to whom it was addreſſed.

Churchill now affected in his manners and dreſs the appearance of a man of the town, and, in conformity to this exterior, he engaged in his illicit amours. He even proceeded to the faſhionable vice of ſeduction, and enticed from her parents the daughter of a reſpectable tradeſman in Weſtminſter, for whom his paſſion ſubſided in leſs than a fortnight; during which ſhort period ſhe had full leiſure afforded her for ſorrow and repentance. Her father was induced to receive her again into his family: this inſtance of tenderneſs ſenſibly affected her, and her future conduct would probably have juſtified the lenient kindneſs of a father, had ſhe not been continually expoſed to the taunts and goadings of an elder ſiſter, the bitterneſs of whoſe reproaches induced this unhappy young woman to apply once more to Churchill for protection, which he readily granted. While this tranſaction was freſh in the public mind, he publiſhed the "Conference," in which the emotions of a mind not hardened in guilt, and ſeverely labouring under the preſſure of ſelf-conviction, are pathetically deſcribed, and ſeveral paſſages of that poem are ſtrongly expreſſive of manly ſentiment and acuteneſs of feeling. Accompanied by this young lady, he retired into Wales in the ſummer of 1763, the ruſticity of whoſe inhabitants he has celebrated in his work, entitled, "Gotham." On his return to London, he found his friend, Lloyd, impriſoned in the Fleet, for whoſe liberation he made every poſſible exertion, but his efforts proved abortive. The rencontre between Wilkes and Martin gave riſe to Churchill's next poem, entitled, "The Duelliſt," and he cloſed his poetical labours for the year 1763, with the "Author." The ſatire in this publication is of a general nature, and well directed. In 1764, he poured forth ſeveral new productions, inſpired by no other muſe than neceſſity, and accumulating all the faults, with few of the beauties of the former: theſe are entitled "The Candidate," "The Times," "Independence," and "The Journey." Towards the latter end of that year Churchill went over to France to pay a viſit to Mr. Wilkes, then a refugee in that kingdom. At Boulogne he was ſeized with a fever, which ſoon threatened the fatal termination that took place on November 4th, 1764, which cloſed his ſhort but animated career in his 34th year. His body was brought to Dover, where it was depoſited in the old church-yard, with a ſtone over it, on which are inſcribed his age, the time of his death, and this line from his own works:

> "Life to the laſt enjoy'd here Churchill lies."

It is to his credit that he is much regretted by his particular friends, to whom he was endeared by a generoſity of temper not unuſually attending ſtrong paſſions and unſhackled manners. His poetical reputation ſeems to have been uniformly declining from the time of his death: a handſome edition of his works was, however, publiſhed in the year 1804, in two volumes, octavo, with explanatory notes, and an account of his life, to which this article is indebted. Churchill left two ſons, Charles and John, the charge of whoſe education was generouſly undertaken by ſir Richard Jebb, who ſent the former to the univerſity of Cambridge, with a handſome allowance. They neither of them proved worthy of this ſupport. They inherited the faults, without the virtues and abilities of their father, and died, like him, victims to their diſregard of temperance and prudence.

CHURCH-HILL, in *Geography*, a poſt and fair-town of Ireland in the county of Fermanagh. It is near Lough Erne, on the road from Enniſkillen to Belleek, and is 89 miles N.W. from Dublin.

Church-hill, a village of America, in queen Anne's county, Maryland, at the head of S.E. creek, a branch of Cheſter river; N.W. of Bridge-town, and N.E. of Centreville eight miles, and 85 S.W. from Philadelphia. N. lat. 40° 9'. W. long. 75° 53'.

Church hill *fort*, called alſo *Prince of Wales's fort*, a fort in New North Wales, at the mouth of Seal river, on the coaſt of Hudſon bay, conſtructed in 1715. N. lat. 58° 55' 30". W. long. 94° 50' 45". The temperature of 12 months, from Sept. 1768 to the end of Auguſt 1769, was 24°.7. Phil. Tranſ. for 1770, vol. LX. p. 148, &c.

Church-hill *river*, a river of New South Wales, which runs north-eaſterly into the weſt ſide of Hudſon bay, at Church-hill fort. N. lat. 58° 47' 32". W. long. 94° 7' 30".

CHURCHING *of women after child-birth*, took its riſe from the Jewiſh rite of purification. In the Greek church it was limited to the fortieth day after delivery; but in the weſtern parts of Europe no certain time is obſerved. There is an office in the liturgy for this purpoſe.

CHURCH-TOWN, in *Geography*, a village of America, in the N.E. part of Lancaſter county, Pennſylvania, about 20 miles E.N.E. of Lancaſter, and 50 W.N.W. of Philadelphia. It has 12 houſes, and an epiſcopal church; and in the environs are two forges, which manufacture about 450 tons of bar-iron annually.

CHURCO, a town of Aſiatic Turkey, on the coaſt of Caramania, about 46 miles from the iſle of Cyprus.

CHURGE, in *Ornithology*, the name given by Buffon to the Indian buſtard; he terms it *churge ou outarde moyenne des Indes*. See Otis *bengalenſis*.

CHURLE, Ceorle, or Carl, in *Saxon Times*, ſignified a tenant at will, who held of the thanes on condition of rent and ſervice. They were of two ſorts: one rented the eſtate like our farmers: the other tilled and manured the demeſnes, and were called ploughmen.

CHURN, in *Rural Economy*, the name of a veſſel in which cream is coagulated by agitation. There are various conſtructions or ſorts of churns, but thoſe which are of the upright or Dutch kind, and barrel churns, have been by much the moſt generally employed. Dr. Anderſon obſerves that he ſhould prefer the ſimpleſt which he has ſeen as the beſt; merely becauſe they admit of being better cleaned, and of having the butter more readily ſeparated from the milk than any others; theſe are the old-faſhioned upright kinds, which have long handles with feet to them, perforated with holes for the purpoſe of beating the cream by means of being moved upwards and downwards by the hand. But though, for theſe reaſons, he may prefer this form of churn, other perſons may chooſe that which they like beſt, as all the ſorts under ſkilful management will perform the buſineſs perfectly well. Indeed, where the cream has been properly prepared, the proceſs of churning will be ſo eaſy, he thinks, as to render thoſe utenſils, in general, the moſt commodious which can be moſt eaſily emptied.

According to the author of the "Agricultural Survey of Cheſhire," the churns in common uſe there are moſtly of the upright ſort, and have in ſome caſes a lever applied to them, in which caſe, one end of it, which is ſupported by an upright frame, is connected to the end of the churn ſtaff, and the other end of it by the means of a rod to the crank of a toothed wheel, and is wrought by a pinion fixed upon the axle of a common winch. By this ſimple contrivance, the operation of churning is performed by a ſingle perſon with the greateſt facility. But in large dairies, churns are frequently wrought by means of a horſe, and on ſuch farms as have threſhing mills, they may be very conveniently attached to and wrought by them. But in whatever way the buſineſs of churning may be performed, the ſize of the churn ſhould always be ſuited to the quantity of cream intended to be churned, as without attending to this point, much loſs may frequently be incurred by the cream being forced out of the churn, as well as other cauſes.

Several improvements have lately been made in this ſort of machinery. Mr. Harland, by an alteration in the manner of working theſe utenſils, has in a great meaſure obviated the inconvenience of the vertical motion of the common churn, and the awkward rotatory motion of the barrel churn; which is ſupplied by a very eaſy muſcular exertion, reſembling in its nature that of a common pump-handle; and by affixing a fly-wheel, the agitation is performed in a more equable manner, and on that account the butter is more perfectly ſeparated from the whey. The effect of the fly-wheel in regulating motion may eaſily be made evident by ceaſing to work the handle, on which the churn, by a regular diminution of motion, continues to act for ſome time without any moving power being applied. At *fig.* 3. *Plate* VIII. of *Agriculture*, is ſhewn the common barrel-churn, thus improved, moved by the intervention of a multiplying-wheel, to moderate its over-violent motion. The head of the crank moving in the mortiſe in the handle, cauſes the rotatory motion of the barrel with great facility. From ſome experiments that have been made it would appear that if the barrel be fixed, and the axis in the inſide, to which the daſhers are attached, be made to turn, that the forming of the butter will be much ſooner completed than when the contrary is the caſe.

Churns with this ſort of alteration have been likewiſe conſtructed by the ſame ingenious mechanic.

At *fig.* 4. is an improvement in communicating the vertical motion to the common churn. The fly-wheel and crank are applied as in the other inſtance, and with the ſame equable effects; which, from the vertical motion of the common churn being ſo intolerably fatiguing, is a very valuable application. The limits of this vertical motion are obviouſly double the length of the crank whoſe end is inſerted in the mortiſe of the handle. The ſame apparatus may be applied for making different quantities of butter by placing larger or ſmaller churns on the ſame platform.

Other improvements in theſe utenſils have been introduced by Mr. Rawntree, the principal advantages of which are, that the cream is more effectually agitated than in the common churns; that, by taking off the covers, the inſide can be perfectly cleaned without any difficulty, and that by leaving them off, the churn will be kept ſweet, when not in uſe, by the current of air paſſing through it. A churn of this improved kind as ſhewn in *fig.* 5, is compoſed of two cylinders of tin plate (or, in large churns, of wood,) A, B joined together in an angle; theſe are ſtrengthened by two bars of wood on each ſide, covered with iron plates D, D, to which the centre pins *d*, that the churn turns upon, are affixed; the iron plates D, D, project beyond the wooden bars, and have holes through them to receive each end of a clamp *e*, which has a ſcrew through the middle of it: the end of this ſcrew preſſes againſt the middle of the cover E, ſo that when the ſcrew is releaſed the clamp *e* can be taken away, and the cover removed. Each of the cylinders contains a beater, compoſed of three circular boards, *fig.* 6, with holes through them, which boards are kept at the proper diſtances from each other by a wooden rod fixed to them; *n n* is a ſmall pipe extending from near the outer end of each cylinder to their junction where it connects with a ſmall upright pipe; theſe anſwer the purpoſe of the vent-peg, and can always be kept open without throwing out the cream. When this churn is uſed, one of the beaters muſt be put into its cylinder, and its cover put on and ſcrewed faſt; the churn muſt be then held by one perſon, ſo that the cloſed cylinder is nearly vertical, (as in the figure) while another pours the cream in at the other end, which is left open; the other beater is then put in and the cover ſcrewed on. The operation of churning is performed by a perſon taking hold of any part of the churn, and moving it up and down on its centre pins, ſo that the elevated cylinder is a little above the horizontal line, (large churns are put in motion by a pendulum affixed to the end of one of the centre pins). By this means the cream is alternately poured out of one cylinder into the other, and daſhed againſt the beaters with great violence. When the butter is made, the butter-milk is drawn off by a peg in one of the covers, and the butter is taken out by removing the covers. And an improvement of his on the upright churn is exhibited at *fig.* 7, by which the operation of churning is ſaid to be executed with much greater eaſe and expedition.

The *pendulum churn* conſtructed by Mr. M'Dougall has been found to anſwer admirably well, and ſave much labour in Mr. Curwen's dairy in Cumberland.

As the improvements of Mr. Harland render the expences of churns conſiderably higher, it may not be unuſeful to ſtate the addition which is thus created. A barrel-churn, which will make four dozen of butter, uſually coſts about 3*l.* 10*s.*, but, with the improvement, five guineas; the common upright churn, with the additional apparatus, will coſt two guineas, when for making eight pounds at a time; and three guineas for making twelve pounds, and ſo on in proportion to the ſize. Theſe churns may be had of the manufacturer in Fenchurch-Street, London.

CHURN-*owl*, in *Ornithology*. The common European goatſucker has obtained the name of churn-owl in many parts of England; and it is alſo called the goat-owl and fern-owl. Ray deſcribes it in his Synopſis under the name of churn-owl; and Willughby under the two latter. At this time it is pretty generally known to be of a diſtinct genus from the owl tribe; it is the *Caprimulgus europæus* of modern naturaliſts. See article CAPRIMULGUS.

CHURNET, in *Geography*, a river of England, which runs into the Dare in Staffordſhire.

CHURNING, in *Rural Economy*, the operation of procuring butter by the agitation of cream in a veſſel of the churn kind. It has been well noticed by Dr. Anderſon, that in the management of this proceſs much greater nicety is requiſite than has been commonly ſuppoſed; as a few haſty irregular ſtrokes given by the daſhers may render the whole of the butter of that churning uſeleſs in its original intention, and of little or no value for any other purpoſe, which, but for that circumſtance, would have been of the firſt quality. It is therefore conceived that the proprietors of extenſive dairies ſhould be particularly attentive to the execution of this part of the buſineſs, and be very careful in providing a proper perſon for the conducting of it.

The moſt ſuitable conductors of operations of this nature are thoſe of cool, ſedate, ſober diſpoſitions, and no others ſhould ever be permitted to take any ſhare in the performance of this ſort of buſineſs without a conſtant attention to the manner in which it is executed, as without ſuch care much loſs and inconvenience may often be ſuſtained by the dairy farmer.

And, it is added, that to thoſe who have been in the habit of ſeeing cream churned that has not undergone a proper preparation, it may perhaps be thought that it muſt be hard labour in a conſiderable dairy to be executed by one perſon; but that nothing is more eaſy, ſo far as bodily labour is concerned, than the proceſs of churning butter where the cream has been prepared in a ſuitable manner.

Mr. Headrick made the following chemical experiment as to the proceſs of churning, which is recorded in the Report of Mid-Lothian. “ From the ſwelling and foaming of the liquor during this proceſs, he was led to conclude that gaſes were evolved from it.”

And “ to aſcertain that point, a glaſs tube was faſtened in a plug of cork, fixed in the funnel of a patent churn belonging to Mr. Robertſon at Granton. The lower extremity of the tube was immerſed in water, and the joints of the funnel and cork luted, ſo as to prevent the acceſs of external air and cauſe the gaſes emitted by the liquor to paſs through the tube into an inverted glaſs jar, previouſly filled with water.

“ To their great ſurpriſe, no gaſes whatever were (he ſays) emitted during the proceſs; and the water in the baſon conſtantly roſe in the glaſs tube; which ſhewed that the atmoſpheric air was ruſhing into the liquor inſtead of gaſes ruſhing from it, as they expected, into the atmoſphere.”

The concluſion which ſeems to follow from this experiment is, he thinks, “ that in churning, the ſaccharine part of the milk combines with the oxygen of the atmoſphere, by which it is converted into acid, and precipitates the oil, or butyraceous part.” He adds, that “ this experiment might give riſe to many important obſervations concerning the nature and management of milk; but it ſhould be previouſly repeated, with varied circumſtances, in order more fully to aſcertain the facts.”

It has been ſuggeſted by ſome, that the proceſs of churning might be greatly expedited by having recourſe to the uſe of acids, ſuch as diſtilled vinegar, towards the latter part of the operation; but it is probable that ſuch additions can never be made without conſiderably injuring the quality of the butter. Beſides, nothing ſeems to be neceſſary to the eaſy and expeditious execution of the buſineſs, but a due temperature and ſtate of acidity in the cream, the manner of attaining which is fully explained in ſpeaking of the nature and management of the dairy. See DAIRYING.

For various methods of churning or making butter among the ancients and in the Eaſt, ſee BUTTER.

CHURR-WORM, in *Entomology*, a name given by ſome to the *Gryllotalpa*.

CHURRITUCK, in *Geography*, a county of America, in the ſtate of North Carolina, and diſtrict of Edenton.

CHURSEN, a town of Arabia; 32 miles N.E. of Chamir.

CHURWALDEN, a diſtrict of Switzerland, in the league of the Ten Juriſdictions, purchaſed of the houſe of Auſtria in 1649. In this diſtrict the hamlets are pleaſantly diſperſed about the vale and upon the ſides of the mountains.

CHUSAN, CHEW-SHAN, or TCHEOU-CHAN, an iſland, or rather a groupe of iſlands, ſituate in the Eaſtern ſea, about 18 or 20 leagues from Ning-poo, between the province of Tche-tchiang, the eaſtern coaſt of China, and Japan. N. lat. 30°. E. long. 122°. At the harbour of the principal of theſe iſlands the Engliſh firſt landed on their arrival at China; and this was formerly reckoned the utmoſt boundary of European navigation. The ſea from thence, for about 10° of latitude and 6° of longitude, was utterly unknown before the late embaſſy, the ſquadron of which touched at this iſland in 1793, except to thoſe who dwelt in the neighbourhood of its ſhores. Into this ſea are received the waters of the great “ Whang-ho,” or Yellow river of China. See YELLOW *Sea*. Between the Queeſan iſlands and Chuſan harbour, through a ſpace of about 60 miles in length, and 30 in width, the number of iſlands exceeds 300. The part of the harbour in which the Clarence, one of the ſhips of the Britiſh ſquadron, anchored, was about half a mile diſtant from a landing place, and the depth of water was five fathoms. In this ſituation the four paſſages into the harbour were ſo ſhut in, that none of them were viſible. It appeared like a lake ſurrounded by hills; the extent of the harbour, from north to ſouth, is little more than a mile, and near three miles from eaſt to weſt. The riſe and fall of the tides make a difference of about 12 feet. The time of high water, at the full and change of the moon, appears to be about 12 o'clock. The tides, however, are very irregular, and vary, according to the wind, and the eddies produced by ſuch a multiplicity of iſlands.

Among theſe numerous iſlands there are almoſt as many valuable harbours, or places of perfect ſecurity, for ſhips of any burden. This advantage, together with that of their central ſituation, in reſpect to the eaſtern coaſt of China, and the vicinity of Corea, Japan, Leoo-keo, and Formoſa, attract conſiderable commerce, eſpecially to Ning-poo, a city of great trade in the adjoining province of Tche-tchiang, to which all the Chuſan iſlands are annexed. From one port in that province twelve veſſels ſail, annually, for copper to Japan.

Moſt of the Chuſan iſlands conſiſt of hills riſing with a regular ſlope, and rounded at top, as if any points or angles, exiſting in their original formation, had been gradually worn off into a globular and uniform ſhape. Many of theſe iſlands, though cloſe to one another, are divided by channels of great depth. They reſt upon a foundation of grey or red granite, ſome part reſembling porphyry, except in hardneſs. They were certainly, ſays ſir G. Staunton (Embaſſy, vol. i. p. 408), not formed by the ſucceſſive alluvion from the earth brought into the ſea by the great river, at whoſe mouth they are ſituated, like the numerous low and muddy iſlands at the mouth of the Po, and many others; but ſhould rather be conſidered as the remains of part of the continent thus ſcooped and furrowed, as it were, into iſlands, by the force of violent torrents carrying off, farther into the ſea, whatever was leſs reſiſtible than the adjacent rocks. Some of them wore a very inviting aſpect; particularly *Poo-too*, which ſee.

CHUSARIS, or CHUSARUS, in *Ancient Geography*, a river of Africa, in the interior of Libya, according to Ptolemy.

CHUSII, or CISII, a people of Aſia, in Suſiana, S.W. of the town of Suſa between this and Paſitigris.

CHUSIS, CHUZES, or CHISAS, an epiſcopal ſee of Africa, mentioned in the acts of the council of Carthage, held under Cyprian.

CHUSISTAN, or KHOSISTAN, in *Geography*, a province of Perſia, bounded on the north by the Irak Ajemi, on the eaſt by Farſiſtan, on the ſouth by the Perſian gulf, and on the weſt and ſouth-weſt by the Tigris, which ſeparates it from the Arabian Irak. This is the ſame country with Cuſh in Aſſyria, having preſerved its ancient name with a Perſian termination, and correſponds to the ancient Suſiana. But the name is antiquated. Shuſtec, or Toſtac, is now the name of a large province. Loriſtan, or Laureſtan, is in Shuſtec; and to the weſt is the country of Havila, the Ahwaz of M. D'Anville. The country, thus denominated, is extenſive, but thinly inhabited. It produces corn, rice, cotton, ſugar, tobacco, and dates. The northern part is mountainous, but the ſouthern flat and marſhy.

CHUSKA, a town of Aſia, in the country of Tibet; 25 miles W.S.W. of Tankia.

CHUTA-NAGPOUR, a town of Hindooſtan, in the country of Bahar; 150 miles S. of Patna, and 190 W. of Calcutta.

CHUTÆI, in *Ancient Geography*, a people originally of Aſſyria or Suſiana. Salmanaſar tranſported them into the country of Samaria, in the room of the Iſraelites; they were then idolaters, and he appointed prieſts to inſtruct them in the worſhip of the God of Iſrael; but they attempted to blend idolatry with the religion of the Hebrews. Under Alexander the Great they obtained permiſſion to build a temple on mount Gerizim. Joſephus.

CHUTE, in *Geography*, a river of England, which runs into the Avon, near Bath.

CHUWASCH, a town of Perſia, in the province of Segeſtan; 70 miles S.E. of Zareng.

CHUZIS, in *Ancient Geography*, a town of Africa propria, placed by Ptolemy between the two Syrtes.

CHWASTOW, in *Geography*, a town of Poland, in the palatinate of Kiov; 40 miles S.S.W. of Kiov.

CHYDA, in *Ancient Geography*, a town of Aſia Minor, in Lycia, according to Ptolemy.

CHYDAS, a river of Sicily. Ptol.

CHYLE, in *Anatomy*, is the fluid into which the food is converted in the ſmall inteſtine. See DIGESTION.

CHYLE, in *Chemiſtry*. The food of animals, after it has undergone digeſtion in the ſtomach, paſſes into the duodenum (the firſt of the ſmall inteſtines), and here a ſeparation begins to take place, the *chyle*, or nutritive part of it, being abſorbed by the *lacteals*, which are minute abſorbent veſſels which open within the cavity of the ſmall inteſtine, whilſt the other portion of the food paſſes down into the large inteſtines. Chyle, therefore, is the laſt change that food undergoes previous to its converſion into blood, for the lacteals convey it by a circuitous courſe into a common reſervoir, the *thoracic duct*, which opens into the left ſubclavian vein not far from the heart. The chemical analyſis of chyle would be ſcarcely leſs intereſting than that of blood itſelf, could it be collected in ſufficient quantity, but this is attended with great trouble, as it would be ſcarcely poſſible to collect from one animal a greater quantity of *healthy* chyle than what would be found in the thoracic duct when the animal was killed a few hours after making a hearty meal. Hitherto only a few deſultory experiments have been made on pure chyle, which have been collected by Haller.

By theſe we learn that chyle is a milky white fluid, of an agreeable ſub-ſaline taſte, lighter than the ſerum of blood, and even than water, on the ſurface of which it ſwims like cream. It readily coagulates by reſt and extravaſation, and appears to be compoſed of water, of an oily ſubſtance, conſiſting of globules evident to the microſcope, of a heavier matter, like cheeſe, which remains at the bottom after coagulation, and of ſome earth. Chyle readily turns ſour by keeping, but when freſh it gives no ſigns of acidity. The nature of the aliment makes but little change in that of the chyle. Its colour is uſually white, as is obvious by the whiteneſs and turgeſcency of the lacteals, if examined after digeſtion; but Dr. Fordyce found that indigo, introduced in fine powder into the ſtomach, was capable of giving a blue tinge to the chyle. For further obſervations as to the time and mode of its formation, ſee the article DIGESTION.

CHYLEMETH, in *Ancient Geography*, a river of Africa, in Mauritania Ceſarienſis, according to Ptolemy.

CHYLIFICATION, is the proceſs by which the converſion of the food into chyle is effected. See DIGESTION.

CHYLONGO. See CHILONGO.

CHYLOSIS. See CHYLIFICATION.

CHYME, is that particular modification which the food aſſumes after it has undergone the action of the ſtomach. See DIGESTION.

CHYME, in *Chemiſtry*. All food is reduced in the ſtomach by the united action of the fibres of this organ and of the gaſtric juice into a white pulpy maſs, in which all the digeſtible parts of the aliment are indiſtinguiſhably blended, and which is called *chyme*. It is probably after this period that the *chyle* begins to be ſeparated. The formation of chyme is ſo intimately connected with the ſubject of *digeſtion*, that we ſhall refer our readers to this article.

CHYMISTRY. See CHEMISTRY.

CHYMOLOGI, among *Botanical Writers*, denote ſuch as have employed their time in inveſtigating the qualities and properties of plants from their taſte and ſmell.

CHYMOSIS, in *Phyſiology*, formed of χυμος, *ſuccus*, of χεω, *fundo*, *I melt*, the act of making or preparing *chyme*, which ſee.

CHYMOSIS, in *Surgery*. See CHEMOSIS.

CHYTLA, in *Antiquity*, a liquor made of wine and oil, and ſometimes uſed in divination.

CHYTRACULIX, in *Botany*, Brown. Jam. See CALYPTRANTHES *chytraculix*.

CHYTRÆUS, DAVID, in *Biography*, a learned Lutheran divine, born at Ingelfing, in Suabia, in 1530, was diſtinguiſhed for his application to theology and the belles lettres, of which he became a profeſſor at Roſtock. He died in 1600. He was a conſiderable author; but his principal piece was a "Commentary on the Apocalyſe." His Latin chronology of Herodotus and Thucydides is alſo in ſome repute. All his works were collected and printed at Hanover, in 1604, in two volumes folio. His brother, Nathan, preſided over an academy at Bremen: he acquired ſome reputation for his Latin poems.

CHYTRI, among the Athenians, a feſtival in honour of Bacchus and Mercury, kept on the 13th of the month Antheſterion.

CHYTRI, in *Ancient Geography*, a town of the iſland of Cyprus, according to Pliny and Steph. Byz., called by Ptolemy *Chytros*, which had been epiſcopal.—Alſo, a lake of Greece, in Bœotia, placed by Theophraſtus in the canton called "Pelecania," between the rivers Melas and Cephiſus.—Alſo, a place ſituated at Thermopylæ, in which were hot baths. Pauſanias, who ſpeaks of theſe baths, ſays, that the people of the country called them χύτρους γυναικείους, *chytres*, or *baths of females*.

CHYTRINUM, or CHYTRIUM, a place of Aſia Minor, in Ionia, belonging to the inhabitants of the iſle of Cos.

CHYTROPOLIA, a place of Aſia, in the vicinity of the burgh of Telephe, ſuppoſed to be ſituated towards the Phaſis in Armenia Major.

CHYTROPOLIS, a ſmall country of Thrace. Steph. Byz.

CHYTRUS, CITRIA, a town of the iſland of Cyprus, at ſome diſtance from the northern coaſt, S. of Marcaria, and N.W. of Salamis.

CIA, or DIA, an iſland of the Ægean ſea, near that of Crete. Pliny.

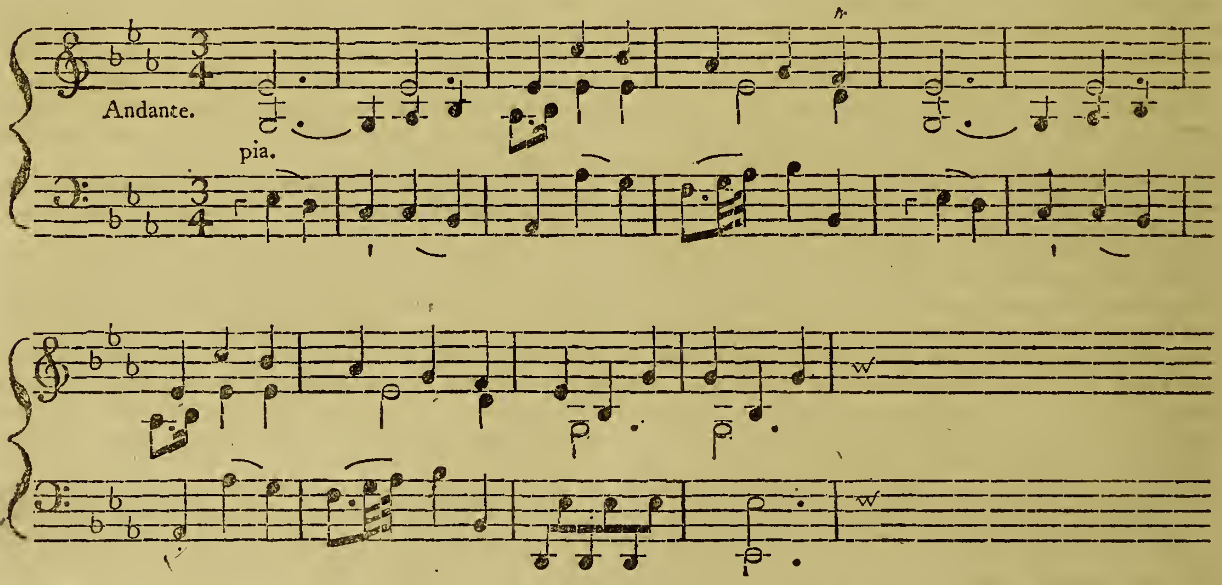
CIABRUS, CIAMBUS, CIAMBRUS, or CEBRUS, *Zibriz*, a river of Mœſia, dividing it into the higher and lower, running towards the north, and diſcharging itſelf into the Danube.

CIACA, a town in that part of Cappadocia, which was afterwards called Armenia Minor; ſituated in the Melitene, upon the right bank of the Euphrates, almoſt oppoſite to Paſtona. Ptolemy calls it *Ciacis*.

CIACCONA, in *Muſic*, in Italian means the ſame thing, with *Chaconne* (which ſee) and is of ſo ancient an invention, that the origin of the term is diſputed. Freſcobalds has compoſed variations on the ciaccona; and a whimſical compoſer of Bergamo, Il Cavalier Tarquinio Merula, in a volume of his works publiſhed in 1635, has a compoſition which he calls "Duo ſopra la Cieccona," on a grand baſe. Etymologiſts are doubtful whence the

the word *chaconne* or *ciacconna* is derived; it has been imagined in Italy by ſome that a *cieco*, or blind fidler, had invented the air, and that it had its name from that circumſtance. And we are able to give ſome weight to this conjecture, from recollecting, that in the "Hiſt. of Muſ. vol. ii." there is an account of a celebrated blind organiſt, who flouriſhed at Florence ſo early as the middle of the 14th century, and who was probably author of the air upon a ground, called the *cieccona*, or *ciacconna*. Philip Villani, the youngeſt of the Florentine hiſtorians of that name, in his "Vite d'Uomini illuſtri Florentini," has inſerted the life of Franceſco Cieco, the blind organiſt, who died in 1390. "Many," ſays this writer, "are the Florentines who have rendered themſelves memorable by the art of muſic; but all thoſe of former times have been far ſurpaſſed by Franceſco Cieco, who ſtill lives; and who, during childhood, was deprived of ſight by the ſmall-pox. . He was the ſon of Jacopo, a Florentine painter, of great probity and ſimplicity of manners; and being arrived at adoleſcence, and beginning to be ſenſible of the miſery of blindneſs, in order to diminiſh the horror of perpetual night, he began in a childiſh manner to ſing; but advancing towards maturity, and becoming more and more captivated with muſic, he began ſeriouſly to ſtudy it, as an art, firſt by learning to ſing, and afterwards by applying himſelf to the practice of inſtruments, particularly the organ, which he ſoon played, without ever having ſeen the keys, in ſo maſterly and ſweet a manner, as aſtoniſhed every hearer. Indeed, his ſuperiority was ſoon acknowledged ſo univerſally, that, by the common conſent of all the muſicians of his time, he was publicly honoured at Venice with the laurel crown for his performance on the organ, before the king of Cyprus and the duke of Venice, in the manner of a poet laureat."

As the beautiful chaconne by Jomilli, which terminated a grand ballet at the Opera Houſe in 1772, and in which Mademoiſelle Heynel diſplayed her unrivalled powers of grace and execution, is not yet forgotten, we ſhall here inſert a few bars of it, as an admirable ſpecimen of the kind of movement ſo called.



CIACICA, in *Geography*, a juriſdiction or province of Peru, in S. America, ſubject to the archbiſhop of Plata; about 90 leagues N. of the city of Plata, and 40 from Paz. Its capital, which has the ſame name, and all the places ſituated to the ſouthward of it, belong to the archbiſhopric of Plata; but many of thoſe that lie to the north of it are in the dioceſe of Paz. The countries in this juriſdiction extend in ſome parts above a hundred leagues, and, of courſe, the temperature is various. Some parts are very hot, and produce abundance of *coca*, (which ſee,) affording a conſiderable commerce, and ſupplying all the mine towns from Charcas to Potoſi. The colder parts feed large herds of cattle; together with vicunas, guanacos, and other wild creatures. This province has alſo ſome ſilver mines.

CIACONIUS, Alphonso, in *Biography*, born at Baeça, in Andaluſia, about the year 1540. He entered the order of the Dominicans, and was afterwards ſent to Rome, where he was created titular patriarch of Alexandria. He wrote ſeveral works, ſome of which prove him to have been exceedingly credulous and ſuperſtitious, ſuch was his treatiſe to confirm the ſtory of the delivery of Trajan's ſoul from hell by the prayers of pope Gregory the Great. His moſt eſteemed work is entitled, "Vitæ et Geſta Rom. Pont. et Cardinalium," which he did not live to finiſh. It was completed by his nephew, and publiſhed in 1602. It abounded with errors, and the reviſion of it was committed to Jerome Alexander, and Vittorelli, and the corrected edition appeared in 1630. The laſt edition was greatly enlarged, and publiſhed in 4 vols. folio, at Rome, in 1676. Ciaconius left in MS. "An univerſal Library of Authors," which was edited, with additional notes, by Camuſat, and printed at Paris in folio, in 1732.

CIACONIUS, Peter, brother of the above, was employed by pope Gregory XIII. in reviſing an edition of the Bible, and of other works then printing at the Vatican. For ſuch an employment he is ſaid to have been admirably fitted, on account of the extraordinary facility which he had of reſtoring mutilated paſſages, and illuſtrating obſcurities. He is celebrated chiefly as a commentator, but he was engaged with Clavius in a correction of the calendar, and, after his death, were publiſhed a poſthumous work of his, entitled, "Kalendarii Romani veteris Explanatio," and ſome ſmaller pieces. He was connected with, and highly eſteemed by, the principal literati of his time, and was accounted

counted among the moſt learned men of the age in which he flouriſhed. He died at Rome in 1581. Gen. Dict.

CIÆNA, or Cinna, in *Ancient Geography*, a town of Aſia Minor, in Galatia. Ptolemy.

CIAGESI, or Ciagisi, an ancient people, who occupied one of the more ſouthern parts of Dacia.

CIAIS, a town of Mingrelia, near the Black Sea.

CIALIS, a country of Independent Tartary, with a capital of the ſame name; bounded on the N. by Eluth, on the E. by ſandy deſerts, on the S. by the Greater Tibet, and on the W. by Turkeſtan.

CIAMBERLANO, Luca, in *Biography*, a painter and engraver, native of Urbino, whoſe prints bear date from 1609 to 1628. His engravings are executed entirely with the graver, in a neat but ſtiff manner: he drew the figure with tolerable correctneſs; but the effect in his prints is much injured by the lights being too much ſcattered, and of equal ſtrength; this, however, is the fault of the time when he lived. Many of his prints are from his own compoſition, and others from Raffaele, Polidor, Caracci, &c. Strutt. Heinecken.

CIAMBETTA, in *Ichthyology*, one of the ſynonymous names of the balance-ſhark, *Libella ciambetta*, Salvian, Aq. See Squalus *zygæna*.

CIAMPA, in *Geography*. See Chiampa and Siampa.

CIAMPELLI, Agostino, in *Biography*, an hiſtorical painter, born at Florence about 1578. He became the diſciple of Santo di Titi, the moſt eminent Florentine painter of that time, and from him imbibed a ſufficiently correct and pure ſtyle of drawing, together with the gay colouring then in uſe among his countrymen. His pictures are, however, a little too red, and ſometimes rather hard. He nevertheleſs acquired ſufficient reputation to occaſion his being employed at Rome under Clement VIII. and his ſucceſſors, upon many large works in freſco, and in oil, which are enumerated by Baglione. The Sacriſty, and the chapel of S. Andrea, in the church of Geſu, are amongſt his beſt works in freſco; and a picture in oil by him at St. Stefano in Peſcia, repreſenting the meeting of Mary and Elizabeth, is conſidered little inferior to another by Tiarini, placed near it. Towards the latter part of his life, he was honoured by the ſuperintendance of the fabric of St. Peter's, the fatigue of which, however, is ſuppoſed to have contributed to his death, about 1640.

A very beautiful compoſition of Ciampelli, repreſenting the death of St. Antonio Abate, is engraved in the Etruria Pittrice. Baglione. Lanzi, Storia Pittorica. Orlandi.

CIAMPI, Vincenzo, an opera compoſer of conſiderable merit, who arrived in England in 1748, with a new company of comic ſingers brought hither from Italy by Signor Croza, for the firſt time. Theſe performers, conſiſting of Pertici, Laſchi, and Guadagni, then very young for the firſt ſerious man; Fraſi, and afterwards the Mellini, for ſerious woman; and the comic female characters by the wives of Pertici and Laſchi, the two beſt buffo actors we ever ſaw on any ſtage, formed a very good troop; and in the comic operas of "La Comedia in Comedia, Orazio, Don Calaſcione, Gli tre Ciciſbei ridicoli," &c. compoſed by Latilla, Natale Reſta, and Ciampi, who came over as maeſtro to the company, pleaſed the public, and filled the theatre, very ſucceſsfully, during the whole ſeaſon.

Ciampi remained in this country till the arrival of Cocchi in 1754, and compoſed ſeveral comic operas, as "Il Negligente," "Bertoldo," &c. and the ſerious operas of "Adriano in Siria," "Didone," and "Il Trionfo di Camilla." He likewiſe publiſhed ſix organ concertos, in which there were ſome maſterly movements; but though all ſuperior to the concertos of Filton, then in high favour, particularly in the country, being leſs familiar and common, they were never much noticed or performed in public. The productions of Ciampi ſtrike us now as they did fifty years ago: they are not without merit; he had fire and abilities, but there ſeems ſomething wanting, or redundant, in all his compoſitions; we never ſaw one that ſatisfied us, and yet there are good paſſages in many of them. "Adriano in Siria" was compoſed for ſecond-rate ſingers, and the muſic is of the ſame kind. The comic ſongs of "Il Negligente" are infinitely better than his ſerious ſongs; and convince us that the buffo ſtyle, for which he came over, was that in which nature beſt aſſiſted him.

CIAMPINI, John-Justin, born at Rome in 1633 was firſt engaged in the ſtudy of the law, with an intention of becoming advocate, but he afterwards attached himſelf ſolely to the practice of the apoſtolic chancery, in which he ſucceſſively occupied various poſts. He was much attached to the ſtudy of the belles lettres, which he promoted by various publications. He took a part in a literary journal commenced at Rome in 1668, and in three years he formed a ſociety for the ſtudy of eccleſiaſtical hiſtory. Under the protection of Chriſtina, then reſident at Rome, he founded, in 1677, an academy for phyſics and mathematics, which attained to conſiderable celebrity. He died in 1698, leaving behind him many works, which exhibit much learning, but they are deficient in method and purity of diction. His chief work is entitled "Vetera Monumenta, in quibus præcipue Moſaica opera, Sacrarum Profanarumque ædium Structura illuſtrantur," 2 vols. folio. This is a learned and curious treatiſe on the remains of ancient buildings and moſaics in Rome, illuſtrated with numerous engravings. The great object of this work is the elucidation of various points in eccleſiaſtical hiſtory. He was a collector of curious books, and well acquainted with their value.

CIANESUS, *Cianidzkhali*, in *Ancient Geography*, a river of Aſia in the Colchis territory. It flowed towards the W.S.W. and diſcharged itſelf into the Euxine Sea, N. of the mouth of the Phaſis.

CIANI, a denomination given by Livy to the inhabitants of the town of Cium, in Aſiatic Myſia.

CIANICA, a town of Aſia, placed by Ptolemy in the Melitene, a county of Leſſer Armenia.

CIANIS, a river which ran near the town of Cium in Aſiatic Myſia.

CIANO, in *Geography*, a town of Piedmont, in the Canaveſe; 12 miles S.E. of Jvrea.

CIANUS, Sinus, the *gulf of Cianus*, was formed by part of the waters of the Propontis, which extended towards the eaſt, between a peninſula that conſtituted northwards a portion of Bithynia, and ſouthwards part of the continent where Olympena was ſituated. It took its name from the town of Cius, ſeated at the bottom of the gulf.

CIASA, or Cæasa, an ancient town of Aſia, in Babylonia.

CIBALAS, Cibola, or Civola, the ancient name of New Grenada, in Terra Firma, South America, and alſo of a town in this province. The country, though not mountainous, is cool; and the Indians, who inhabit it, are ſaid to be the whiteſt, moſt witty, moſt ſincere, and moſt orderly of all the aboriginal Americans. When the country was diſcovered, they had, each of them, only one wife, and were extremely jealous. They worſhipped water, and an old man that was a magician, whom they ſuppoſed to lie concealed under one of their lakes.

CIBALIS, or Cibalæ, in *Ancient Geography*, a town of Lower Pannonia, whoſe name is ſtill preſerved in the obſcure ruins of Savilei; ſeated on the Save about 50 miles from Sirmium, the capital of Illyricum, and about 100 from Taurunum, or Belgrade, and the conflux of the Danube and Save. This town is famous for the firſt battle fought on the 8th of October, A.D. 315, between Conſtantine and Licinius; in which the latter, after a ſevere conflict, and the loſs of more than 20,000 men, was obliged to retreat and make his eſcape, at the head of his cavalry, to collect a new army in Dacia and Thrace.

CIBAO, in *Geography*, a groupe of high mountains, occupying the centre of the iſland of St. Domingo; from which diverge three large chains, the longeſt ſtretching towards the eaſt, and dividing that part of the iſland; another ſtretching to the north-weſt, ending at Cape Foux; and another, of leſs elevation, running nearly in the ſame direction, and terminating at Cape St. Mark. See St Domingo.

CIBARIA, a term which, in its general acceptation, ſignifies food, meat, victuals for man, cattle, fiſhes, &c. But in a *Military Senſe* it denotes proviſions, or what the French call *munitions de bouche*. Cicero ſays, that when a Roman army ſet out on a march, each ſoldier carried proviſions with him for 15 days; and Titus Livius ſays for a whole month. The Greeks, who made but ſhort campaigns, and ſeldom at a great diſtance from their own cities and territories, were not impeded in their marches and operations by great quantities of baggage or ſupplies, and always returned home to paſs the winter.

CIBARITIS, or Cybaretis, in *Ancient Geography*, a country of Aſia Minor, near the Mæander; ſuppoſed to be the territory of the town of Cibyra.

CIBBER, Colley, in *Biography*, an eminent actor and dramatic writer, was born in Southampton-ſtreet, London, on the 6th of November, 1671. His father was a ſtatuary, a native of Holſtein, who came to England about the time of the Reſtoration. In London are ſeveral ſpecimens of his talents as an artiſt. Of theſe are the ſtatues of the kings round the Royal Exchange, as far as king Charles, and that of ſir Thomas Greſham in the piazza beneath. But his moſt capital works are the two figures of melancholy and raving madneſs, which were till lately in the front of Bethlehem. Colley bore the name of his mother; his firſt education was at the free-ſchool at Grantham, whence his father hoped to get him elected into Wincheſter college, to which he had ſome claim, on account of his maternal deſcent from William of Wykeham; he was, however, diſappointed. He would then willingly have ſent him to the univerſity in order that he might have been brought up to the church; but in this alſo his ſchemes were baffled. At length the young man purſued his own inclination, and, at eighteen, entered as a performer at Drury-lane theatre. His encouragement was at firſt ſmall, it being ſeveral months before he was allowed ten ſhillings a week ſalary. As an actor he excited attention by performing the part of lord Touchwood in the “Double Dealer,” to which he had been recommended by Mr. Congreve, who was fully ſatisfied with his manner of acting; and in conſequence of his recommendation his ſalary was doubled. His father ſettled on him twenty pounds per annum; and being in his twenty-ſecond year he married a lady, with whom he had ſome fortune. He gained conſiderable reputation by performing the part of Fondlewife in the “Old Bachelor:” and in 1696 he appeared as a dramatic writer, and his comedy of “Love's laſt Shift,” or the “Fool of Faſhion,” was pronounced by lord Dorſet, then lord chamberlain, the beſt firſt play he had ever known. He himſelf acted the principal character, to which his talents were well adapted. In ſome other productions Cibber was by no means ſo happy; his “Woman's Wit” was ill-received' and his “Xerxes” exiſted but a ſingle night. The comedy of “Love makes a Man,” though not original, proved beneficial to him; but his principal comedy was the “Careleſs Huſband,” which extorted praiſe from Pope, who never was the friend of Cibber, and who afterwards became his ſevere ſatiriſt. This comedy, which has been ſaid to contain the moſt elegant dialogue, and the moſt perfect knowledge of perſons in real life that has appeared in any language, is by no means a perfect play. It poſſeſſes ſcarcely any plot, and its ſucceſs depends chiefly upon ſmart converſation, ſcenes, and the diſplay of ſome lively and rattling characters, with which the ſtage at that time abounded. Its profeſſed object is the reclaiming of a libertine huſband; yet the virtuous wife is far from being properly diſplayed, and every ſuperiority is given to an agreeable rake. Without enumerating the ſeveral pieces brought forward by Cibber, it is ſufficient to ſay, that his importance as an actor continued to increaſe; and in 1711 he became manager and joint patentee of Drury-lane theatre; his brother managers were Wilks and Doggett. At the acceſſion of George I. a new patent was granted; but inſtead of Dogget the names of Booth and Steele were inſerted. The neceſſities of ſir Richard Steele were not ſatisfied with the common profits, and he withdrew from the management; this led to a chancery ſuit, in which Cibber pleaded his own cauſe ſo ſucceſsfully, that a deciſion was given in favour of himſelf and his brother managers.

In 1717, Cibber brought forward his comedy of “The Nonjuror,” levelled at the Jacobite party. It had a great run, and was acted for eighteen ſucceeding nights: on account of its tendency, the author received two hundred pounds from the king, and the office of poet laureat. He ſoon after gave up his ſhare in the theatre, and withdrew from the buſineſs of the ſtage, coming forward only on particular occaſions, as an actor, when he had fifty guineas per night as a ſalary. At the age of ſeventy he profeſſed himſelf the humble admirer of Mrs. Woffington, and was delighted to act with her in the play of the “Old Bachelor.” In 1740 Cibber publiſhed an apology for his life, which included an hiſtorical view of the ſtage during his own time. The eaſe and ſprightlineſs with which this was written, together with the numerous anecdotes which it contains, rendered it a very popular work, and its reputation is ſupported to the preſent time. In 1745, when he was turned of ſeventy-four, he appeared in the character of Pandulph, the pope's legate, in his own tragedy, entitled “Papal Tyranny in the Reign of King John;” and notwithſtanding his advanced years, performed the part with great ſpirit and vigour. In 1747 he publiſhed “Remarks on Middleton's Life of Cicero,” a work to which it will be generally admitted he was by no means competent; it was of courſe ſhort-lived, and is now almoſt wholly forgotten. Cibber finiſhed a long and active life on Dec. 12, 1757. His man-ſervant, with whom he had converſed, in apparently good health, at ſix in the morning, found him dead at nine, lying on his pillow, juſt as he had left him. He had entered his eighty-ſeventh year. He left two children. Theophilus adopted his father's profeſſions of actor and dramatic writer, but with very inferior ſucceſs. He was a mean and depraved character, and finiſhed a life of diſtreſs and infamy by ſhipwreck in his paſſage to Ireland, in 1758. His daughter, Mrs. Clarke, was alſo on the ſtage, which was one only of the many parts ſhe acted in life, and few women ever paſſed through a greater variety of adventures and occupations. When ſhe quitted the theatre ſhe kept a ſhop in Long-acre; then became miſtreſs of a puppet-ſhow; afterwards in man's cloaths ſhe appeared

peared as a valet to a nobleman: ſhe was afterwards a ſort of pork-butcher; and nine years of her life were ſpent in the occupation of a ſtrolling-player in the country. In Wales ſhe was a farmer and a paſtry-cook; at Briſtol the corrector of the preſs for a printer. She at length found means to take a public houſe at Iſlington, where ſhe died in great diſtreſs in 1760. To return, however, to Cibber; he was a man of great vivacity, good-humour, and benevolence; his chief failing was vanity, the preponderance of which, and the liberties which he took with the characters of other perſons, without any ill-intention, produced him many enemies, by whom, and by Pope in his "Dunciad," in particular, he was attacked with much more ſeverity than he deſerved. Their attacks, though often very pointed and malignant, made but little impreſſion upon him, and he was even ready to acknowledge his foibles with frankneſs. As an actor he poſſeſſed great merit; but his judgment as a manager was not always to be depended upon: his behaviour to young authors was not always candid, and ſometimes inſolent and overbearing. His own pieces are generally of a moral tendency, and his comedies are entitled to praiſe. He collected and publiſhed his pieces in two volumes 4to. and they have ſince been re-publiſhed in five volumes 12mo. Biog. Brit.

Cibber, Mrs. Susannah Maria, the ſiſter of Dr. Arne, has been juſtly celebrated as a great tragic actreſs; but as ſhe firſt appeared on the ſtage as a ſinger, in her brother's opera of Roſamond, written by Addiſon, and afterwards ſung in Handel's oratorios of Sampſon and the Meſſiah, the firſt time they were performed, both in England and Ireland, and for whom he compoſed his two beſt oratorio airs: "Return, O God of Hoſts," and "He was Deſpiſed and Rejected;" which, with a feeble voice, and little knowledge of muſic, by a natural pathos, ſhe ſung in a more affecting manner, than much finer ſingers have ever done; theſe conſiderations, and perhaps, the ſtimulus of friendſhip, incline us to give her an article here, for her vocal powers. As an actreſs, ſhe was thought moſt excellent in tender parts, till, during the rebellion, ſhe appeared in the character of Conſtance in Shakeſpear's King John, in which ſhe manifeſted not only the maternal tenderneſs of a Merope, but ſuch dignity, ſpirit, and paſſion, as perhaps, have never been exceeded, if equalled, on any ſtage. Handel himſelf was exceedingly partial to her, and took the trouble of teaching her the parts expreſsly compoſed for her limited compaſs of voice, which was a mezzo ſoprano, almoſt, indeed, a contralto, of only ſix or ſeven notes, with all the drudgery of repetition neceſſary to undergo, in teaching perſons more by the ear than the eye. He and Quin uſually ſpent their Sunday evenings at Mrs. Cibber's, where wit and humour were more frequently of the party, than Melpomene, Euterpe, or Orpheus.

With reſpect to the effect of Mrs. Cibber's ſimple, but pathetic, ſtyle of ſinging, it ſeems to demonſtrate, that expreſſion in muſic is the ſoul, and mere ſounds the corporeal part. The moſt beautiful and affecting air of an oratorio or ſerious opera, if ſung without expreſſion, becomes a vapid and unintereſting pſalmody: *notes et rien que des notes*, as Rouſſeau ſays, notes and nothing but notes. But this expreſſion muſt be ſuited to the language in which the air is ſet. The ſongs which Handel expreſsly compoſed for Mrs. Cibber's limited powers, were never half ſo touching when ſung by a Monticelli, a Guarducci, or a Guadagni, great ſingers as they were, as by our countrywoman, though, comparatively, ignorant of muſic, and poſſeſſing but a thread of a voice. However, from the excellence of her underſtanding, knowledge of our language, and the natural pathos in the tone of her voice, ſhe never failed to penetrate into the inmoſt receſſes of the ſoul of every hearer of feeling in ſinging theſe airs, as much as ever ſhe did in the moſt tender and diſtreſsful ſcenes of declamation.

CIBDELOPLACIA, in *Natural Hiſtory*, the name of a genus of ſpars. The word is derived from κιϐδηλος, *impure*, and πλαξ, *a cruſt*. The bodies of this genus are terrene ſpars, that is, are compoſed of ſpar, debaſed by a very large admixture of earth, and are not, therefore, of the leaſt brightneſs or tranſparence; and are found formed into thin cruſts, coating over vegetable and other extraneous bodies in form of incruſtations. Of this genus there are five known ſpecies, ſome of them uſed in medicine, and diſtinguiſhed by particular names.

CIBDELOSTRACIA, the name of a genus of ſpars. The word is derived from κιϐδηλος, *fouled* or *adulterated with extraneous matter*, and οστρακον, *a cruſt* or *ſhell*.

The bodies of this genus are cruſtaceous ſpars, ſo highly debaſed with earth, that they appear to the naked eye mere earths; they are deſtitute of all brightneſs or tranſparence, and are formed into thin plates, and uſually found incruſting over the ſides of fiſſures of ſtone. Of this genus there are ſeven known ſpecies.

CIBELIANA, *in Ancient Geography*, an epiſcopal ſee and town of Africa.

CIBERIS, a town of the Thracian Cherſoneſus, which was re-built and re-peopled by Juſtinian, after having been ruined; and in which he conſtructed baths, hoſpitals, and other edifices.

CIBILITANI, a people placed by Pliny in Luſitania.

CIBORIA, in *Antiquity*, the large huſks of Egyptian beans, which are ſaid to have been ſo large as to ſerve for drinking cups; whence they had their name, *ciborium* ſignifying *cup* in the Egyptian language.

CIBORIUM, in *Eccleſiaſtical Antiquity*, the covering for the altar of a church being an inſulated edifice, conſiſting of four columns ſupporting a dome.

This name was originally given to the huſks of Egyptian beans (ſee the preceding article), and thence by an eaſy tranſition came to denote a dome of the ſame form. The ciborium was in general uſe during the lower and middle ages, but was at length ſupplanted by the baldaquin, an object of the ſame nature, but in the form of a canopy. The application of a ciborium was not ſtrictly confined to the covering of an altar, they were alſo erected over the tombs of ſaints or martyrs, and the Italians call any inſulated tabernacle ciborio; thus there were ſometimes ſeveral in a cathedral, but in general there was only one placed over the great altar, and the ſpace which it occupied was called the ſanctum ſanctorum.

The moſt magnificent ciborium ever known was that erected by Juſtinian in the church of St. Sophia at Conſtantinople. Four large columns, of a fine red marble, ſupported a ſilver dome, on the ſummit of which was placed a globe of maſſy gold, which weighed 118 pounds; lilies of gold ſurrounded the globe, and fell in feſtoons; they weighed 116 pounds, and in the middle was placed a croſs of 75 pounds, of the ſame metal, and covered with the moſt rare and precious jewels.

CIBOTUS, in *Ancient Geography*, a name given by Strabo to a port which had been formed near the town of Alexandria in Egypt.

CIBOULS, or Chibouls, in *Botany*, the Welſh onion. See Allium *fiſtuloſum*.

CIBSAIM, in *Ancient Geography*, a town of Judæa, in the tribe of Ephraim. It was given to the Levites of this tribe, who belonged to the family of Caath, the firſt of the

Levites; and is mentioned in the book of Joſhua and the firſt book of Chronicles.

CIBULON, in *Geography*, a town of Aſia, in the country of Tibet; 8 miles N.E. of Zuenga.

CIBUS Castrensis, the food or nouriſhment which the Roman ſoldiers took in their camps, which conſiſted chiefly of bread, bacon, vegetables, and cheeſe. Their drink or beverage was a ſort of oxicrat, or a mixture of water and vinegar. They were not permitted to go to their meals without a ſignal or order for the ſame.

Cibus *ferialis*, in *Antiquity*, an entertainment peculiar to a funeral; for which purpoſe, beans, parſley, lettuce, bread, eggs, lentils, and ſalt were in uſe.

CIBYRA, in *Ancient Geography*, called the *Great*, a town of Aſia Minor, ſituated on the confines of Phrygia, Caria, Lycia, and Piſidia. It is called *Cibyrrha* by Ptolemy. This town was watered by a river which, according to Pliny (l. v. c. 28), deſcended from the mountains called "Cibyratarum Juga," and after paſſing through the territory of Cibyra, diſcharged itſelf into the river Calbis. Cibyra, as Strabo informs us (l. xiii.), was an ancient colony of Lydians, who took poſſeſſion of Cabatia, a country in the vicinity of Lycia; and in proceſs of time, the Piſidians removed this town to a more advantageous ſituation, and built a new town, 100 ſtadia in circuit. The inhabitants, who were very numerous, ſpoke four different languages, viz. the Lydian, Piſidian, Lycian, and Greek. The town, ſituated in a fertile diſtrict, acquired great celebrity by the excellence of its laws and the mildneſs of its government, and thus attained to a very high degree of proſperity. The dominions of this town extended from Piſidia and Milyuda to Lycia, and the coaſt over againſt the iſle of Rhodes, and they were able to raiſe 30,000 foot and 2000 horſe. When the conſul Cneius Manlius was commiſſioned, in the year of Rome 565, to reduce the Galatæ in Aſia Minor, he paſſed near Cibyra, and obtained from Moagetes, the governor of this town, 100 talents in ſilver, and 10,000 meaſures of corn, who thus prevented the pillage of the country, and the threatened ſiege of the capital. Polybius ſays, this town was ſubjugated by the prætor L. Muræna, and its territory reduced to a province, in the year of Rome 671. Cibyra maintained its dignity and ſplendour under the Roman government, and became the capital of an extenſive department, which contained 25 towns, and which Pliny (l. v. c. 25.) calls "Conventus Cibyraticus." This department remained, for ſeveral years, a part of the government of Cilicia. At the commencement of the civil war between Cæſar and Pompey, the departments of Cibyra, Piſidia, and Lycia, were detached from the province of Cilicia, and annexed to that of Aſia. Tacitus (Annal. l. iv. c. 17.) reports, that Cibyra had ſuſtained conſiderable damage by an earthquake; and Tiberius iſſued a decree of the ſenate, that it ſhould not pay tribute for three years. This epocha was the year of Rome 776. Accordingly this emperor was conſidered by the inhabitants as the founder of their city, and in order to perpetuate the remembrance of it, they cauſed the ſeries of years, inſcribed in their annals and engraved on their monuments, to be reckoned from the epocha of the revival of their city. Cibyra took a diſtinguiſhed part in the public rejoicings occaſioned by the victories of Gordian; it offered ſolemn ſacrifices and celebrated public games, as may be ſeen on an urn, which was engraved on a medal ſtruck in honour of Gordian, in the year 289 of his æra, or 242 of Chriſt. Strabo ſpeaks in terms of high commendation of the vines that grew in the vicinity of this place, and of the excellent wines which they afforded; and he adds, that Cibyra derived a large revenue from its iron mines, and that its inhabitants carried on a conſiderable commerce in hams. Apollo had a temple at Cibyra, and Mars was probably its principal and tutelary divinity, repreſented on its public monuments. Cibyra was at firſt governed by its own princes, but after it became ſubject to the Romans, by a ſenate under a chief magiſtrate. About the year 705 of Rome, Cibyra obtained from the Romans the privilege of being governed by its own laws and by its own magiſtrates, whoſe names appear on the ancient medals. It had alſo the privilege of coining money, which it retained for many ages under the Roman emperors. It further obtained from the emperors and the ſenate, the honour of placing on its monuments the title of Cæſarea, probably in honour of Tiberius, its reſtorer, adopted by Auguſtus into the family of the Cæſars. After the proconſular province of Aſia was divided into ſeveral parts by Diocleſian, the town of Cibyra was comprehended within the province of Caria. Upon the diviſion of Conſtantine the Great, Cibyra was referred to the department of the Thraceſians and of Anatolia. In the firſt ages of the church, the city of Cibyra was erected into an epiſcopal ſee in the eccleſiaſtical province of Caria, under the metropolis of Aphrodiſias.

Cibyra, a town of Aſia Minor, in Pamphylia. It was ſituated in the interior of the country, S.E. of Aſpendus. Its territory extended along the ſea-coaſt, between the valley of Sidé and the river Melas, according to Strabo, l. xiv. Ptolemy places it in Cilicia Trachæa.

CIBYRATICA, one of the principal governments of Aſia Minor, the capital of which was Cibyra of Phrygia.

CICACOLE, a circar of Hindooſtan, on the N.W. coaſt of the bay of Bengal; 150 miles long, and from 15 to 30 broad.—Alſo, a town in this circar; 150 miles N.E. of Rajamundry, and 308 E. of Hydrabad. N. lat. 18° 16′. E. long. 84° 8′.

CICADA, in *Entomology*, a genus of the hemipterous order, poſſeſſing, according to the Linnæan arrangement, the following characters. Antennæ inflected, or bent, inwards under the breaſt; antennæ ſetaceous; the four wings membranaceous and deflected; legs in moſt formed for leaping, or as in the maniferæ for walking or creeping.

Linnæus, in order to comprehend the various natural tribes, or families, of inſects, which he includes under the general head of cicada, found it neceſſary to diſtribute them into ſeveral diſtinct ſections, ſome of which, in the entomological arrangements of more modern writers, conſtitute, and with much propriety, ſo many different genera. The *foliaceæ* family of the Linnæan cicadæ, conſiſt of thoſe in which the thorax is compreſſed, membranaceous, and larger than the body. The *cruciatæ*, thoſe which have the thorax armed on each ſide with a horn or ſpine. The *maniferæ*, thoſe which have the feet formed for creeping or walking inſtead of leaping. The *ranatræ*, thoſe having the poſterior feet formed for leaping. And the *deflexæ*, thoſe whoſe wings are wrapped round the ſides of the body.

Scopoli divides the cicadæ into three different ſections, according to the ſubſtance and texture of the wing-caſes: the firſt containing thoſe cicadæ which have the whole of the wing-caſes coriaceous; the ſecond, thoſe coriaceous from the baſe to the extent of half their length; and the third, ſuch as have thoſe parts entirely membranaceous.

In the Fabrician ſyſtem of entomology, the Linnæan cicadæ are divided into ſeveral genera; in one of the lateſt and moſt comprehenſive works of that author, his "Entomologia Syſtematica," they are divided into four genera, membracis, tettigonia, cicada, and cercopis, and this final arrangement is retained in his "Supplementum," publiſhed ſince, with this difference only, that his former genus, cicada, is divided into two genera, one of which he names flata, and the other cicada, as before. A new genus, delphex, comprehending two of Panzer's ſpecies of cicada, is likewiſe added, ſo that Fabricius may be conſidered as having conſtituted ſix diſtinct genera of thoſe inſects, which Linnæus would have united in his ſingle genus cicada. Gmelin has endeavoured to reconcile the Linnæan and Fabrician arrangements, by making the genera of the latter ſubſervient to the ſections of Linnæus: the laſt Fabrician genera were, however, unknown to Gmelin.

The cicadæ live on various kinds of plants; the larvæ are entirely deſtitute of wings, which in the pupa begin to appear; but both in the larva and pupa ſtate, they reſemble the perfect inſect, except in being deſtitute of wings. The larvæ, eſpecially thoſe of the Linnæan family ranatræ, diſcharge a kind of froth from the vent and pores of the body, under which they conceal themſelves; they are furniſhed with ſix feet, and are very active. The males of the perfect inſect, in general, chirp like the cricket; and ſome of the larger kinds of the tettigonia family poſſeſs two peculiar drum-like organs, which emit a loud and inceſſant noiſe at the pleaſure of the inſect, as is particularly exemplified in ſome of the Chineſe and North American cicadæ. (See Donov. Inſ. China, cicada atrata, &c.)

The following ſpecies of this extenſive genus are deſcribed by Linnæus, Scopoli, Geoffroy, Fabricius, Donovan, and others.

Inflata. Thorax foliaceous; the membrane inflated, teſtaceous and reticulated. *Membracis inflata,* Fabr. A native of Cayenne.

The membrane of the thorax is large, inflated; on each ſide ſeven black dots; body yellowiſh; wing-caſes hyaline, and duſky on the thinner margin.

Rhombea. Foliaceous, the membrane rhombic and broader behind. *Cicada rhombea,* Linn. Phil. Tranſ. A.D. 1765. Inhabits South America.

Foliata. Thorax foliaceous, rounded, yellow, with a black band and ſpot. *Cicada foliata,* Linn. *Membracis foliata,* Fabr. A native of South America.

Lunata. Thorax foliaceous, rounded, black; with three white lunules. *Membracis lunata,* Fabr. From Cayenne; cabinet of V. Rohr.

Fasciata. Thorax foliaceous, rounded, and black, with two bands, the anterior one fulvous, poſterior white. *Membracis faſciata,* Fabr. Inhabits Cayenne. Same country as the laſt.

Bracteata. Thorax foliaceous, green, and immaculate. *Membracis bracteata,* Fabr. An inſect of ſmall ſize, from the ſame country as the preceding.

Squamigera. Thorax foliaceous, acute before and behind, and grey. Linn. Inhabits South America.

Hastata. Horn of the thorax projecting above the head, compreſſed, and carinated; body grey. *Membracis haſtata,* Fabr. A native of South America; ſize ſmall.

Lanceolata. Horn of the thorax projecting above the head, and incurvated; body black, with two white dorſal ſpots. *Membracis lauceolata,* Fabr. Inhabits Cayenne.

2-Maculata. Horn of the thorax compreſſed, extending beyond the head; brown, with a yellow marginal ſpot each ſide. *Membracis 2-maculata,* Fabr. *Cicada 2-puſtulata,* Gmel. Inhabits America. Deſcribed from the cabinet of Boſc.

Spinosa. Thorax three-horned, and produced behind to the length of the wings. Fabr. Inhabits India.

Acuminata. Thorax three-horned; the middle horn longeſt and compreſſed. Fabr. Inhabits Pennſylvania. Bankſian cabinet.

Planata. Thorax flat, produced each ſide, and acute; body greeniſh. Fabr. Inhabits the Eaſt Indies.

Aurita. Thorax two-eared; ſhield of the head dilated and rounded anteriorly. *Cicada aurita,* Linn. Found in Europe.

Flexuosa. Thorax two-horned, and blue; horns depreſſed and black. *Membracis flexuoſa,* Fabr. A native of the Eaſt Indies.

Marginata. Thorax two-horned, and longer behind than the abdomen; margin yellowiſh. *Membracis marginata,* Fabr. Inhabits China.

Horrida. Thorax two-horned, produced behind, with two large tubercles, and the tip three-ſpined. *Membracis horrida,* Fabr. Inhabits Cayenne.

Trifida. Thorax four-horned, hairy, produced and trifid behind; the diviſions ſubulate. *Membracis trifida,* Fabr. A native of Cayenne.

Punctata. Thorax two-horned, ſpotted with white, and lengthened behind, beyond the abdomen. *Membracis punctata,* Fabr. Deſcribed from the Bankſian cabinet. Inhabits Braſil.

Cornuta. Thorax two-horned, black; behind ſubulate, and as long as the abdomen; wings fuſcous. *Cicada cornuta,* Linn. An European ſpecies. Donov. Brit. Inſ.

Bubalus. Thorax two-horned, and long as the thorax behind; abdomen greeniſh; head and abdomen fulvous; wings hyaline. *Membracis bubalus,* Fabr. Inhabits North America. Helwig.

Taurus. Thorax two-horned, fuſcous, filiform behind, and as long as the abdomen; horns arched. *Membracis taurus,* Fabr. Inhabits the Eaſt Indies. Koenig.

Vitulus. Thorax two-horned and green, with a white curve and line; poſterior part produced as long as the abdomen; wings white. *Membracis vitulus,* Fabr. Inhabits America.

2-Punctata. Thorax nearly unarmed, produced behind, and ſhorter than the abdomen; wing-caſes with a black ſpot at the baſe. *Membracis 2-punctata,* Fabr. A native of New Holland. *Cicada biuotata,* Gmel.

Bonasia. Thorax two-horned, and lengthened behind, with white margin; at the baſe of the wings a white ſpot. *Membraſis bonaſia,* Fabr. An American ſpecies deſcribed from the Hunterian Collection.

Convoluta. Thorax unarmed, greeniſh, with yellow margin, and length of the abdomen behind. *Membracis convoluta,* Fabr. Inhabits Braſil. Bankſian Cabinet.

Mutica. Thorax unarmed, ferruginous, carinated, and length of the abdomen behind. *Membracis mutica,* Fabr. A native of North America.

Inermis. Thorax unarmed, greeniſh, length of the abdomen behind, and ſubulate. *Membracis inermis,* Fabr. Same country as the preceding.

Genistæ. Thorax unarmed, fuſcous, and half the length of the thorax behind. Fabr. Inhabits France, Geoffroy; and England, Lee.

Sinuata. Thorax foliaceous; back in the middle broad, emarginate; body brown. *Membracis ſinuata,* Fabr. An American ſpecies.

Emarginata. Thorax foliaceous; back broad, emarginate; body black, with a few whitiſh ſtreaks; legs white. *Membracis emarginata,* Fabr. Inhabits Carolina. Boſc.

Fuscata. Thorax foliaceous, rounded, and fuſcous, with a narrow white ſtreak anteriorly, and a broad white band behind. *Membracis fuſcata,* Fabr.

Inhabits the Eaſt Indies. The wings are fuſcous, and the tip of the thorax ſharp-pointed and black.

Rupicapra. Thorax three-horned; the middle one ſomewhat longer, and recurved wing-caſes duſky hyaline. *Membracis rupicapra*, Fabr.

Inhabits India, Daldorff. This is ſmall, general colour fuſcous; the lateral thoracic horns thickeſt, obtuſe, and ſomewhat dentated; wings white.

Tarandus. Thorax two-horned; horns arched; wing-caſes hyaline. *Membracis*, Fabr. Inhabits the Eaſt Indies.

In ſize and appearance this reſembles *cicada cornuta*. The body is duſky, on the back fuſcous; the horns on the thorax are compreſſed and vaulted; thorax ſubulate, and lengthened behind; wing-caſes hyaline, veined with fuſcous; wings whitiſh; legs ferruginous.

Capra. Thorax two-horned, ſhort behind, and emarginate; body fuſcous. *Membracis capra*, Fabr. Inhabits India.

Minuta. Thorax nearly unarmed, ſcabrous, and length of the abdomen behind; wing-caſes whitiſh, at the baſe black. *Membracis minuta*, Fabr. A very ſmall ſpecies is found in the Eaſt Indies.

Fasciata. Thorax nearly unarmed, behind as long as the abdomen; wing-caſes duſky, with a yellow band at the baſe. *Membracis faſciata*, Fabr. Inhabits American iſlands. Boſc.

Obſ. This, and the ſeven preceding inſects, are new ſpecies, deſcribed in the Supp. Ent. Syſt. of Fabricius.

* Section *Mannifera*, (legs not formed for leaping) Linn.
Genus *Tettigonia*, Fabr.

Indica. Black; thorax with a yellow ſtripe, and towards the extremity of the abdomen an orange band; wing-caſes browniſh olive, with red veins. Donov. Inſ. India.

A new ſpecies, and unqueſtionably the moſt ſtriking and magnificent inſect of the genus hitherto deſcribed. A ſingle ſpecimen only was diſcovered in Bengal about ſeven or eight years ago, and which is now depoſited in the Imperial Cabinet at Vienna. The deſcription and figure in Donov. Inſects of India is taken from that individual and unique ſpecimen.

Grossa. Thorax green, with a few black lines; wings white, with a yellow ſpot at the baſe of the poſterior ones, Fabr. Inhabits Braſil. Bankſian Cabinet.

Fasciata. Head and thorax black, ſpotted with rufous; wing caſes black, with an abbreviated white band, Fabr. A large ſpecies, and inhabits Java. *Cicada javana* of Gmelin.

Grisea. Grey; wing-caſes pellucid as water; poſterior margin dotted with black; rib white on the anterior part. Fabr. A native of America.

Limbata. Thorax dilated at the margin, and acute; lower wings black, with white poſterior margin. Fabr. An American ſpecies in the Bankſian Cabinet.

Dilatata. Thorax dilated at the margin, and black; wings whitiſh. Fabr. Found in Jamaica.

Spinosa. Thorax armed each ſide with a ſingle ſpine, and fuſcous; wing caſes duſky, with a macular black ſtreak. Fabr. Inhabits Sumatra.

Vaginata. Teſtaceous; wing-caſes whitiſh, with a black rib. Fabr. Same country as the laſt.

Tibicen. Scutel emarginate; wings with a greeniſh rib. *Cicada tibicen*, Merian. Linn. Inhabits South America.

Septendecim. Black; wing-caſes white, with a yellow rib. Linn. Inhabits America.

Variegata. Black; thorax variegated with teſtaceous; wing-caſes hyaline, with two black ſpots. Fabr. A native of Carolina.

Catena. Thorax variegated; wing-caſes hyaline, with punctured nerves on the anterior part, and two undulated fuſcous ſtreaks behind. Fabr. Inhabits the Cape of Good Hope.

Maculata. Black; thorax, wing caſes, and wings, ſpotted with yellow. Drury. Inſ. A native of China.

Cantans. Head and thorax black; wings at the baſe white. Fabr. A native of Barbary. Deſfontaines.

Æstuans. Black; two ſpots on the thorax, and ſide of the abdomen beneath pale. Fabr. Same country as the preceding.

Pustulata. Black; head and thorax ſpotted with red; upper wings with darker bands at the baſe; veins teſtaceous. Fabr. A large ſpecies, and inhabits South America.

Stridula. Villous; wing-caſes greyiſh; wings yellow, with the margins hyaline. Linn. &c. *Cicada catena*, Drury. *Cicada capenſis* of Linnæus is ſuppoſed to be a variety only of his *Cicada ſtridula*.

Cingulata. Thorax ſpotted; wing-caſes hyaline; rib and ſpot fuſcous; abdomen black, with yellow bands. Fabr. Inhabits New Zealand. Deſcribed from a ſpecimen in the Bankſian Cabinet.

Villosa. Thorax fuſcous and green, varied; breaſt white and villoſe. Fabr. A native of the Cape of Good Hope.

Cruentata. Thorax variegated; wing-caſes hyaline; rib yellowiſh; abdomen black, with ſanguineous bands. Fabr. A native of New Zealand.

Conspurcata. Black; wing-caſes ſpotted with yellow at the baſe; tail yellow. Fabr. Inhabits India.

Hæmatodes. Black; inciſures of the abdomen, and nerves of the wings ſanguineous. Linn. A native of the ſouth of Europe.

Plebeja. Scutel bidentated at the tip; wing-caſes with four anaſtomoſes, and ſix ferruginous lines. Linn.

Inhabits Africa and Italy, and is preſumed to be, with the next ſpecies, the cicada of the Greek and Roman poets. See Notes on *Cicada atrata*. Donov. Inſ. China.

Orni. Wing-caſes with ſix concatenate dots within the margin, and the inner anaſtomoſes brown. Linn. Inhabits the ſame country as *Cicada plebeja*.

Repanda. Wing-caſes with a flexuous line; margin of the wings hyaline. Linn. A native of India.

Reticulata. Grey, with a white line on the thorax; wing-caſes reticulated with white.

Kæmpferi. Wing-caſes fuſcous, with hyaline bands; wings black, with the margin hyaline. Fabr. Sent by Kæmpfer from Japan and preſerved in the Britiſh Muſeum.

Picta. Thorax black, with teſtaceous ſpots; wing-caſes veined, with white at the baſe; rib black. Fabr. Inhabits Provence. Boſc.

Atrata. Black; wings white, at the baſe black; veins teſtaceous. Fabr. Donov. Inſ. China.

Australasiæ. Teſtaceous; margin of the thorax dilated; wings hyaline. Donov. Inſ. New Holland.

A new ſpecies, of conſiderable ſize; the general colour teſtaceous.

Testacea. Black; abdomen ſanguineous; wing-caſes and the wings teſtaceous, veined with black. Stoll. Inhabits Tranquebar.

Flavescens. Yellowiſh-green; poſterior ſhanks armed with a ſingle tooth. Fabr. Inhabits Guinea. Iſert.

Olivacea. Olivaceous; head pale, with a tranſverſe black ſpot on the ſnout, and another on the crown; poſterior ſhanks armed with a ſingle tooth. Fabr. A ſmall ſpecies, and like the former, inhabits Guinea.

Sanguinolenta. Black; mouth, two ſpots on the thorax, and abdomen ſanguineous. Drury, Donov. Inſ. China, &c.

Splendidula. Wing-caſes golden-fuſcous; anterior ſhanks thick, dentated, and rufous. Fabr. Donov. Inſ. China.

Ephemera. Wing-caſes hyaline, with fuſcous ſpots. Stoll. Inhabits Surinam.

Muta. Wing-caſes hyaline; rib ſanguineous; abdomen with a ſanguineous dorſal line. A ſmall ſpecies, deſcribed by Fabricius from a New Zealand inſect in the Bankſian Cabinet.

Violacea. Violet; wings fuſcous at the tip. Linn. Muſ. Lud. Ulr.

Minuta. Livid; dorſal line on the thorax, and nerves of the wing caſes yellowiſh.

8-Guttata. Thorax behind black, with a large, trifurcated, teſtaceous ſpot; wing-caſes black, with four white ſpots on each. *Tettigonia 8-guttata.* Fabr.

Inhabits Cayenne. This and the following tettigoniæ are new ſpecies deſcribed in the Fabrician Supp. Ent. Syſt.

Costalis. Black; wing-caſes hyaline, with a fulvous rib. Inhabits Philadelphia. Boſc.

Punctata. Thorax black behind, with three ferruginous lines; wing-caſes hyaline, with a white ſtigma, and two ſtreaks of fuſcous dots. A native of Ruſſia. An inſect of moderate ſize.

Hyalina. Black; thorax with a ferruginous ſtreak in the middle, and two ferruginous little lines; wing-caſes hyaline; ſtigma black. Inhabits the ſame country as the laſt, but is ſmaller.

Brunnea, Brown; anterior part of the thoracic lobe with three yellow ſpots on each ſide; wings hyaline.

Inhabits the iſle of France. The head is black, deepeſt in front; thorax duſky brown; ſcutel yellow; abdomen brown with the margin of the ſegments yellow.

* *Cicada,* Linn.

Genus *Flata,* Fabr. Suppl. Ent.

Perspicillata. Black; wings with an ocellated white hyaline ſpot; abdomen yellow at the tip. Fabr. An Indian ſpecies.

Ocellata. Wing-caſes compreſſed, aſcending, green, with ocellar ferruginous dots. Fabr. Inhabits Tranquebar. Koenig.

Limbata. Wing-caſes deflected, green, with red margin, the inner baſe dotted with black. Fabr. *Cicada æquinoctialis,* Gmel. An African inſect.

Candida. Snowy; wing-caſes deflected, with two ſmall yellow lines. Fabr. Suppl. A large ſpecies from the Iſle of France. Cabinet of Billardiere.

Fuscata. Wing-caſes deflected, black, hyaline and immaculate. Fabr. Inhabits Tranquebar. Lund.

Phalænoides. Whitiſh; wings deflected, patulous; anterior part of the wing-caſes dotted with black. Linn. Found on plants in America.

Bipunctata. Whitiſh; wing-caſes deflected; thorax with two impreſſed dots on the anterior margin. Linn. Same country as the preceding.

Retusa. Whitiſh, and immaculate; head retuſe. Fabr. A native of Cayenne.

Grisea. Grey; wing-caſes deflected; a black dot on the tip of the head. Fabr. A native of America.

3-Punctata. Wings deflected, green, with three whitiſh dots. Fabr. An African ſpecies.

Virida. Green; wing-caſes deflected; wings white; front conic. Fabr. Inhabits American iſlands.

Minuta. Wings deflected, green; back ſcabrous; poſterior margin of the head, and dorſal line on the thorax ſanguineous. Fabr. Deſcribed a New Holland inſect in the Bankſian Cabinet.

Marginata. Yellow; wing-caſes deflected, and duſky; lateral line yellow. Linn. Inhabits American iſlands.

Pygmæa. Wing-caſes deflected, and immaculate; body yellowiſh. Fabr. Inhabits South American iſlands.

4-Punctata. Wing-caſes deflected, grey, with a pair of black dots on each. Fabr. &c. Same country as the laſt.

Viridana. Green; wing-caſes deflected, with two white ſpots near the baſe, and two pale bands towards the apex; wings white. Donov.

This, with the two following inſects, are new ſpecies of the Fabrician genus *flata;* natives of Botany, and deſcribed in Donovan's Hiſtory of the Inſects of New Holland.

Modesta. Pale; wing-caſes deflected, with two orange ſpots at the baſe, the inner one marked on the ſide with a black dot. Donov.

Pustulata. Whitiſh-green; wing-caſes deflected, with numerous red ſpots; poſterior angle pointed, and brown. Donov.

* Section *Cicada,* Linn.

Genus *Cicada,* Fabr. Ent. Syſt.

Cunicularia. Wings deflected, hyaline; with a ſtreak, band, and dots of brown; tail woolly. Linn. A native of India.

Lanata. Wing-caſes black, with blue dots; front red at the ſides; tail woolly. Linn. Inhabits India and China. Donov. Inſ. China.

Tomentosa. Wing-caſes deflected, green, with two interrupted fulvous bands; wings ſnowy-white, with two black bands. Fabr. Inhabits the Eaſt Indies. Muſ. Tottianum.

Barbata. Fuſcous; abdomen greeniſh; tail covered with ſnowy wool. Fabr. Deſcribed from a New Holland inſect in the Bankſian Cabinet.

Atrata. Black; thorax with four grey ſpots; margin of the abdomen yellow, with ſnowy ſpots. Fabr. A native of Cayenne.

Striatula. Above rufous, with black ſpots, beneath yellowiſh. Fabr. Inhabits Cayenne. Boſc.

Nigripennis. Black; margin of the head and thorax yellowiſh, with black dots. Fabr. Country unknown.

Ferruginea. Head, thorax, and ſcutel dotted with black; wing caſes rufous; wings white. Inhabits the Cape of Good Hope, Fabr. Bankſian Cabinet.

Undata. Head and thorax cinereous, teſtaceous, and black, varied; wing-caſes duſky rufous, with a greeniſh lateral ſpot, and hyaline tip. Fabr. Inhabits Carolina.

Irrorata. Fuſcous; wing-caſes with the rib, baſe, and ſpeckling fulvous. Fabr. Inhabits Carolina.

Obtusa. Black; wing-caſes cinereous, hyaline at the tip. Fabr. Inhabits Cayenne.

Aurulenta. Head and thorax rufous; wing-caſes fuſcous, with cinereous tip. Fabr. Same country as the laſt.

Myopa. Head and thorax golden fuſcous, varied with black; wing-caſes hyaline, with a duſky tip, and a gold ſpot. Fabr. This alſo inhabits Cayenne.

Villosa. Green; wing-caſes deflected, whitiſh; tail woolly. Fabr. A native of South America. *Cicada Rohrii.* Gmel.

Elongata. Thorax red, with yellow lines; wing-caſes very long, and dotted with black. Fabr. Inhabits New Holland.

Histrio. Linear, fleſh-coloured, with black lines. Fab. Muſ. Lund. Country unknown.

Suturalis. Linear, teſtaceous; head with two elevated black dots, and ſuture of the wing-caſes fuſcous. Fabr. Country unknown.

Nigripes. Blackiſh; wing-caſes fuſcous; nerves white, with black dots. Fabr. Inhabits Braſil.

Vittata. Yellow; wing-caſes with a double longitudinal repandate and dentated ferruginous ſtripe. Linn. Inhabits gardens in Europe.

Lateralis. Black; wing-caſes white at the ſides. Linn. Panzer. Inhabits Europe.

Variegata. Above black; ſcutel, two yellow ſpots on the back, and exterior margin of the wing caſes yellowiſh. Fabr. From the Bankſian Cabinet. A native of Braſil.

Fenestrata. Above black; head and ſcutel yellow; margin of the wing-caſes hyaline. Fabr. Inhabits the Pacific Ocean.

Flavipes. Black; head and legs yellow; wing-caſes hyaline at the tip, and ſtriated with black. Fabr. Found in Rotterdam Iſland.

Interrupta. Wing-caſes yellow, with a double black, interrupted, longitudinal line. Linn. An European ſpecies.

Lineata. Pale; head and thorax dotted with black; wing-caſes lineated with black. Fabr. Inhabits Saxony. *Cicada hyneri,* Gmel.

Acuminata. Black; wing-caſes fuſcous, ſtriated, and barred with white. Fabr. *Cicada acuminalis,* Gmel. Inhabits Germany.

Abbreviata. Yellowiſh; wing-caſes cinereous, with a black abbreviated ſtripe. Fabr. Inhabits Europe.

Flavicollis. Black; poſterior margin of the head with the thorax yellow. Linn. Found on graſs in Europe.

Viridis. Wing-caſes green; head yellow, with black dots. Linn. Fn. Suec. Inhabits Europe, and is found in England. Donov. Brit. Inſ.

Læta. Above black and poliſhed, with bluiſh dots. Fabr. Inhabits Cayenne.

Atomaria. Golden; wing-caſes obſoletely ſpeckled with white. A native of Italy. Fabr.

Prasina. Green; wing-caſes white, and hyaline at the tip. Fabr. Inhabits Italy.

Argentata. Head yellow, with black band between the eyes; thorax and wing-caſes ſilvery, ſtriated with fuſcous. Fabr. Inhabits France.

4-Guttata. Wing-caſes reddiſh, with two green ſpots and hyaline tip. Fabr. A South American inſect.

Marginella. Black; head, thorax, and wing-caſes edged with ſcarlet. Fabr. Same country as the laſt.

Lanio. Green; head and thorax fleſh-colour. Linn. Panzer. An European inſect.

Striata. Yellowiſh, poliſhed; head, thorax, and wing-caſes ſtriated with white. Fabr. Inhabits France.

Ignita. Greeniſh, poliſhed; head, ſcutel, and abdomen fulvous. Fabr. Inhabits Cayenne.

Festiva. Yellow; head and thorax with two black dots; wing-caſes with three black ſpots. Fabr. A native of Germany.

Mixta. Yellow, variegated with black; wings black. Fabr. Inhabits Paris. Boſc.

Bicolor. Above yellow, beneath black; wing-caſes pale, fuſcous at the tip. Fabr. A ſmall inſect found in Denmark. *Cicada bicolorata,* Gmel.

Turca. Black; abdomen yellow; wings fuſcous at the tip, with a hyaline lunule. Fabr. Inhabits South America.

Matura. Black; breaſt and abdomen ſanguineous. Fabr. Donov. Inſ. New Holland. Inhabits New Holland. Deſcribed from the Bankſian Cabinet.

Nebulosa. Black; wing-caſes hyaline, with the baſe fuſcous. Fabr. An African inſect. Same country as the former.

Hyalina. Fuſcous; wing-caſes with an abbreviated band; and poſterior margin hyaline. Fabr. A native of the Eaſt Indies.

Pellucida. Grey; with a hyaline ſtripe in the middle of the wing-caſes. Fabr. Donov. Inſ. New Holland.

Cynosbatis. Fuſcous; wing white and hyaline, with a margin of fuſcous dots. Fabr.

Clavicornis. Fuſcous; wing-caſes hyaline, with a fuſcous ſtreak behind; antennæ compreſſed, and margined. Fabr. A native of France.

Serratulæ. Yellow; wing-caſes white, with a dot, and two bands of black. Fabr. Found on thiſtles in England.

Nervosa. Wings fuſcous hyaline; nerves white, dotted with black. Linn. Fn. Suec. Inhabits Europe.

Varia. Black, varied with green; wings hyaline, with three coſtal black dots. Fabr. Found in Germany.

Lyncea. Front and thorax glaucous, with four ocellar dots; wing-caſes hyaline, with yellowiſh margin. Fabr. A native of the Eaſt Indies.

Picta. Head and thorax yellowiſh, with black ſpots; wing-caſes pale; ſtripe and two dots black. Fabr. Inhabits Germany.

Brunnea. Yellow; thorax grey; wing-caſes teſtaceous, and without ſpots. Fabr. A native of Germany.

Grisea. Grey, immaculate; wing-caſes flat. Fabr. *Cicada plana,* Gmel. Inhabits Italy.

2-Guttata. Pale, golden rufous, with four white dorſal dots. Fabr. Found in Germany.

4-Notata. Greeniſh; head yellow, with four black dots; wing-caſes whitiſh. Fabr. Inhabits France.

4-Verrucata. Yellow, with four black dots on the head; wing-caſes gloſſy golden. Fabr. Inhabits Italy.

Fulgida. Yellow; wing-caſes golden fuſcous. Fabr. Inhabits England.

Diadema. Head yellow, with two abbreviated black bands; wing-caſes fuſcous hyaline. A native of Germany.

Reticulata. Fuſcous-green: wing-caſes fuſcous, and ſomewhat reticulated with white. Inhabits South-American iſlands.

Punctata. Wing-caſes yellowiſh, with fuſcous dots. Geoffroy. An European inſect.

Rosæ. Yellow; wings white; tip ſtriated with fuſcous. Linn. Found on the leaves of the roſe.

Maculata. Grey; wing-caſes with fuſcous dots and tip; wings white, and at the tip fuſcous. Fabr. Found on plants in Europe.

2-Pustulata. Yellow; head with two frontal rufous dots; wing-caſes teſtaceous and hyaline. Inhabits Germany.

Aurata. Yellow; wing-caſes marked with fulvous, and four black dots, gilt behind. Linn. Inhabits Sweden.

Ulmi. Wings yellowiſh-green; tips black, and gloſſed with golden. Linn. Geoffroy. Inhabits Europe.

Triangularis. Teſtaceous, ſpotted with yellow; wing-caſes at the baſe whitiſh. Inhabits Denmark.

Nitidula. Wing-caſes pale golden; wing-caſes hyaline, with two brown bands. Donov. Brit. Inſ. &c. Inhabits Europe.

Virescens. Greeniſh; wing-caſes whitiſh, and immaculate. A native of Germany. Fabr. *Cicada viridans,* Gmel.

Flavescens. Pale yellow, immaculate; wing-caſes and wings white and hyaline. Fabr. Same country as the preceding.

Cuspidata. Grey; head flat, depreſſed, and fuſcous at the tip. Fabr. A ſmall inſect, and inhabits England.

Quercus. Yellowiſh; wing-caſes ſanguineous, with a brown ſpot at the tip. Fabr. An European inſect found on the oak.

Spinosa. Front retuſe, yellow; wing-caſes green, with three whitiſh bands; eyes ſpinous. Fabr. Suppl. Inhabits the iſle of France.

Orbona. Head and ſcutel fulvous, reticulated with black; wing-caſes black, with the tip duſky cinereous. Fabr. Suppl. Inhabits America.

Dænais. Green; wing-caſes hyaline, with the tip black. Fabr. Suppl. Country unknown. Cabinet of Weber.

Graminea. Green; head ſomewhat elevated, with a black dot at the tip. Fabr. Suppl. Inhabits Italy.

Cruenta. Above ſcarlet, variegated with black. Fabr. Suppl. Inhabits Cayenne.

Festiva. Black; head and thorax with a broad dorſal ſnowy ſtripe; wing-caſes black, with two ſcarlet ſpots. Fabr. Suppl. A ſmall inſect, found in Cayenne.

Parvula. Duſky; wing caſes black; dot in the middle, and tip hyaline. Fabr. Suppl. Found in Cayenne. Cabinet of Richard. A minute ſpecies.

* *Cicada*, Panzer.

Genus *Delphex,* Fabr. Suppl.

Crassicornis. Pale; wing-caſes white, varied with teſtaceous. A native of Germany.

Clavicornis. Fuſcous; wing-caſes hyaline, with a fuſcous ſtreak behind. Inhabits France.

* *Cicada*, Linn. &c.

Genus *Cercopis*, Fabr.

Gigas. Head and thorax pale, with four ferruginous lines; wing-caſes fuſcous, with a band and three dots of white. Fabr. Suppl. One of the largeſt inſects of the genus *Cercopis*. Deſcribed from a ſpecimen in the cabinet of M. Dymeril. Found in Cayenne.

Bicolor. Black; wing-caſes teſtaceous; ſuture, and daub behind black. Fabr. A native of the Cape. Size of the laſt.

Transversa. Head and thorax black, with yellow band; wing-caſes pale and immaculate. Fabr. Suppl. Found on plants in Europe.

Lateralis. Black, with a narrow line, and ſpeckling of yellow; margin of the wing-caſes ſanguineous. Fabr. Suppl. Inhabits Carolina.

Albipennis. Pale; thorax fuſcous; wing-caſes white, with a ſpot at the baſe, and an oblique ſtreak of fuſcous. Fabr. Inhabits France.

Grossa. Wing-caſes fuſcous-grey, with a marginal, fulvous, and cinereous ſpot. Fabr. Inhabits Africa, and is a large ſpecies. *Cicada afra,* Gmel.

Marginata. Black; wing-caſes with a marginal ſanguineous ſtripe on each ſide. Fabr. *Cicada atra,* Gmel. Inhabits America.

Maculata. Thorax black, with a fulvous band; wing-caſes fulvous, ſpotted, and tipped with black. Fabr. *Cicada maculoſa,* Gmel. An African ſpecies.

Coccinea. Red, immaculate; poſterior ſhanks ſingle-toothed. Fabr. Found in the American iſlands.

Rubra. Sanguineous; wing caſes with two obſolete fuſcous ſpots. Fabr. Inhabits Senegal.

Sanguinolenta. Black; wing-caſes with two ſpots, and a band of ſanguineous red. Linn. Donov. Brit. Inſ. Inhabits Europe.

Analis. Black; wing-caſes ſanguineous, with a whitiſh ſpot in the anal angle. Fabr. Inhabits the Cape of Good Hope.

Obscura. Deep black; wing-caſes duſky black. Fabr. A native of Guinea.

Schach. Black; wing-caſes fuſcous, with an interrupted ſanguineous band. Deſcribed from the Hunterian Cabinet. Fabr. An American ſpecies.

Cruentata. Rufous; wing-caſes black, with two yellow bands. Fabr. *Cicada rubra,* Linn. Inhabits Surinam.

Versicolor. Black, gloſſy; wing-caſes with two white ſpots at the baſe, and a ſingle rufous one in the middle. Fabr. Inhabits Tranquebar.

Atra. Black, gloſſy; wings whitiſh. Fabr. Inhabits the ſouth of Europe. *Cicada nigra,* Gmel.

Viridis. Green; wing-caſes with an outer hyaline margin. Fabr. A native of American iſlands. *Cicada virens* of Gmelin.

Nebulosa. Yellowiſh; wing-caſes fuſcous with an oblique band, and two daubs of yellowiſh. Fabr. Inhabits the Eaſt Indies. *Cicada nebula* of Gmel.

Carnifex. Sanguineous; ſpot on the thorax, and two ſtripes on the wing-caſes black. Fabr. Inhabits New Holland. Donov. Inſ. New Holland.

Varia. Head and thorax greeniſh; wing-caſes fuſcous with two ſpots at the baſe, and ſtripe behind yellow. Fabr. Inhabits Cayenne.

4-Fasciata. Yellow, with four fuſcous bands. Linn. Inhabits Surinam.

Spumaria. Fuſcous; wing-caſes with two whitiſh lateral ſpots. Linn. Inhabits Europe.

Pellucida. Greyiſh, with a hyaline band acroſs the wing-caſes. Donov. Inſ. New Holland.

Maura. Black; breaſt and abdomen ſanguineous. Donov. Inſ. New Holland.

Aurata. Cinereous, golden, gloſſy, and without ſpots. Fabr. Inhabits Cayenne.

Marginella. Black; head, thorax, and wing-caſes margined with white. Fabr. Inhabits Europe.

Leucophthalma. Black; eyes white. Linn. Inhabits the north of Europe.

Leucocephala. Head and thorax at the baſe yellowiſh. Linn. Found in Sweden, and other parts of Europe.

Striata. Black, two yellow bands on the head; wing-caſes ſtriated with white. Fabr. Found on plants in Germany.

Lineata. Yellowiſh; wing-caſes with three black ſtreaks. Fabr. Inhabits Germany.

Vittata. Above cinereous, with a black ſtripe. Fabr. Inhabits France.

Coleoptrata. Wing-caſes entirely coriaceous, and covering the wings, grey, with a fuſcous dot in the middle. Fabr. Inhabits Germany and France.

Angulata. Black; above pale; wing-caſes with a ſmall line at the baſe, and two fuſcous ſtreaks uniting at the exterior margin. Fabr. Inhabits Sweden.

Præusta. Cinereous; ſcutel at the baſe black; wing-caſes fuſcous at the tip. Fabr. Same country as the preceding.

Immaculata. Duſky, and without ſpots; wing-caſes ſtriated. Fabr. Inhabits Italy.

Aptera. Fuſcous; wing-caſes coriaceous and pellucid; no wings. Fabr. A ſmall ſpecies found on the coaſt of Barbary.

Grylloides. Yellowiſh; wing-caſes coriaceous, varied with fuſcous; no wings. Fabr. An Italian ſpecies.

Pedeſtris. Wing-caſes coriaceous, abbreviated; tail ſetaceous; no wings. Fabr. Inhabits Europe.

Ruſtica. Grey, immaculate; wings white. Fabr. An European ſpecies, found on plants.

Gibba. Black; wing-caſes ſpotted with white. Fabr. Inhabits Denmark.

Biguttata. Black, ſpotted with yellow; wing-caſes fuſcous; marginal ſpot white. Fabr. A native of Germany.

Ruficollis. Black; thorax rufous; wing-caſes varied with rufous, and fuſcous. Fabr. Inhabits Italy.

Variegata. Head and thorax black, with a yellowiſh ſtreak; wing-caſes yellow, ſtriated with yellow.

Faſciata. Yellowiſh; wing-caſes duſky; band and two ſpots of white. Fabr. Inhabits Europe.

Unifaſciata. Cinereous; wing-caſes with an oblique fuſcous band. Fabr. Inhabits Italy.

2-Faſciata. Yellowiſh; wing-caſes fuſcous, with two whitiſh bands. Linn. Found in Sweden.

Capitata. Black; head teſtaceous; a black band beneath. Fabr. Inhabits Paris. Boſc.

3-Faſciata. Black; thorax, and two bands on the wing-caſes whitiſh. Inhabits Paris.

Striatella. Fuſcous; head and thorax with a greeniſh band; wing-caſes with many greeniſh lines. Fabr. Inhabits Paris.

Hiſtrionica. Black; head and thorax yellow, variegated; wing-caſes ſtriated with paler, and a fuſcous ſtreak behind.

Populi. Clouded; two dots on the crown, and baſe of the abdomen black. Linn. Found on plants in Europe.

Reticulata. Wing-caſes varied with pale, and ferruginous; diſk reticulated with black. Fabr. Found on plants in Europe.

CICÆ, in *Ancient Geography*, iſles of the ocean, ſituated, according to Pliny, on the weſtern coaſt of Spain. Ptolemy calls them "Deorum Inſulæ." They are the iſles of Bayonne. M. D'Anville marks them in his chart on the coaſt of the Callaici, oppoſite to a ſmall gulf, N.W. of Tyde.

CICATRICULA, in *Natural Hiſtory*, a little whitiſh ſpeck, or veſicle, in the coat of the yolk of an egg; wherein the firſt changes appear towards the formation of the chick. The *cicatricula* is what is otherwiſe called the eye of the egg.

CICATRIX, in *Surgery*, is ſynonymous with a ſcar or ſeam in the ſkin, which remains after the healing of a ſore, &c. This word is derived from the Latin *cicatrico*, to heal up, and was formerly ſpelt cicatrice, after the French. The older ſurgeons fancied they had the power of cicatrizing wounds at pleaſure, and that certain remedies poſſeſſed the faculty of producing good cicatrizations; but we have learned to be much more diffident of our abilities in this reſpect, on obſerving that it is wholly a proceſs of nature, and that the ſurgeon is not able to do any thing towards producing it, although he may eaſily prevent the formation of a cicatrix.

It is evident that cicatrices differ in their texture and compoſition from true ſkin, becauſe they uſually have neither blood-veſſels nor nerves; and, in brute-animals, this new-formed ſubſtance will ſeparate, ſo as to leave holes in the ſkin, on its being ſubmitted to the operation of tanning. We know of no author who has treated ſo amply, and (for the moſt part) ſatisfactorily on the formation of a cicatrix, as Mr. James Moore, in a diſſertation printed A.D. 1789, by order of the Lyceum Medicum Londinenſe. He ſays, as cavities are filled up in a different manner, during the adheſive and ſuppurative inflammations, there is likewiſe ſome diſtinction in the formation of cicatrices during theſe different ſtates.

When a wound is healed by the adheſive inflammation, the ſkin, as well as the parts more deeply ſeated, throws out the inflammatory exſudation, and the whole is united by this exſudation and extravaſated blood.

Upon the ſurface of the ſore a dry cruſt is formed; this conſiſts partly of the extravaſated blood, and partly of an exſudation from the wound, which after coagulation hardens by the evaporation of the watery parts. This cruſt or ſcab adheres to the lips of the wound; if it is removed it gives ſome pain; the ſore is then obſerved moiſt with a tranſparent fluid, and there generally follows an oozing of blood, ſome of the new veſſels of the uniting medium being torn. The cruſt does not become organized, but remains like dead foreign matter. Immediately under it, and on a level with the cutis, the new ſkin forms, and covers the uniting medium. This new ſkin is a fine delicate membrane; but it gradually becomes thicker and ſtronger. The cruſt, at firſt, adheres to it ſo ſtrongly that if it is attempted to be removed the cicatrix will be torn off with it. But when left to itſelf the cruſt becomes hard, dry, and ſhrivelled; gradually looſens from the cicatrix and then drops off. The ſcar now appears red; but ſoon acquires a brown colour, and at laſt changes to nearly the ſame appearance as the old ſkin, though rather more white and gliſtening.

When a wound or ſore heals by the ſuppurative inflammation, the cicatrix does not begin to form until the granulations have ariſen to the ſurface of the old ſkin, or nearly ſo.

When the healing is moſt favourable, the granulations ariſe exactly to the level of the ſkin; if they ſhoot much higher no cicatrix will form, until the exuberancy is removed by an internal proceſs, or by the ſurgeon's art; and if the granulations are much too low, the cicatrix likewiſe does not form. A mathematical exactneſs, however, is not required; for cicatrization generally takes place when the granulations are nearly of the ſame height, although ſtill a little higher or lower than the old ſkin.

The formation of the cicatrix begins from the edges of the old ſkin. The redneſs which exiſted during the inflamed ſtate abating, the ſwelling ſubſiding, and the edges of the ſore uniting with the riſing granulations. The margin then acquires a bluiſh white or pearly colour, which gradually extends itſelf to the centre till the whole ſore is covered with new ſkin. It ſometimes happens in broad ſores, that cicatrization takes place, not only from the circumference, but likewiſe from one or two points in the centre; theſe appear like iſlands in the midſt of a ſea of granulations; they are of the ſame colour as the healing margin; and they become larger by extending in every direction. In conſequence of cicatrization going on from different central parts, it happens not unfrequently during the progreſs of healing, that one broad ſore is divided into two or three ſmaller ones; and when this happens the cure muſt go on faſter. There is always more or leſs of a cuticular covering upon the cicatrix, which being conſtantly moiſtened by the diſcharge from the granulations is ſoft and pulpy, and occaſions that whitiſh colour obſervable on the edges of healing ſores. I have ſometimes removed this cuticular ſubſtance, and have obſerved underneath the real new ſkin, which ſeems a very fine membrane of a red colour, the granulations ſhining through it.

When a ſuppurative ſore is nearly healed, if it is not kept moiſt by ſome application, a ſcab is apt to form in the ſame manner as in thoſe wounds which are healed by the firſt intention. This cruſt conſiſts of pus dried by the evaporation of the watery parts; the new ſkin forms under it, and it ſoon after falls off.

From the ſurface of the cicatrix there is no ſecretion; there are only the perſpirable veſſels. While it is forming, it is kept moiſt by the diſcharge from the uncovered granulations; but when completely formed, the cicatrix is as dry as any other ſkin.

It appears that the new ſkin at firſt cannot form a good cuticle and rete-mucoſum, for there is always a ſucceſſion of ſcales falling off for ſome time; at laſt this ceaſes, and the new ſkin is covered with a good cuticle and rete-mucoſum, like other parts. The cicatrix changes ſucceſſively from a reddiſh colour to a brown; and laſtly it becomes whiter, and of a more ſhining appearance than the original ſkin. This is a curious circumſtance and merits ſome attention.

The cutis, as every anatomiſt knows, is not a ſmooth poliſhed membrane, but is full of eminences, which are named papillæ. Theſe, in ſome parts of the body, run in waving rows, and form in others irregular lozenges and triangles. The rete-mucoſum and cuticle, which lie immediately over the cutis, are marked with furrows analogous to the eminences of the cutis. The cuticle is of a light colour, and ſemi-tranſparent. The rete-mucoſum is white, yellowiſh, brown, or black, in men of theſe various colours. And the cutis is extremely vaſcular; the blood contained in theſe veſſels ſhines through, and gives the florid fleſhy tint to the body. The colour of the ſkin, then, depends partly upon the rete-mucoſum, and partly upon the blood which circulates in the cutis. In white men the cuticle and rete-mucoſum, which cover cicatrices, appear ſimilar to that which covers other parts; but there is a great difference in the quantity of blood which circulates in the old and new ſkin. For the new is far leſs vaſcular than the old; or, at leaſt, the greater number of its veſſels are of a much ſmaller diameter, and admit a leſſer quantity of the red globules of the blood. It happens in conſequence of this, that cicatrices are of a whiter colour than the original ſkin. In negroes, the reverſe takes place, their ſcars being generally blacker than other parts, owing to a darker rete-mucoſum forming in them upon ſcars, than upon the old ſkin.

Beſides the difference of colour, a cicatrix has a gloſſy, ſhining look, which the ſkin does not poſſeſs: this is owing to the ſcar being a ſmooth poliſhed membrane without hair, or any of thoſe papillæ which are upon the cutis; both the papillæ and hair are parts which are formed in the firſt organization of the body, and are never afterwards produced.

As ſcars are leſs vaſcular than the old ſkin, it is probable that they have fewer nerves; for blood-veſſels and nerves are generally in proportion to each other. But as nerves can hardly ever be traced to the ſurface of the body, we can only judge of their number there, by the degree of ſenſibility; and this is conſiderably weaker in cicatrices than in the old ſkin. This indeed might naturally be expected, for ſcars have no papillæ, which are ſuppoſed to be the principal ſeat of the ſenſe of feeling in the ſkin. It is obſerved, that ſcars are generally far leſs moveable than the original ſkin; the latter being commonly attached by a looſe cellular membrane to the deep ſeated parts; whereas the ſcar forms itſelf immediately upon the granulations, and is ſo intimately connected, as to make the ſame ſubſtance with them. This is the reaſon, likewiſe, that although a ſcar is, at firſt, exactly level with the ſkin, yet after a certain period, it often is very much depreſſed. For during the healing of a ſore, particularly if the diſcharge is great, the fat and neighbouring fleſh are conſiderably waſted by abſorption. But when the whole is healed, the internal parts recover their bulk, and the fat is regenerated. The ſkin being attached looſely, readily yields and accommodates itſelf to this increaſe; whereas the cicatrix adhering cloſely, and being, as it were, tacked down to the parts upon which it is formed, appears depreſſed.

It ſometimes happens that a cicatrix, inſtead of being depreſſed, rather projects above the ſkin, owing to the exuberancy of the granulations upon which it is formed; and very often the ſcar has an irregular unſeemly appearance, from the granulations riſing to unequal heights.

Its appearance is ſo different from real ſkin, that although every one agrees that it is not the ſame, yet there are very different opinions with reſpect to what it really is.

Some authors aſſert that it is a diſtinct membrane; others, that it is only the cellular membrane condenſed; or, as one or two French writers have termed it, an exſiccation of the ſurface of the ſore. Mr. Bell of Edinburgh, in his excellent Syſtem of Surgery, ſays, "That a dry pellicle of a ſcarf-ſkin forms over wounds."

But it is certain that, upon every cicatrix there is both a cuticle or ſcarf-ſkin, and likewiſe a rete-mucoſum, which may be raiſed by a bliſter in the living body; or may be removed in a dead body by maceration. After theſe membranes are taken away, there is diſcovered underneath a ſmooth poliſhed ſurface, which is, properly ſpeaking, the new ſkin. If it is attempted to diſſect this from the deep ſeated parts, there is found no line of ſeparation, no diſtinction of parts, but all is uniform. The operator, therefore, if he perſiſts in his attempt, does not know whether to cut to the depth of the fourth, eighth, or tenth of an inch; the ſubſtance of the whole, except the ſmooth external ſurface, being ſimilar.

It is, therefore, a mere diſpute of words to conteſt whether there is a new membrane or not. If it is ſaid that there is one, it muſt be allowed to be ſo intimately attached to the parts upon which it is formed, that no ſeparation can be obſerved. And if there is ſaid to be no new membrane, it muſt be granted that the ſurface of the ſore loſes its extreme vaſcularity, the power or diſpoſition of ſecreting pus, and becomes ſmooth, poliſhed, and able to form a cuticle and rete-mucoſum.

The ſubſtance of the new ſkin is, then, exactly (or, in many reſpects) of the ſame nature with the new fleſh upon which it forms; and although it has by no means the ſame elaſticity as the old ſkin, yet it is nearly as ſtrong and able to reſiſt mechanical violence. It is, therefore, a good ſubſtitute for the other.

The difference in its appearance from the original ſkin is at firſt ſtriking; this diſſimilarity gradually leſſens with time, but never vaniſhes entirely. For as the ſcar cannot acquire the papillæ, or the ſame degree of vaſcularity with the cutis, it continues diſtinguiſhable during life; as is proved by the wound of even the fineſt lancet in bleeding.

But in ſuperficial cuts, in thoſe ſmall abſceſſes called pimples, and other ſlight ulcerations, and in the mild ſpecies of the ſmall-pox, where the ſurface of the cutis only is affected, and where it is not pierced through, no laſting ſcar is left. Becauſe in theſe caſes an entire portion of new ſkin is not required, as ſome of the old remains, from which the roots of the papillæ and hair ſhooting up, the temporary ſcar diſappears and the part regains its former appearance. But when the puſtules of the ſmall-pox, or other ulcerations, corrode ſo deep as to deſtroy the cutis or papillæ, the cicatrix or ſcar never diſappears; as is often cruelly exemplified in the bad ſpecies of ſmall-pox. The puſtules ſometimes heal with a depreſſion or pit, as it is called; and ſometimes where no pit is left, but all is level, a gliſtening white mark remains for ever. For papillæ once deſtroyed never again ſpring up; for which reaſon the cicatrix never acquires an equal degree of vaſcularity with the original ſkin.

Some ingenious remarks occur likewiſe on the ſubject "*Of Skinning*," in Mr. John Hunter's book upon inflammation and wounds, chap. viii.

CICATRIZE, to heal with new ſkin. See CICATRIX.

CICCA, in *Botany*, Linn. Mant. 1. p. 17. Schreb. 1417. Juſſ. 386. Mart. Claſs and order, *monœcia tetrandria*. Nat. ord. *Euphorbiæ*, Juſſ. Gen. ch. Male. *Cal.* Perianth four-leaved; leaves roundiſh, concave. *Cor.* none. *Stam.* four, briſtle-ſhaped; anthers ſomewhat globular, the length of the calyx. Female. *Cal.* and *Cor.* as in the male. *Piſt.* Germ roundiſh; ſtigmas four, two-parted, awl-ſhaped, the length of the germ; ſtigmas acute, permanent. *Peric.* Berry four-celled. *Seeds* ſolitary.

Eſſ. Ch. Calyx compoſed of four roundiſh leaves. Pericarp a four-celled berry. Nearly allied to Phyllanthus, but differs in the number of parts, and having a berry for the fruit.

Sp. 1. C. *diſticha*, Linn. Mart. 124. Mart. Lam. Encyc. Illuſt. Pl. 757. fig. 6. "Male and female flowers in ſeparate racemes on the naked part of the branches." A tree with long ſimple branches. *Leaves* in two alternate rows on ſhort petioles; the lower ones rounded, egg-ſhaped, ſmaller; upper ones ovate-lanceolate, acuminate; entire, very ſmooth. *Flowers* proceeding from the lower part of the branches, after the falling of the leaves, and occupying their places. A native of the Eaſt Indies. The younger Linnæus has ſuppoſed this plant to be the averrhoa acida of his father; but whatever it may be, it certainly is not an averrhoa. See AVERRHOA. 2. C. *nodiflora*, Lam. Encyc. Illuſt. Pl. 757. fig. 2. "Flowers aggregate, axillary." A ſhrub. *Leaves* on ſhort petioles, egg-ſhaped, acute, ſmooth, entire, ſometimes almoſt round, with a ſmall point at their ſummit. *Flowers* extremely ſmall. *Fruit* a globular berry; with four ſmall, permanent, expanding ſtyles. A native of the iſland of Java.

Loureiro has a ſpecies which he calls C. racemoſa, the terme of Gærtner, who has preſerved its Japaneſe name. He deſcribes it as a middle-ſized tree, with aſcending branches. Leaves egg-ſhaped, ſomewhat acuminate, quite entire, ſmooth, alternate, petioled, in two rows. *Flowers* in compound, ſhort, nearly terminal racemes; males and females on different branches. He aſſerts, that what Linnæus calls the calyx is properly a bell-ſhaped, four-cleft corolla; the ſegments egg-ſhaped, ſpreading, red, dotted with white; filaments ſhorter than the corolla; anthers two-celled. *Fruit* a roundiſh berry, half an inch in diameter, pale, ſmooth, acid, eatable. *Seeds* four, egg-ſhaped. A native of Champava. Cultivated, but rarely, in the capital of Cochinchina. See TERME.

Profeſſor Martyn has given averrhoa acida of Linnæus, as a ſynonym to C. racemoſa of Loureiro, but he afterwards doubts their identity.

CICCIONE, ANDREA, in *Biography*, a Neapolitan ſculptor and architect of great eminence of the 14th and 15th centuries; he was the diſciple of Maſuccio the ſecond. Amongſt his beſt works in architecture, are the famous monaſtery and church of Monte Oliveto, and the beautiful palace erected for Bartolommeo du Capua, prince della Riccia, at St. Biagio de Librari; and the third cloiſter, of the Ionic order, at S. Severino. His greateſt work of ſculpture is the monument, erected, in the church of St. Giovanni, by order of Giovanna, then queen of Naples, to the memory of her brother the young king Ladiſlaus, who died 1414. It is all of white marble; four figures, repreſenting Temperance, Fortitude, Prudence, and Magnanimity, are introduced in place of pilaſters to ſupport the fabric; over theſe, under a great arch, are ſeated two figures repreſenting Ladiſlaus and his ſiſter; on the top of the arch is a ſepulchral urn, ornamented with baſſo relievos, upon which lies the reſemblance of the dead king, diſcovered to the ſight by two angels who draw aſide a curtain; above this the monument riſes in a pyramidical form, completed with a cornice, where the figure of Ladiſlaus is once more repreſented, with a martial deportment, ſeated on horſeback, in complete armour. Ciccione died, much regretted, at a very advanced age in the year 1455. Domenici, Vita del Pitt. Scul. & Arch.

CICELY, in *Botany*. See SCANDIX *odorata*.

CICER, Linn. gen. 875. Schreb. 1189. Juſſ. 361. Vent. 3. 420. Gært. 872. Claſs and order, *diadelphia decandria*. Nat. ord. *Papilionaceæ*, Linn. *Leguminoſæ*.

Gen. Ch. *Cal.* one-leaved, five-cleft, as long as the corolla; the four upper ſegments incumbent on the ſtandard; the fifth ſmaller, placed under the keel. *Cor.* papilionaceous; ſtandard roundiſh, larger than the other petals; wings approaching each other rather obtuſe; keel ſhorter than the wings. *Stam.* filaments ten, diadelphous, aſcending; anthers ſimple. *Piſt.* germ ſuperior, egg-ſhaped; ſtyle aſcending; ſtigma obtuſe. *Peric.* legume rhomboidal, turgid, inflated. *Seeds* two or more, almoſt globular, with a ſmall point at their baſe.

Eſſ. Ch. Calyx five-cleft, the length of the corolla; four upper ſegments incumbent on the banner. Legume rhomboid, turgid.

Sp. 1. C. *arietinum*, Linn. Sp. Pl. Willd. 1358. Mart. Lam. Illuſt. pl. 632. Gært. tab. 151. (C. ſativum, Bauh. Pin. Tourn. cl. 10. gen. 2. Ciche. Lam. Encyc.) Common cich or ciches. "Leaves unequally pinnated; leaflets ſerrated; legumes two-ſeeded." Lam. *Root* annual. *Stem* from a foot to eighteen inches high, erect, leafy, branched, ſpreading, angular. *Leaves* compoſed of about eight pairs of leaflets with an odd one, egg-ſhaped, finely ſerrated, hairy. *Flowers* ſmall, purple or white; peduncles axillary, ſolitary, one-flowered, bent, furniſhed with a ſhort thread near the angle. *Seeds* one or two, ſometimes nearly globular, with a ſhort beak at the navels, ſometimes angular, with a fancied reſemblance to a ram's head, whence the trivial name. A native of the ſouth of Europe, where it is cultivated like other pulſe for agricultural purpoſes. It is cut ſeveral times in the ſpring, and given green to ſheep and lambs, to whom it is eſteemed peculiarly nouriſhing. It is alſo ſaid to increaſe the milk of cows, who eat it with avidity. Its ſeeds are eaten in its native climate, both raw and boiled, but do not always agree with delicate ſtomachs, eſpecially when cultivated in a colder climate. They are ſometimes uſed as a ſubſtitute for coffee, when roaſted to blackneſs, pulverized and boiled in water. In warm and dry weather there is ſecreted from the tips of the hairs of the leaves, a tranſparent acid liquor which corrodes the ſhoes and ſtockings of thoſe who walk over the fields where it is ſown, and which, according to Deyeux (Journ. de Phyſ. Flor. An. 6.) is a pure oxalic acid. 2. C. *nummularifolium*,

rifolium, Lam. Encyc. (Elatines folio ſubrotundo; folliculis hirſutis turgidis, Pluk. Amalth. tab. 389. fig. 5.) "Leaves ſimple, inverſely egg-ſhaped, quite entire, hairy; legumes generally more than two-ſeeded." Lam. *Stems* ſlender, about a foot and half long, hairy, branched, leafy. *Leaves* alternate, ſomewhat egg-ſhaped, or roundiſh, entire, hairy. *Flowers* two or three, reſembling thoſe of the preceding ſpecies, but rather ſmaller; peduncles lateral, axillary, hairy. *Legumes* ſomewhat egg-ſhaped, inflated. *Seeds* ſomewhat heart-ſhaped. A native of the Eaſt Indies; communicated to La Marck by Sonnerat. La Marck pronounces it to be perfectly diſtinct frnm glycine monophylla of Linnæus, and aſſerts that, notwithſtanding its difference in habit, its fructification is properly that of cicer; but Juſſieu doubts whether it ought not rather to be referred to crotalaria.

Cicer *lens*, Willdenow. See Ervum *lens*.

Cicer *ſylveſtre, foliis oblongis hiſpidis, majus*, Bauh. Pin. 647. See Astragalus *cicer*.

Cicer *foliis oblongis hiſpidis minus*, Bauh. Pin. 347. See Astragalus *microphyllus*.

Cicer *montanum lanuginoſum erectum*, Bauh. Pin. 347. See Astragalus.

Cicer *piloſus ſylveſtre latifolium triphyllum*, Bauh. Pin. 347. ——*ſylveſtre tertium*. Dod. Pempt. 525. ——*ſylveſtre verum*, Lob. Ic. 2. p. 73. See Ononis *rotundifolia*.

Cicer *pedunculis bifloris*, Hort. Upſ. 224. Savag. Monſ. 233. Hort. Cliff. 370. See Ervum *lens*.

CICERA, Dod. Pempt. See Lathyrus *cicera*.

CICERELLUS, in *Ichthyology*, a name given by Boccone and ſome others to the fiſh called in England the ſand-launce, *ammodytes tobianus* of Linnæus.

CICERI *ſylveſtri minori affinis*, Bauh. Pin. 347. See Astragalus *Glaux*.

CICERO, Marcus Tullius, *in Biography*, was born on the third of January, in the year of Rome, 647, about 107 years before Chriſt. His birth, if Plutarch is to be believed, was attended with prodigies, foretelling the future eminence of his character. But theſe are to be aſcribed to the credulity or invention of a writer, who wiſhes to excite curioſity by the appearance of what is marvellous. The name Marcus, which he derived from his father and grandfather, was properly perſonal, equivalent to that of baptiſm with us, and impoſed with ceremonies analogous to the chriſtian on the ninth day, called the luſtrical or day of purification. Tullius was his family name, which in the old Latin, as apparently derived from the oriental term דלל *dalal*, ſignified a *flowing ſtream*, ſuggeſted, it is probable, from their ſituation at the confluence of two rivers. As Tullius, the family name, was ſuggeſted by the ſituation of the farm; ſo Cicero, the ſirname, was borrowed from the *vetches*, which were chiefly raiſed and cultivated in it. Agriculture was regarded by the Romans as the moſt liberal employment; and thoſe families, who reſided on their farms in the country, as the moſt honourable. Pliny in his Nat. Hiſt. 18. 3. 1, aſſures us, that all thoſe names which diſtinguiſhed any ſpecies of grain, ſuch as the Fabii, Lentuli, &c. were acquired by the reputation of being the beſt cultivators of that ſpecies. The grain *cicer*, which gave our author the appellation of *Cicero*, was held in all ages of the republic in great eſteem by the Roman populace, as it conſtituted a principal article of thoſe bounties beſtowed upon them by the rich, and was ſold every where in the ſtreets, and prepared for immediate uſe by being ready parched or boiled.

Moſt great men owe much of their early improvement, and conſequently of their future celebrity, to maternal education. But to this general fact Cicero appears an exception, unleſs we ſuppoſe him to have been no leſs deſtitute of filial gratitude than he was of affection. Of his mother, whoſe name was Helvia, a name noticed in hiſtory, and found on old inſcriptions among the honourable families of Rome, no mention is made in any part of his writings; though the little incident of domeſtic management, recorded by his brother Quintus, ſhews that ſhe was equally entitled to the attachment of her children and the imitation of her neighbours. But the indifference or averſion, which induced our author to omit the tribute of veneration due to the memory of his mother, betrays itſelf in the very unpardonable levity with which, in a letter to Atticus, he notices the death of his father.

His paternal family, though not ennobled by any of the great offices of the republic, was yet ancient and honourable, of the firſt diſtinction in that part of Italy in which it reſided, and of equeſtrian rank from its firſt admiſſion to the freedom of Rome. And though he could not with truth boaſt of the ſplendour of his anceſtors, he ſpeaks of them, when occaſion required, with great complacency and frankneſs, as having lived content with their paternal fortunes, and the private honours of their own city, without the ambition of appearing on the public ſtage of Rome. It is for this reaſon that we find him ſo often called a new man; not that his family was new or ignoble, but becauſe he was the firſt of it who ever ſought and obtained the public magiſtracies of the ſtate.

The place of his birth was Arpinum, a city anciently of the Samnites, now part of the kingdom of Naples; which upon its ſubmiſſion to Rome acquired the freedom of the city and was inſerted into the Cornelian tribe. It had the honour alſo of producing the great Caius Marius, which induced Pompey to ſay on a public occaſion, that Rome was indebted to this corporation for two citizens, who had each in his turn preſerved it from ruin. It may juſtly, therefore, claim a place in the memory of poſterity for giving life to ſuch worthies, who exemplified the character which Pliny gives of true glory, "by doing what deſerved to be written, and writing what deſerved to be read," and thus making the world the happier and the better for their having lived in it. The family ſeat was about three miles from the town of Arpinum, in a ſituation extremely pleaſant and well adapted to the nature of the climate. It was ſurrounded with groves and ſhady walks leading from the houſe to a river called Fibrenus, which was divided into two equal ſtreams by a little iſland covered with trees, and a portico contrived both for ſtudy and exerciſe, whither Cicero was uſed to retire when he had any work upon his hands. The clearneſs and rapidity of the ſtream murmuring through a rocky channel, the ſhade and verdure of its banks, planted with poplars, the remarkable coldneſs of the water, and, above all, its falling by a caſcade into the noble river Liris, a little below the iſland, give us the idea of a moſt beautiful ſcene. The houſe, as Cicero deſcribes it, was but ſmall and humble in his grandfather's time, according to the ancient frugality, like the Sabine farm of old Curius, till his father beautified and enlarged it into a handſome and ſpacious habitation. But there cannot be a better proof of the delightfulneſs of the place than that it is now poſſeſſed by a convent of monks, and called the villa of St. Dominic. Strange revolutions, adds Dr. Middleton, to ſee Cicero's portico converted to monkiſh cloiſters! the ſeat of the moſt refined reaſon, wit, and learning, to a nurſery of ſuperſtition, bigotry, and enthuſiaſm. What a pleaſure muſt it give theſe Dominican inquiſitors to trample on the ruins of a man, whoſe writings, by ſpreading the light of reaſon and liberty through the world, have been one great inſtrument to obſtruct their unwearied pains to enſlave it!

The firſt care of his father Marcus, whoſe wiſdom and learning recommended him to the principal magiſtrates of the republic, was to give his ſon the beſt education which Rome could afford, in hopes to excite in him the ambition of aſpiring to the higheſt offices of the ſtate. Accordingly he was brought up under the direction of L. Craſſus, a man of the firſt dignity as well as the firſt eloquence in Rome. The Romans were careful and exact in the education of their children; their attention to it began from the time of their birth, when they committed them to the care of ſome reputable matron, whoſe buſineſs it was to form their firſt habits of acting and ſpeaking, to watch their growing paſſions, and direct them to their proper objects, to ſuperintend their ſports, and to prevent any thing indecent or improper from entering into them, that the mind, preſerved in its native innocence, might be at liberty to purſue whatever was laudable, and apply its whole ſtrength to that profeſſion in which it deſired to excel. This formed a part of that domeſtic diſcipline in which our author was trained, and of which he often ſpeaks. But as ſoon as he was capable of a more liberal inſtruction, his father brought him to Rome and placed him in a public ſchool under an eminent Greek maſter, as the moſt eligible method of educating one who was deſigned to appear on the public ſtage, and who, as Quintilian obſerves, "ought to be ſo bred as not to fear the ſight of men, ſince that can never be learned in ſolitude which is to be produced before crowds." Here he gave the firſt ſpecimens of thoſe ſhining abilities, which rendered him afterwards ſo illuſtrious; and his ſchool-fellows carried home ſuch ſtories of his extraordinary talents, that their parents were often induced to viſit the ſchool, for the ſake of ſeeing a youth endowed with ſuch ſurpriſing faculties.

Encouraged by the promiſing genius of his ſon, the father ſpared no expence in improving it by the help of the ableſt maſters. Among the inſtructors of his youth, was the poet Archias, who, with a high reputation for learning and taſte, opened a ſchool in the family of Lucullus, when Cicero was only five years old. Notwithſtanding this early age, he applied himſelf under this maſter to poetry, and made ſuch a proficiency in it, that, while he was ſtill a boy, he compoſed and publiſhed a poem, called "Glaucus Pontius," which, though now loſt, was extant in the days of Plutarch. Having finiſhed his youthful ſtudies, he laid aſide the habit of the boy for that of the man, and aſſumed what was called the *manly gown*, or the robe of the citizen. This ſeaſon, which was about the 17th year in the ancient republic, though probably ſomewhat earlier in the caſe of Cicero, was a period of great joy to the young men; who, by this change, paſſed into a ſtate of greater liberty and enlargement from the reſtraint of their tutors, and aſſumed the dignity and independence of manhood.

Cicero being then introduced into the Forum, a place calculated to call forth all the enthuſiaſm of his talents, as there the popular aſſemblies were convened, the magiſtrates harangued from the roſtra, and judicial proceedings were uſually tranſacted, was placed under the auſpices of Q. M. Scævola, the augur, and at the ſame time the principal lawyer and ſtateſman of that age, all whoſe remarkable ſayings and leſſons of wiſdom he carefully treaſured up in his memory. After his death, he applied to Scævola, the high prieſt, a perſon of the ſame family, and of equal probity and ſkill in the law, though not a lawyer by profeſſion. Under theſe maſters he acquired a complete knowledge of the Roman laws, a qualification uſeful and ornamental in all countries, but in Rome of ſuch conſequence, that one of the common exerciſes, allotted to boys in ſchool, was to learn by heart the laws of the twelve tables, as they did their poets and claſſic authors. Before he was yet called to the bar, he had ſtudied this ſubject even in its moſt intricate and complex branches with ſuch accuracy and comprehenſion, as to be able to ſuſtain a diſpute on any queſtion with the moſt diſtinguiſhed profeſſors of that age; and once, in pleading with his friend Sulpicius, he declared, by way of raillery, what he was probably able to make good in fact, that, if he provoked him, he would, in the courſe of three days, profeſs himſelf a lawyer.

The profeſſion of the law, next to that of arms and eloquence, was a ſure recommendation to the honours of the republic, and for that reaſon was preſerved, as it were, hereditary in ſome of the nobleſt families of Rome, who, by giving their advice gratis to all that wanted it, attained the favour of their fellow-citizens, and acquired great authority in all the affairs of ſtate. But Cicero's ambition aſpired to much higher attainments. Aiming at being an univerſal patron, not only of the fortunes, but of the lives and liberties of his countrymen, he wiſhed to become an accompliſhed orator, or pleader of cauſes, whoſe profeſſion, as deſcribed by himſelf, was to ſpeak aptly, elegantly, and copiouſly on every ſubject which could be offered to him, and whoſe art, therefore, included all other arts of the liberal kind, and could not be acquired to any perfection without a competent knowledge of whatever was great and laudable in the univerſe. This was his own idea of the character he had undertaken, and his ambition was to illuſtrate the juſtice of his deſcription by his own attainments and eloquence. For this purpoſe, while he ſtudied the law under the Scævolas, he uniformly attended the pleadings at the bar and the public ſpeeches of the magiſtrates, and at the ſame time ſpent a portion of every day in reading and writing at home. It was his conſtant practice to take notes and make comments on what he read, and he was fond, when very young, of an exerciſe, recommended by ſome of the great orators before him, of treaſuring in his memory the ſubſtance of what he read in verſe or proſe, and then expreſſing the ſame ſentiments in different, but the moſt elegant, words that occurred to him. But finding that the moſt eligible terms were already employed, and becoming by a growing confidence in himſelf leſs diſpoſed to tread in the footſteps of others, he laid aſide this practice, and tranſlated into Latin the ſelect ſpeeches of the beſt Greek orators, a method which gave him the command of the moſt elegant words in his own language, and at the ſame time furniſhed him with an opportunity of enriching it with new terms, formed in imitation of the Greek. Nor did he yet neglect his poetical ſtudies; for Aratus "On the Phenomena of the Heavens," he tranſlated into Latin verſe, fragments of which are ſtill extant, and alſo compoſed an heroic poem in honour of his countryman C. Marius, of which, unfortunately, only a ſmall ſpecimen is preſerved, deſcribing a memorable omen given to Marius from the oak of Arpinum, which, from the ſpirit and elegance of the deſcription, renders it probable, that his poetical genius, if cultivated with the ſame diligence, would ſcarcely have been inferior to his eloquence. He moreover publiſhed another poem called "Limon," of which the ſubject was uncertain, but which, if we may conjecture from the title, was a collection of various flowery pieces. While he was employed in theſe juvenile exerciſes, for the improvement of his ſtyle and invention, he applied himſelf with no leſs induſtry to the ſtudy of philoſophy. Among his firſt maſters was Phædrus, the Epicurean, of whom he was then very fond, and for whom he always retained a particular eſteem,

teem, on account of his learning, humanity, and politeneſs; though a more enlarged experience and more critical judgment of things, led him ſoon after wholly to abandon, and ſtrenuouſly to oppoſe the principles of that ſect.

When the tranquillity of Rome was diſturbed by what writers call the *Italic* or *Marſic* war, begun by a confederacy of the principal cities of Italy, to ſupport their demand of the freedom of Rome; Cicero firſt directed his attention to the art of war, in the diſcipline of which all young men of diſtinction were trained, as neceſſary in an empire raiſed and ſupported by the force of arms. In this war he followed the camp of Sylla, who, deſirous to ſignalize his military talents, and to eclipſe the fame of his rival, Marius, as the ſureſt way of obtaining the conſulſhip to which he was aſpiring, gained many conſiderable victories. The example of this general inſpired our author with the love of glory; and he was no leſs diligent in the army than he was in the Forum, to obſerve every thing that paſſed; and he always contrived to be near the perſon of the chief commander, that no action of moment might eſcape his notice. During the enſuing diſſenſions between Marius and Sylla, in which the greateſt cruelties were perpetrated by both parties, Cicero appears to have taken no active part, but to have reſumed the ſtudy and practice of eloquence: and being now about the age of twenty-one, compoſed thoſe rhetorical treatiſes, which, though unworthy of his maturer judgment, are ſtill preſerved, and are generally conſidered as the ſame with thoſe on the ſubject of invention. At this time he commenced the ſtudy of philoſophy under Philo, a diſtinguiſhed diſciple of the Academic ſchool, who, together with many of the principal Athenians, fled to Rome to eſcape the fury of Mithridates, now maſter of Greece. While he was cultivating the academic philoſophy under the direction of this celebrated profeſſor, he received from Diodotus, the Stoic, lectures in logic, which Zeno uſed to call "a cloſe and contracted eloquence," and eloquence, "an enlarged and dilated logic," comparing the one to the fiſt or the hand doubled; the other to the palm opened. Yet with all his attention to logic and philoſophy, he never ſuffered a day to paſs without ſome exerciſe in oratory, in which he was aſſiſted by the ſkill and direction of Molo, the Rhodian, who, about this time, had eſtabliſhed at Rome a ſchool of rhetoric, and was one of the principal orators, as well as the moſt celebrated teacher of eloquence, in that age. Under his auſpices, with the advantages of talents and induſtry peculiar to himſelf, he hoped ſoon to rival the fame of Hortenſius, who then made the chief figure at the bar, and whoſe praiſes fired him with ſuch ambition of acquiring the ſame glory, that he allowed himſelf ſcarcely any reſt from his ſtudies either day or night. His principal exerciſe in this department was that of declaiming, which he generally performed with his fellow diſciples M. Piſo and Q. Pompeius, two young noblemen, with whom, though a little older than himſelf, he had contracted an intimate friendſhip. With theſe he declaimed occaſionally in Latin, but more frequently in Greek, becauſe the ſuperior copiouſneſs of this language furniſhed a greater variety of elegant expreſſions, and an opportunity of introducing them into his own tongue; and becauſe the Greek maſters, who were far the beſt, could not correct and improve them, unleſs they declaimed in that language.

Thus did he paſs through all that courſe of diſcipline, which he lays down as neceſſary to form the complete orator; a character to which, according to his own deſcription, none ſhould pretend, without being previouſly acquainted with every thing in art and nature; whoſe profeſſion it is to ſpeak upon every ſubject that can be propoſed to him, and whoſe eloquence, without the knowledge of what he ſpeaks, would be but the unmeaning prattle of children. Having learnt the rudiments of grammar and languages from the beſt teachers, gone through the ſtudies of polite letters under the moſt diſtinguiſhed poet, inſtructed in philoſophy by the principal profeſſors of each ſect, acquired a perfect knowledge of the law from the greateſt lawyers, as well as the greateſt ſtateſmen of Rome; having received lectures on oratory from the moſt eloquent maſters of Greece, continually compoſed at home, and declaimed in the Forum under their direction; having, finally, attained all the graces of polite converſation by continued intercourſe with ladies, as well as men of refinement and literature, eſpecially with the daughter of Lælius, and Mucia, wife of the great orator Craſſus, who excelled all others of their ſex, in the delicate uſe of the Latin tongue; with all theſe accompliſhments, he offered himſelf to the bar about the age of twenty-ſix. This was the age in which Demoſthenes began to diſtinguiſh himſelf at Athens. The firſt ſpecimen, which he gave the public of his eloquence, as ſome have ſaid, was in defence of S. Roſcius, who was acquitted to the great honour of his patron. His courage and addreſs in the conduct of the defence being applauded by the whole city, he was from this time conſidered as an advocate of the firſt claſs, and equal to the moſt arduous cauſes. As by this defence he acquired great reputation in his youth, ſo he reflects upon it with pleaſure in his old age, and recommends it to his ſon as the ſureſt way to true glory and authority in his country, to defend the innocent in diſtreſs, eſpecially when they happen to be oppreſſed by the power of the great: "as I have done," ſays he, "in other cauſes, but particularly in that againſt Sylla himſelf in the height of his power." A noble leſſon to all young advocates to apply their talents to the protection of innocence and injured virtue, and to make juſtice, not profit, the rule and end of their labours!

At the age of eight and twenty years, he left the forum, and went to Greece and Aſia, the faſhionable tour of thoſe who travelled for curioſity or improvement. His firſt viſit was to Athens, the chief ſeat of arts and ſciences. Here, under Antiochus, the principal philoſopher of the old academy, he renewed thoſe ſtudies, to which, as he aſſerts, he had been devoted from his earlieſt years, and formed with T. Pomponius, who, from his predilection for Athens and his reſidence there, was called *Atticus*, that memorable friendſhip, which ſubſiſted between them through life, and has been tranſmitted to poſterity as the faireſt model of conſtancy, diſintereſtedneſs and affection. From Athens he paſſed to Aſia, and wherever he went, he collected about him the principal orators of the country, who accompanied him the reſt of his voyage, and with whom he diſputed in every place where he made any ſtay. The chief of his aſſociates was Menippus of Stratonica, the moſt eloquent of all the Aſiatics; alſo Dionyſius of Magneſia, Æſchylus of Cnidos, and Xenocles of Adramyttus, the firſt rhetoricians in all Aſia. "Not content with theſe (adds he) I went to Rhodes; and applied myſelf again to Molo, whom I had heard before at Rome, who was an experienced pleader and a fine writer, and particularly expert in obſerving the faults of his ſcholars, as well as in his method of teaching and improving them. His greateſt trouble with me was to reſtrain the exuberance of a juvenile imagination, always ready to overflow its banks, within its proper channel." At Rhodes he devoted part of his time to the ſtudy of philoſophy, under Poſidonius, the ſtoic, whom he often mentions with reſpect, not only "as his maſter, but his friend."

Having finiſhed the circuit of his travels, he returned to Italy after an abſence of two years, extremely improved, and changed, as it were, into a new man; the vehemence of his voice and action was moderated, the redundancy of his ſtyle and fancy corrected, his lungs ſtrengthened, and his whole conſtitution confirmed. From this voyage, indeed, he muſt have received the greateſt benefits. His education had qualified him for deriving all the advantages from whatever he could ſee or hear in a tour the moſt delightful which the ancient world could furniſh. By his previous knowledge of the laws of Rome, he was able to compare them with thoſe of other cities, and to bring back with him whatever he found uſeful either to his country or to himſelf. He was entertained, wherever he came, in the houſes of the great and of thoſe who were diſtinguiſhed by their knowledge and eloquence, as well as by their birth and fortune, men honoured in their reſpective communities, as the principal patriots, orators, and philoſophers of the age. Theſe, that he might not loſe the opportunity, even on the road, of profiting by their advice and experience, he made the conſtant companions of his travels. No wonder, then, that from ſuch a voyage he ſhould derive every accompliſhment which could improve or adorn a man of ſenſe.

Soon after his return, while Cotta and Hortenſius, his rivals in eloquence and honour, ſtood candidates, the former for the conſulſhip, the latter for the ædileſhip, Cicero claimed the quæſtorſhip; and had the ſatisfaction before all his competitors of being choſen by the unanimous ſuffrage of the tribes, in the thirty-firſt year of his age, and the very firſt in which he was eligible by law. The quæſtors were treaſurers of the republic, and their office formed the firſt ſtep in the aſcent of public honours, and after its expiration opened an immediate door to the ſenate, and an actual admiſſion into it during life. Choſen annually by the people, the quæſtors formed the regular and ordinary ſupply of the vacancies of the ſenate, by which excellent inſtitution, the road to the higheſt offices in the ſtate was laid open to the virtue and induſtry of every private citizen, and the dignity of this ſovereign council maintained by a ſucceſſion of members, whoſe diſtinguiſhed merit had firſt recommended them to the notice and favour of their country.

The provinces of the quæſtors being diſtributed to them by lot, the iſland of Sicily fell to the ſhare of Cicero. This, from the quantity of corn annually raiſed and exported, was called the granary of the republic, and the quæſtor's chief employment in it was to ſupply proviſion for the uſe of the city. The ſcarcity peculiar to this year at Rome made the people clamorous, and gave the tribunes an opportunity of inflaming them the more eaſily, by aſcribing it to the loſs of the tribunitian power, and to their being by that means left a prey to the oppreſſions of the great. To appeaſe the public mind, it was neceſſary, therefore, to export from the iſland large and ſpeedy ſupplies, by which it was likely to be drained, ſo that Cicero had the difficult taſk of furniſhing what was ſufficient for the city, without, at the ſame time, being oppreſſive to the poor natives; yet he managed the matter with ſo much addreſs, that he made very great exportations without any burden upon the province, ſhewing great courteſy to the dealers, juſtice to the merchants, generoſity to the inhabitants, humanity to the allies, and, in ſhort, doing all good offices to every body, by which he gained the love and admiration of the Sicilians, who decreed greater honours to him at his departure, than they ever had before done to any of their chief governors. In the hours of leiſure from his provincial affairs, he employed himſelf very diligently, as he uſed to do at Rome, in his rhetorical ſtudies, agreeably to the rules which he conſtantly inculcates, never to let one day paſs without ſome exerciſe of that kind; ſo that on his return from Sicily, his oratorical talents, according to his own judgment, were in their full maturity and perfection. Before he left Sicily, he made the tour of the iſland, to ſee every thing in it that was curious, and eſpecially the city of Syracuſe, which had always made the principal figure in its hiſtory. Here his firſt object was to diſcover the tomb of Archimedes, of which the inhabitants were ignorant; but knowing it to be engraved with a cylinder, as an emblem of his mathematical genius, and remembering the words inſcribed upon the grave, he diſcovered in a ſpot over-grown with briars, a ſmall column, whoſe head juſt appeared above the brambles, marked with the memorable inſcription; and he left the place with ſaying, that one of the nobleſt cities of Greece, and once likewiſe the moſt learned, had known nothing of the monument of its moſt deſerving and ingenious citizen, if it had not been diſcovered to them by a native of Arpinum. At the expiration of his year, he took leave of the Sicilians by a kind and affectionate ſpeech, aſſuring them of his protection in all their affairs at Rome; in which he was as good as his word, and continued ever after their conſtant patron to the great benefit and advantage of the province. He came away well pleaſed with his own adminiſtration, and flattering himſelf that the public were celebrating his praiſes. But no ſooner had he landed at Puteoli, than awaking from his dream of imaginary applauſe, he found the majority of the people equally ignorant of the quæſtor and his province. The diſcovery mortified his ambition, or rather taught him to apply it with more ſucceſs; for, according to his own account, it made him reflect "that the people of Rome had dull ears, but quick eyes, and that, therefore, it was his wiſdom to keep himſelf always in their ſight, and to make them ſolicitous, not ſo much to hear, as to ſee him; ſo that from this moment he reſolved to continue on the forum, and perpetually to live in the view of the city, without permitting either his porter or his ſleep to debar any man's acceſs to him."

He was now in his 37th year, the proper age for being choſen ædile, which was the firſt public office properly called a magiſtracy; the quæſtorſhip being only a place of truſt without any juriſdiction in the city. Theſe ædiles, as well as all the inferior officers, were elected by the people voting in their tribes, a mode of election free and popular, in which he was declared ædile, as he had been before inveſted with the quæſtorſhip, by the unanimous ſuffrage of the tribes, in preference to all his competitors. After his election, but before his entrance on that office, he undertook the famed proſecution of C. Verres, the late prætor of Sicily, charged with many flagrant acts of injuſtice, rapine, and cruelty, during his tyrannical government of that iſland. Verres, guilty and corrupt as he had been in the adminiſtration of his province, was ſupported by the moſt powerful families of Rome, and defended by Hortenſius, who was the reigning orator at the bar, and uſually ſtiled the king of the forum; yet the difficulty of the cauſe, inſtead of diſcouraging, ſerved only to animate him the more, by the greater glory of the victory. The reſult was, that Verres was condemned, and the reputation of Cicero both for abilities and integrity greatly increaſed, as of one whom neither money could bribe, nor power terrify, from proſecuting a public oppreſſor; and the Sicilians ever after retained the higheſt ſenſe of his ſervices, and on all occaſions teſtified the utmoſt zeal for his perſon and intereſt.

After this impeachment, Cicero entered on his ædileſhip, of the duties of which he gives us in one of his ſpeeches an account, and which, however important they might be deemed by him, muſt appear contemptible to a modern reader; "I am now choſen ædile," ſays he, "and am ſenſible of what is committed to me by the Roman people. I am to exhibit with the greateſt ſolemnity the moſt ſacred ſports to Ceres, Liber, and Libera; I am to appeaſe and conciliate the mother Flora to the people and city of Rome, by the celebration of the public games; and to furniſh out thoſe ancient ſhows, the firſt which were called Roman, with all poſſible dignity and religion, in honour of Jupiter, Juno, and Minerva." Of theſe games the people were paſſionately fond; and as their gratification in this reſpect was the ſureſt road to popularity, many perſons of wealth, when in office, were ruined by theſe diverſions. Cicero, in the execution of this undertaking, avoided the extravagancies into which other magiſtrates had plunged, adopting the middle courſe, "ſo as neither to hurt his character by a ſordid illiberality, nor his fortune by a vain and oſtentatious magnificence; ſince the one, by making a man odious, deprived him of the power of doing good, the other, by making him neceſſitous, puts him under the temptation of doing ill."

After the uſual interval of two years from the time of his being choſen ædile, he ſtood candidate for the prætorſhip, the office of which was to preſide and judge in all cauſes, eſpecially of a public and criminal nature; and it fell to Cicero's lot to ſit upon actions of extortion and rapine, brought againſt governors of provinces; in which, as he tells us himſelf, he had acted as an accuſer, ſat as a judge, and preſided as a prætor. In this office he acquired great reputation for integrity, by condemning L. Macer, a perſon of prætorian dignity, and great eloquence, who would have made an eminent figure at the bar, if his abilities had not been ſullied by the infamy of a vicious life. Though fully employed in public affairs as prætor, he found time ſtill to act as an advocate, as well as a judge, and not only to hear cauſes in his own tribunal, but to plead them alſo at the tribunals of the other prætors; and what furniſhes the moſt remarkable proof of his induſtry is, that, during his prætorſhip, though he was in the conſtant habit of exerciſing his eloquence, yet he frequented the ſchool of the celebrated rhetorician Gnipho, with the deſign, if not to learn ſomething new, at leaſt to prevent any ill habit from inſenſibly growing upon him, by exerciſing himſelf under the obſervation of ſo judicious a maſter. At the expiration of his prætorſhip, he declined to accept any foreign province, the uſual reward of that magiſtracy, and the chief advantage which the generality of prætors looked for from the office. Cicero had no love of money, nor genius for arms, ſo that thoſe governments had no charms for him. The glory which he purſued was to ſhine in the eyes of the city, as the guardian of its laws, and to teach the magiſtrates how to execute, and the citizens how to obey them.

But the great object of all his hopes was the conſulſhip, to ſue for which he now began to prepare; and his chief ſolicitude was to obtain it in its proper year, and without a repulſe. The affection of the city, ſo ſignally declared for him in all the inferior ſteps of honour, afforded him flattering hopes of ſucceſs in his preſent pretenſions to the higheſt: but he had reaſon to apprehend great oppoſition from the nobility, who looked upon the public dignities as a kind of birthright, and could not brook the claims of *new men*; and, therefore, he reſolved to put it out of their power to fruſtrate him, by taking the pains, required of a candidate, to viſit and ſolicit all the citizens in perſon. On the day of election, therefore, he mixed with the crowd, aſſembled in the field of Mars, careſſing and familiarly ſaluting each individual by name. In the vacation from the forum, which was uſually in Auguſt, he alſo viſited the towns and colonies of the Ciſalpine Gaul, a province which, from its numerous votes, had great influence in the election. Amongſt his competitors was the famous Catiline, now returned from the government of Africa, where, to ſupply his boundleſs extravagance, he had practiſed rapine and extortion. In order to defeat the claims of this formidable rival, the friends of Cicero appear to have preſented againſt him the charge of mal-adminiſtration, and hence in a letter to his friend Atticus he thus expreſſes himſelf: "As to Catiline, I am then only ſure of him as a competitor, when his judges ſhall decide that the ſun never ſhines at noon day." It was uſual with the Roman lawyers to defend the moſt infamous criminals, if recommended by birth and fortune. Of this practice Cicero expreſſes his repeated diſapprobation; yet we find that his principles, however fair and honourable, when they interfered with his intereſt, in any affair of moment, were ſacrificed to his ambition. Catiline applied to our orator to ſhield him by his eloquence, from the vengeance of the law. The reſult of this unexpected application we learn from a ſubſequent letter to Atticus; "I am now," writes he, "preparing to defend my competitor Catiline. If he ſhould be acquitted, I am in hopes that he will the more cordially concur in promoting my election; but if it ſhould prove otherwiſe, I ſhall endeavour to bear it with patience." Yet in a ſpeech which ſome time after he made againſt the criminal, he addreſſes him, "Wretch, not to ſee, that thou art not acquitted, but reſerved only to a ſeparate trial, and heavier puniſhment."

As the election of conſuls approached, Cicero's intereſt appeared to be ſuperior to that of all the candidates: for the nobles themſelves, though always envious and deſirous to depreſs him, yet, out of regard to the dangers which threatened the city from many quarters, began to think him the only man qualified to preſerve the republic, and to break the cabals of the deſperate by the vigour and prudence of his adminiſtration. The method of chooſing conſuls was not by open votes, but by *ballots*, or little tickets of wood, diſtributed to the citizens, with the names of the candidates ſeverally inſcribed upon each: but in the caſe of Cicero, the people were not content with this ſecret way of teſtifying their inclinations, but before they came to any ſcrutiny, loudly and univerſally proclaimed Cicero the firſt conſul, ſo that, as he himſelf declares, in his ſpeech after the election, "he was not choſen by the votes of particular citizens, but the common ſuffrage of the city, not declared by the voice of the crier, but of the whole Roman people." He was the only new man, who had obtained this ſovereign dignity, or, as he expreſſes it, "had forced the entrenchments of the nobility for forty years paſt, and the only one who obtained it in its proper year, and without a repulſe."

Cicero, being thus arrived at the higheſt honour, which a citizen could deſire, or the people beſtow, employed his talents with extraordinary ſucceſs in adminiſtering the affairs of the republic; and, according to the unanimous teſtimony of all ancient writers, Rome never ſtood in greater need of the ſkill and vigilance of an able conſul than in this very year. His firſt policy was to conciliate his colleague Antonius, by aſſigning to him the beſt province, at the expiration of their year; and having by this ſacrifice ſecured his concurrence, he made it the firſt object of his adminiſtration to unite the equeſtrian order with the ſenate, and it was the authority of his conſulſhip that firſt diſtinguiſhed and eſtabliſhed the former into a third order of the ſtate. About the time of his inauguration, the tribune P. Servilius Rullus propoſed to the ſenate an *agrarian law*, the object of which was to appoint ten commiſſioners, with abſolute power for five years, over the revenues and lands of the republic. The promulgation of a law ſo pernicious, however gratifying to the populace, the new conſul oppoſed; and in a ſpeech delivered from the roſtra, he gave ſuch a turn to the inclination of the people, that they rejected it with as much eagerneſs, as they had before evinced to receive it; aſſuring them of his fixed determination not to ſuffer the ſtate to be injured, or its liberties impaired, while the adminiſtration continued in his hands. This was a ſtriking inſtance of the influence which his eloquence obtained over the paſſions of men; and the following is a ſtill more memorable proof of his aſcendancy in ſwaying the public mind. Otho, who had propoſed a law for the aſſignment of ſeparate ſeats to the equeſtrian order, appearing ſoon after in the theatre, was univerſally hiſſed by the people, while from the knights he received the loudeſt applauſe. A tumult enſued, and Cicero, informed of it, repaired to the theatre, and the conſequence of his addreſs was, that the people vied with the knights in applauding the man whom they before had hiſſed; and it is ſuppoſed, not without ſome colour of truth, that the conduct of Cicero on this occaſion gave birth to the beautiful compariſon of Virgil in Æn. i. 152. 157. About this time, a formidable conſpiracy was formed in the boſom of the republic: of this the chief author was Catiline, and with him concurred a number of young men of diſtinction, who had ſacrificed their fame to their vices, and who ſought to repair their ruined fortunes by the diſorders of the ſtate. The conſul detected and defeated their plans, and claimed, by his ſucceſs, the proud appellation of the ſaviour of his country. See the article CATILINE. In this year was born *Octavius*, ſirnamed Auguſtus, an event, which, though inſignificant in itſelf, ſerved by a concurrence of auſpicious circumſtances to open a new æra in the annals of Rome; and it has been noticed as an inſtance of the inſcrutable ways of Providence, and the ſhort-ſighted policy of man, that, in the very year in which Cicero ſaved the republic from deſtruction, appeared an infant, who in a ſhort time effected what Catiline had in vain attempted, and deſtroyed both Cicero and the republic. Having attained the pinnacle of public honours, he did not derive from his elevation that fame, influence, and popularity, which he expected to enjoy. At the expiration of his office, he deſired no foreign government, no command of armies; his province was the ſenate and the forum; for the purpoſe of guarding, as it were, the palladium of the empire, and directing all its counſels to their proper end, the general good; and in the advanced poſt of a *conſular ſenator*, the character which he chiefly coveted, as in a watch tower of the ſtate, to obſerve each threatening cloud and riſing ſtorm, and to give the alarm to his fellow citizens from what quarter it was coming, and by what means its effects might be prevented. In this honourable ſtation he excited the envy of the nobles, and the malignity of the profligate: and the ſplendour of the nobleſt conſul whom Rome ever beheld, was ſoon followed by the diſgrace of a voluntary baniſhment. The cauſes which more immediately led to this extraordinary event, claim, from their importance, a place in this narrative.

About this time J. Cæſar returned from the government of Spain, and Pompey from the Eaſt, both celebrated by their far-famed victories. The former ſought the conſulſhip, while the latter endeavoured to obtain of the ſenate the honour of a triumph: but not ſucceeding to the extent of their ambitious views, they united with L. Craſſus, a rich and turbulent citizen, who hoped to raiſe himſelf by the authority of Pompey and the talents of Cæſar. The object of this coalition, which was called the *firſt triumvirate*, and which terminated in the diſſolution of the republic, was to extort that power by violence and bribery which was denied by law, and as a neceſſary ſtep to this end, to detach Cicero, the bulwark of the ſtate, from the intereſt of the ſenate. In the mean while P. Clodius, a young man of noble birth, and great talents, but of abandoned morals, had an intrigue with Pompeia, Cæſar's wife. But, as he could not eaſily gain acceſs to her, he took the opportunity, while ſhe was celebrating the myſteries of the goddeſs *Bona Dea* at her own houſe, to enter diſguiſed in a woman's habit. While he was waiting in one of the apartments for Pompeia, he was diſcovered by a maid-ſervant of Cæſar's mother, who immediately giving the alarm, he was driven from this female ſociety with great indignation. The ſtory was preſently known, and excited general abhorrence on account of the profanation of rites held the moſt ſacred. The citizens and the prieſts demanded the puniſhment of this bold impiety, and Cicero, concealing ſome political motives under the veil of religion, took the lead in the proſecution. It was the conſtant belief of the populace, ſays he, "that if any man ſhould ever pry into theſe myſteries, he would be inſtantly ſtruck blind. But it was not poſſible to know the truth of it before, ſince no man beſides Clodius was baſe enough to make the experiment; though it was now diſcovered that the blindneſs of the eyes was converted to that of the mind." Clodius, though ſo obviouſly guilty, as, in the words of Hortenſius, to be deſtroyed with a ſword of lead, was yet acquitted by his corrupt judges; and to revenge the chief author of the proſecution, he adopted effectual means for his deſtruction. Cæſar and Pompey, in order to remove the chief obſtacle to their ambition, and to render dependent upon them the illuſtrious object of their envy, though profeſſedly friends to Cicero, yet in reality concurred in the faction againſt him, and by the adoption of Clodius, a nobleman, and therefore by birth incapable of being elected tribune of the people, into a plebeian family, cauſed him to be inveſted with that office. In this capacity, in order to gain the public favour, and to humble his rival, he promulgated many laws, which, as they were advantageous to the people, Cicero was adviſed not to oppoſe. By theſe means, in which he diſplayed talents and perſeverance worthy of a better cauſe, Clodius unravelled the grand plot of the play he was acting, obtaining a ſpecial law, that whoever had taken the life of a citizen uncondemned, and without a trial, ſhould be prohibited from fire and water. Cicero, though not named, was known to be the perſon intended by the law. His reputed crime was the putting Catiline's accomplices to death, which, though not done by his ſingle authority, but by a general vote of the ſenate, was alleged to be illegal, and contrary to the liberties of the people. Thus reduced to the condition of a criminal, Cicero changed *his habit*, as was uſual in the caſe of a public impeachment, and appeared about the ſtreets in a ſordid mourning gown, to excite the compaſſion of the citizens; whilſt Clodius, at the head of his mob, contrived in ſeveral places to meet and inſult him, reproaching him with cowardice, and pelting him with ſtones. But he was reſcued from danger, though not protected from inſults, by the zeal of his friends. The whole body of the knights, the young nobility to the number of twenty thouſand, and the greater part of the citizens changed their habits, and attended him about the city to implore the protection and aſſiſtance of the people. But theſe humiliating meaſures were premature, and the faction gained, from the dejection and precipitate fears of Cicero, that triumph which it would have loſt by a more manly and determined oppoſition. His enemies by their ſucceſsful attacks increaſed in number and ſtrength. The tribune Metellus, the conſuls, Piſo and Gabinius, were among his open foes. Cæſar, though unſeen, was the principal agent in the plot, and the protection of Pompey was implored in vain. In this extremity he ſummoned a council of his friends with intent to act agreeable to their advice; and propoſed the queſtion, Whether it was beſt to ſtay in the city, and defend himſelf by force, or to prevent the effuſion of blood by retreating till the ſtorm ſhould be over? Lucullus adviſed the firſt, but Cato and Hortenſius warmly urged the laſt expedient, which, ſanctioned by the authority of Atticus, and the entreaties of his family, induced him to leave the field in the poſſeſſion of his enemies, and ſubmit to a voluntary exile. The mind of Cicero, however elevated by ſuperior genius, was, in ſeaſons of danger, abject, timid, and undetermined. He wiſhed indeed to prevent the effuſion of blood, but there is reaſon to believe that the blood which by his precipitate retreat he deſired principally not to ſhed, was his *own:* and when the hardſhips of baniſhment rendered him ſenſible of his cowardice, he bitterly reproached himſelf, in his letters to Terentia and Atticus, for not having taken up arms, and reſolutely withſtood the violence of Clodius. With his proſperity Cicero loſt his dignity, and there is no period of his life in which his character appears leſs reſpectable than in his afflictions. The letters which he addreſſed to his friends, and which convey the only knowledge we have of him during his baniſhment, are filled with bitter complaints of the inſincerity of his friends, his own miſconduct, and regret that he did not put an end to his life. "Your advice," ſays he, in one of his letters to Atticus, "has reſtrained me from doing violence to myſelf. But your encouragements have not been able to reconcile me to the courſe I have followed, and to the life I lead. For what is there for which I ſhould now deſire to live, eſpecially if I am diſappointed in the hopes I carried with me out of Rome. I will not, indeed I will not, recount all the miſeries into which I have fallen, through the unexampled wickedneſs of the men who envied, rather than of thoſe who hated me, leſt I ſhould awake to all the horrors of my condition, and you to a ſenſe of my ſorrows. One thing I affirm, never was a man oppreſſed with ſuch a weight of calamity; never had a man more reaſon to implore death. But the time is irrecoverably paſt, when I might have died with glory. The remainder of my days cannot repair, they can only finiſh my miſeries." His friend uſed every means to conſole and ſupport him, reproves his abject lamentations, and expreſſes his apprehenſions that his underſtanding was impaired by exceſſive grief. To this he replies, "You often accuſe me with being too much dejected under my misfortunes; but you ought to forgive me this weakneſs: for you never ſaw, you never heard, of any ſo diſtreſſed as I am. You tell me that my ſufferings have affected my underſtanding. This is not true; and I wiſh my judgment had been equally clear and ſound at the time I united with thoſe hoſtile and cruel traitors, whom I imagined to be the beſt friends to my perſon and welfare; thoſe who, when they ſaw me indiſpoſed from apprehenſion to accord with their views, had recourſe to all the arts of perfidy as means to effect my ruin." Lib. iii. 14.

In the mean time Clodius proceeded againſt him with unabated fury, cauſed a law to paſs that no one ſhould receive him, or make any motion for recalling him, under pain of death, plundered his magnificent villas, and, after deſtroying his houſe in Rome, conſecrated the ſpot to the perpetual ſervice of religion, and upon it built a temple to the goddeſs Liberty. Emboldened by theſe ſucceſſes, he now began to act without the conſent of, and even in oppoſition to, his chief ſupporters. The implacable reſentment of Clodius towards a fallen adverſary, or the dread of his power, now grown formidable, induced Pompey at length to eſpouſe the cauſe of Cicero; but unwilling to take any ſtep for his reſtoration, without the concurrence of Cæſar, he ſent Sextius with diſpatches to Spain to ſolicit his conſent and influence. Metellus, now advanced to the conſulſhip, from fear of offending Pompey, no longer acted with open hoſtility, and Lentulus, his colleague, was the active and decided friend of Cicero. Vigorous, though indirect and partial, meaſures were now adopted to effect his recal. The honeſt citizens were invited to Rome from all parts of Italy, and entertained with public ſhows. The ſenators held him upon all public occaſions as the ſaviour of their country; plays were acted with pointed reference to the illuſtrious exile, and the tragedian Æſopus, in the character of the baniſhed Telamon, was received with enthuſiaſtic applauſe. After repeated efforts, defeated by the ſkill and vigilance of Clodius, the law for his reſtoration was ratified, in the moſt numerous aſſembly of citizens which Rome ever contained: and this ratification was probably the laſt act of juſtice and freedom, which the republic ever exerciſed.

The day of his return to Rome was the 4th of Auguſt, after an inglorious abſence of 18 months. As he approached the city, multitudes from all parts flocked to ſee and to congratulate him. All the towns of Italy decreed him public honours, and ſent him a deputation of their chiefs to teſtify their joy at his return, and it has been emphatically ſaid of him by Plutarch, that he was carried back upon the ſhoulders of Italy. "That one day," ſays he, "was worth an immortality, when, on my approach towards the city, the ſenate came out to receive me followed by the whole body of the citizens, as if Rome itſelf had left its foundations, and marched forward to embrace its preſerver."

His firſt act, after being reſtored to his rank, though not to his property, was, in eloquent and affecting ſpeeches to thank the ſenate and the people for the active part which they took in his reſtoration. Gratitude in the heart of Cicero was a principle of refined ſenſibility, which knew no reſtraint from reaſon, or any limitation from the duties, which he owed to the intereſts of the Republic. To Lentulus, now governor of Cilicia, he evinced his ſenſe of obligation by endeavouring with unwearied efforts to authoriſe him, with the conſent of the ſenate, to reſtore Ptolemy, a profligate and cruel prince, to the throne of Egypt. The great concourſe of citizens in Rome from the different parts of Italy, had occaſioned a temporary ſcarcity, which was ſeverely felt by the common people: and in order to reſtore plenty to the city, he propoſed that Pompey ſhould be inveſted with an abſolute power over all the public ſtores of the empire. The motion paſſed into a law; and Pompey was authoriſed for five years to ſuperintend all the proviſions of the Republic, with the power of chooſing fifteen officers to act as his deputies. Cæſar, who was now in the full career of victory in Gaul, ſent the ſenate a requeſt that money might be decreed him for the payment of his army, and his command be prolonged five years more. The demand, though exorbitant, was ſupported by Cicero, who alleged that the courſe of his victories ought not to be checked by the want of neceſſary ſupplies, while he was ſo gloriouſly extending the bounds of the empire, and conquering nations, whoſe names had never before been heard at Rome. His object no doubt was to conciliate Cæſar, and more fully to evince his devotion to Pompey. But his conduct was an evident deviation from his own principles; and the patriots, his former friends, charged him with apoſtacy, who, with Cato at their head, appear now to have formed a party againſt him. In a letter addreſſed to the pro-conſul Lentulus, he juſtifies himſelf with great ingenuity and elegance. "It appears to me," ſays he, "to be the dictate of ſound policy, to act in accommodation to particular conjunctures, and not inflexibly to purſue the ſame unalterable ſcheme, when public circumſtances, together with the ſentiments of the beſt and wiſeſt members of the community, are evidently changed. In conformity to this notion, the moſt judicious reaſoners on the great art of government have univerſally condemned an obſtinate perſeverance in one uniform tenor of meaſures. The ſkill of the pilot is ſhewn in weathering the ſtorm at leaſt, though he ſhould not gain his port, but if ſhifting his ſails, and changing his direction, ſhould infallibly carry him with ſecurity into the intended harbour, would it not be an inſtance of moſt unreaſonable tenaciouſneſs to continue in the more hazardous courſe, wherein he began his voyage? Thus (and it is a maxim I have often had occaſion to inculcate) the point we ought all of us to keep in view in our adminiſtration of the commonwealth, is the final enjoyment of an honourable repoſe. But the method of ſecuring to ourſelves this dignity of retreat, is by having been invariable in our intentions for the public welfare, and not by a poſitive perſeverance in certain favourite modes of obtaining it. To repeat, therefore, what I juſt now declared, had I been abſolutely uninfluenced by every motive of friendſhip, I ſhould ſtill have purſued the ſame public meaſures in which I am now engaged. But when gratitude and reſentment both conſpire in recommending this ſcheme of action to me, I cannot heſitate a moment in adopting it, eſpecially ſince it appears moſt conducive to the intereſts of the republic in general, as well as to my own in particular. To ſpeak freely, I act upon this principle, ſo much the more frequently and with the leſs reſerve, not only as my brother is lieutenant under Cæſar, but as the latter receives the ſlighteſt action or even word of him in his favour with an air, that evidently ſhews he conſiders them as obligations of the moſt ſenſible kind. And, in fact, I derive the ſame benefit from that popularity and power which you know he poſſeſſes, as if they were ſo many advantages of my own. The ſum of the whole in ſhort is this, I imagined that I had no other method of counteracting thoſe perfidious deſigns, with which a certain party were ſecretly contriving to undermine me, than by thus uniting the friendſhip and protection of the men in power, with thoſe internal aids which have never yet been wanting to my ſupport." With equal ſeverity and truth it has been remarked, that the principles by which Cicero attempts to juſtify himſelf in this epiſtle are ſuch as will equally defend the moſt abandoned proſtitution and deſertion in political conduct. Perſonal gratitude and reſentment; an eye to private and particular intereſt, mixed with a pretended regard to the public good; an attention to a brother's advancement and farther favour; a ſenſibility on being careſſed by a great man in power; a calculation of the advantages, derived from the popularity and credit of that great man to one's own perſonal intereſt, are very weak foundations indeed to ſupport the ſuperſtructure of a true patriot's character. Yet theſe are the principles which Cicero here avows and defends.

The ambitious chiefs, Pompey and Cæſar, whoſe union was cemented only by views of intereſt, began at length to be at variance; an event accelerated by the death of Julia, who was tenderly beloved by both. The ſenate, in general, were in the intereſt of Pompey, who, confiding in the name and authority of ſo great a leader, were determined to humble the pride and ambition of his rival, by re-calling him from his government; whilſt Cæſar, on the other hand, relying on the fidelity of his troops, reſolved to keep poſſeſſion of his power, in defiance of the ſenate. This was the commencement of the civil war, which terminated in the deſtruction of the commonwealth, and in the final misfortunes of Cicero. In this poſture of affairs, Cicero was induced to accept the government of Cilicia, a character which he never before ſuſtained, and which he was anxious to decline, or, at leaſt, not to prolong, though in the eſtimation of reaſon it comprehends the moſt honourable period of his life. He formed the generous reſolution of practiſing in his provincial command thoſe admirable rules which he had previouſly drawn up for his brother, and from an employment to which he ſeems totally averſe, of gaining freſh acquiſition of glory and ſatisfaction, by leaving his adminiſtration as a model of juſtice and integrity to all ſucceeding proconſuls. To his friend Atticus, he tranſmitted a minute account of his proceedings, and it would be injuſtice to his memory not to make a ſhort extract of his detail. "I perceive that my moderation and diſintereſtedneſs give you pleaſure; but how would it be enhanced, had you been here in perſon? Many cities had the whole of their debts cancelled; many were greatly relieved, while all of them, being judged by their own laws and in their own forms, recovered their ſpirits by thus recovering their conſtitution. I have given thoſe cities a power of keeping themſelves free of debt, or making their debts very eaſy by two means; the one, that, during the whole time of my government, I have not put them, and I ſpeak without a figure, to one farthing of expence, I repeat it, not to a ſingle farthing. It is incredible how many cities have diſcharged their debts from this ſingle circumſtance. The other mean was the following: They were greatly plundered by thoſe among the natives, who, for ten years paſt, had been their magiſtrates, and who did not ſcruple to acknowledge the fact; and, therefore, to prevent a public cenſure, with their own hands returned the money to the people. By theſe means, the ſubjects, without any difficulty, have paid to our farmers of the revenue all the land-tax for this term, of which, till then, they paid nothing, and their arrears of the laſt. In all the other departments of my government, I proceeded with ſimilar addreſs, and my clemency has been joined to unexampled affability. In giving my audiences, I have laid aſide the formalities adopted by other provincial governors. I ſuffer no application to be made to my dependents, but directly to myſelf. Before day-break, I walk about in my houſe, as I uſed formerly to do, when I ſtood for public offices. This condeſcenſion ſecures me popularity and influence, and I was formerly ſo accuſtomed to it, that it gives me as yet no pain." How many millions of human beings would have been rendered happy if all the governors of the provinces could, with equal truth, have given a ſimilar account of their adminiſtration! His conduct in this, as well as in many other reſpects, proves that Cicero was naturally diſpoſed to be on the ſide of the people, and a foe to oppreſſion; that he delighted in acts of juſtice and beneficence, and that, however deſirous of diſtinction, he had more pleaſure in communicating happineſs to others than in accumulating to an immoderate extent the means of happineſs to himſelf; and that he never deviated from the true intereſts of his country, or ſupported the claims of ambition, but when allured by the ſplendid accompliſhments, or aided by the high authority, of the claimants. As a commander, he made a leſs enviable figure. Nature did not intend Cicero for a ſoldier; yet, by ſome ſucceſsful movements againſt the Parthians, and ſome advantages over the inhabitants of Mount Amanus, and of the town Pandeniſſum (a name which, however ſtrange to Atticus, meant only *a city on the hill*, and conveys the ſame meaning with Penthinas in Celtic, or Βουνουδυναζεια in Greek), he received the title of "Imperator," and returned home with laurelled lictors, claiming the honour of a triumph, and ſoliciting a decree of *thankſgiving*. When the queſtion for this decree was diſcuſſed in the ſenate, Cato roſe and expreſſed his opinion, that the military achievements of the commander little deſerved notice, but that his diſintereſted conduct as a governor was ſuch, that if triumph were decreed to virtues as well as to victories, he merited a thouſand. Of this fine compliment, beſtowed by ſo great a man, Cicero was informed, and he thus ſpeaks of it to Atticus; "The man who oppoſed that meaſure did me more honour than triumphs can beſtow."

The civil war, the ſparks of which began to appear before his departure, was now fully kindled on his return to Rome; and the firſt wiſh of his heart was to extinguiſh the flame between the contending parties, thinking, as he himſelf expreſſes it, that "peace between citizens, however unfavourable the terms, was more advantageous than the moſt juſtifiable war." But his hopes of accommodation, while Cæſar ſolicited his interference for that purpoſe, were fruſtrated by the ſtubbornneſs of Pompey, who expreſſed his determination either to conquer or to die in the cauſe of liberty, though he afterwards acted with a precipitation which forfeited all confidence either in his ſkill or his courage. Supported as he was by the ſenate, the patriots, by all the virtuous citizens and the united forces of the republic, he left Italy with its municipal towns, Rome with all its treaſures, to be the prey of Cæſar, which he ſeized with the rapacity and ſwiftneſs of a vulture. His unaccountable conduct in this reſpect induced him to charge Pompey with inability; and regarding him as one who had been guilty of ſailing out of harbour without a rudder, and committing himſelf to the mercy of the ſtorm, he long heſitated to follow him beyond ſea. Yet he was too much attached from gratitude and from principle to the cauſe of Pompey, however he might waver, finally to abandon it. This leader, indeed, Cicero knew was tyrannical in his views, and too prone to imitate the proſcriptions of Sylla; but, upon the whole, he conſidered him as the champion of public liberty, or, at leaſt, the country had leſs to dread from his cruelties than from the ambition of his rival. On the other hand, Cæſar he conſidered as a bold deſperate citizen, who wiſhed to ſubvert the civil conſtitution, and to accumulate in himſelf the whole powers of the ſtate. "Poſſeſſed," ſays he to Atticus, "of a powerful army, multitudes joining him from hopes and promiſes: his ambition graſps every object. Such is the man to whom Rome, deprived of the means of defence, but ſtored with riches, has been ſurrendered. What have we not to apprehend from one who looks upon Rome, with all her edifices, public and private, not as his country but his prey? Miſtaken wretched man! inſenſible to every idea of true glory! He pretends that all he does is to maintain his dignity. But can dignity exiſt without virtue? Is it compatible with virtue to continue at the head of his army, without the voice of the people to authorize him, and to ſeize cities inhabited by Romans, that he may open to himſelf a more eaſy paſſage to the heart of his country? Not to mention the cancelling of the national debts, the recal of the baniſhed, and a thouſand crimes that are yet to be perpetrated, before he can rear the temple of tyrannic power, the only deity he worſhips. I do not envy his greatneſs. I had rather ſpend one day with you in the ſunny walks of Lucretum, than be a monarch over innumerable kingdoms acquired by guilt like his. I had rather die a thouſand deaths than harbour ſuch an idea at the expence of my country. You think, you will ſay, for yourſelf. And is there a wretch who is not at liberty to think? But I repeat it, I think the man who acts in this manner is more miſerable than the wretch who lies extended on the wheel. There is but one miſery beyond it, and that is ſucceeding in the attempt."

Theſe ſentiments have their proper place aſſigned them in the Cato of Addiſon, but are too much coloured by paſſion to correſpond with the real features of truth; and in the letters which he ſent to Cæſar, he ſpeaks of him in terms ſo different, that they brought upon him the imputation of adulation and ſervility. Contrary to the general apprehenſion, Cæſar behaved with uncommon clemency; and Cicero himſelf, notwithſtanding his petulance, experienced his forbearance. Having triumphed over Italy by his humanity, he, about a year after, defeated his rival at Pharſalia. Cicero was not preſent at the battle, having, from indiſpoſition or chagrin, ſtayed behind at Dyrrhachium. He reſolved to give the uſurper no farther oppoſition, but to devote, in retirement, the remainder of his days to letters and philoſophy. He was adviſed by Atticus to addreſs an epiſtle to Cæſar, in commendation of his clemency and his military achievements, directing him, at the ſame time, in the uſe of his victories and the adminiſtration of the empire. This letter was compoſed, but, for fear of giving offence to ſome of Cæſar's dependents, was never ſent. It appears to have been written in a ſtyle of uncommon elegance, and the manly freedom with which he addreſſed the tyrant, would, if preſerved, have reflected great honour on his memory What he ſays to Atticus in reſpect to it is well deſerving of being tranſcribed; "You are no ſtranger to thoſe perſuaſive addreſſes which were made to Alexander by men of eloquence and learning. They addreſſed a young prince, fired with the love of the trueſt glory, and panting for thoſe counſels which lead to the ſummit of unperiſhable fame. Eloquence is not wanting, when it is inſpired by a ſubject truly glorious. This in Cæſar I do not poſſeſs. Nevertheleſs, from the untowardly materials of the oak, I have carved, if not the image of true glory, yet ſomething that bears the reſemblance of it, and becauſe ſome features in it are wrought with more exactneſs than thoſe uſually delineated, they are cenſured."

He rejoiced in the aſſaſſination of Cæſar by Brutus and Caſſius, though he had no previous knowledge of the conſpiracy. The hope of ſaving the country induced him again to take an active part in public affairs, and by his eloquence and authority he prevented Antony from ſucceeding to the empire. But betrayed by Octavius, whoſe cauſe he had eſpouſed, he was delivered up to the vengeance of his rival. The triumvirs agreed to divide the empire among themſelves, and to place Cicero at the head of the proſcription. This at firſt was kept a ſecret; but before it tranſpired, it was confidentially imparted to him while with his brother and nephew at his Tuſcan villa. He firſt fled towards Aſtura, with the intent of croſſing the ſea, but after embarking, the wind proving contrary, and the ſea tempeſtuous, he landed at Circæum, in order to repoſe in his Formian villa, weary of life, and declaring that he would die in that country which he had ſo often ſaved. His ſervants, anxious for his preſervation, prevailed upon him to be conveyed away in the morning. As ſoon as he was gone, the ſoldiers ſent in purſuit of him, arrived at the houſe, and perceiving that he was fled, they haſtened towards the ſea-coaſt, and overtook him in a wood, where they cut off his head and hands, and in triumph returned with them towards Rome. Antony ordered the head to be fixed on the roſtra between the two hands, and rewarded Popilius, the leader of the ſoldiers, with the honour of a civic crown, and the ſum of eight thouſand pounds. The whole city lamented the cruel fate of this eminent man, and wept at the ſight of thoſe members, once gloriouſly exerted in defence of the laws, the liberties, and the fortunes of the Roman people, but now ignominiouſly expoſed in that very place, to the ſcorn of ſycophants and traitors. His death occaſioned univerſal ſorrow; it was conſidered as the final triumph of deſpotiſm, and his blood as cementing the perpetual ſlavery of Rome. The writers of the Auguſtan age have paſſed over this cruel deed with inglorious ſilence, and ſought to draw over the cruelty of Antony and the perfidy of Octavius, the veil of eternal oblivion. Yet Paterculus could not refrain from the following beautiful expoſtulation: "Thou haſt done nothing, Antony; haſt done nothing, I ſay, by ſetting a price on that divine and illuſtrious head, and by a deteſtable reward procuring the death of ſo great a conſul and preſerver of the republic. Thou haſt ſnatched from Cicero a troubleſome being, a declining age, a life more miſerable under thy dominion than life itſelf; but ſo far from diminiſhing, thou haſt but increaſed the glory of his deeds and ſayings. He lives, and will live, in the memory of all ages; and as long as this ſyſtem of nature, whether formed by chance or providence, which he of all others beſt comprehended in his mind, and illuſtrated by his eloquence, ſhall remain unchanged, it will perpetuate the praiſes of Cicero; and poſterity, while they will admire his writings againſt thee, will curſe thy deed againſt him."

About the time of his conſulſhip Cicero married Terentia, a lady of family and fortune, who ſhared in the trials of his baniſhment with great firmneſs, and whom he then appears to have tenderly loved, but whom for ſome domeſtic grievance, at which he delicately hints in a letter to Atticus, he afterwards divorced. By Terentia he had a ſon and a daughter. The ſon, with all the advantages of education and example, inherited neither the talents nor the virtues of his father; but the daughter, as ſhe merited, poſſeſſed in an eminent degree his affections. She was firſt married to Piſo, a young nobleman of great promiſe; but being left a widow in the bloom of youth, ſhe again married Craſſipes, and afterwards Dolabella, from whom, without any imputation on her chaſtity and honour, ſhe was ſucceſſively divorced. She died of child-birth in the thirty-ſecond year of her age. Her father's grief was exceſſive. Retired from the world, and ſecluded even from his friends, he adopted the ſingular expedient of addreſſing to himſelf letters of conſolation, and we owe to his ſecluſion at that period, many of thoſe philoſophical treatiſes, which have ſince delighted and inſtructed the world. Thinking her deſerving of immortality, he had the weakneſs to ſeek her deification on earth, by erecting a temple in memory of her name and worth. Cicero believed the immortality of the human ſoul; but on the abſurd principle derived originally from the Chaldeans, that, being a particle of the deity, and exiſting previouſly to the preſent, it would continue to exiſt in a future ſtate. A faith thus borrowed from ſuperſtition, and unſupported by the force of truth, could have little effect upon his conduct, and he ſeems to have derived no comfort from the hope of being again reſtored to his beloved offspring. In a letter to Atticus reſpecting the death of a common friend, he urges the conſolatory maxim, that "we are born on the condition of ſubmitting to all the calamities entailed on our nature." But this ſentiment, however beautiful, is calculated rather to ſilence than to ſoothe complaint; and yet this is the fartheſt limit to which the light of natural religion extends. The diſciple of nature under affliction may ceaſe to grieve, becauſe to grieve is unavailing; becauſe the cauſe of his ſorrows is the inevitable lot of man. But the believer in revelation poſſeſſes ſources of real conſolation even in circumſtances of the greateſt diſtreſs. Deprived of his deareſt friends and relatives, and even in the proſpect of his own death, he looks through the evidences of chriſtianity to a renewed and more exalted being. His fears therefore are changed into reſignation, and his ſorrows ſubſide into ſerenity and joy.

The perſon of Cicero was tall and ſlender, with a long neck, but regular and manly features. His deportment was dignified and commanding, yet enlivened by cheerfulneſs and ſerenity. Though naturally weak, his conſtitution was made capable, by habit and diſcipline, of ſupporting all the fatigues of action and of ſtudy; while his moderation in reſpect to diet, with regular exerciſe, inſured him perpetual health and vigour. His temper was open and communicative; his attachments, domeſtic and ſocial, were warm and violent, but liable to change or abate with the change of objects or ſituation. While his connection with Atticus taught and exemplified the principle of genuine friendſhip, his frequent reconciliation, and even exertion in behalf of thoſe who had been his bittereſt enemies, prove that he poſſeſſed a forgiving and placable heart. His manner was free from the affectation of ſingularity; and in his dreſs he avoided the oppoſite extremes of ruſtic negligence and foppiſh delicacy. His villas, his gardens, and his ſtudies were highly magnificent, adorned with the moſt valuable monuments of art, and the moſt expenſive articles of furniture. The ſtyle of living, which he conceived ſuitable to his rank, and of entertaining his friends, was liberal to profuſion. He ſeemed to think that money, with whatever toils acquired, ſhould be chiefly ſpent by a man of rank, in the gratification of taſte. The want of economy and attention to his domeſtic affairs, ſometimes occaſioned embarraſſment to himſelf and loſſes to his friends; and he, whoſe talents enabled him to lay the whole community under tribute, was often under pecuniary obligations to inferior or obſcure individuals. But his predominant failing was vanity. He knew the extent of his own powers; he felt the high eſtimation in which he was held as a ſcholar, an orator, and a ſtateſman; he was ſenſible of the favours which his knowledge or his eloquence had conferred upon the public, and no commendation that might appear inadequate to the extent of his merits, could ſatisfy his appetite for praiſe. The parade with which he often ſpeaks of his conduct in the republic, or in the government of Cilicia; the frankneſs, with which he extols the eloquence of his own compoſitions, or the effects of his ſpeeches, his requeſt to Lucceius to write the annals of his conſulſhip, and to praiſe him, even at the expence of truth, are unfortunately ſtill recorded to perpetuate his weakneſs. But theſe imperfections, though they might detract from the dignity, did not impair the moral excellence of his character. Few perſons in chriſtian countries, and none in his own age, were upon the whole ſo free from vice. He was an entire ſtranger to the ſordid paſſions of luſt and avarice; and however vain, irreſolute, or inconſiſtent a part he ſometimes acted, he does not appear ever to have committed a crime. His candour in the various relations of life exemplified the leſſons of morality which his writings inculcate; and they are unqueſtionably the beſt and pureſt of which heathen antiquity can boaſt.

His character as an orator and philoſopher is too well known to need a minute delineation. His powers of writing and ſpeaking ſhone with unrivalled luſtre; and his name ſoon became ſynonymous with that of eloquence. According to the unanimous opinion of critics, he poſſeſſed in an eminent degree the qualities of a fine ſpeaker, a powerful voice, a commanding figure, graceful action, a brilliant imagination, a happy turn for wit and raillery, a correct taſte, and a ſound judgment; with a memory retentive and enriched with all the poſſible varieties of knowledge, which inceſſant ſtudy, active curioſity, converſation with the learned, and acquaintance with books could ſupply. With theſe endowments he ſoon roſe above all competition. At the commencement of his judicial career, he eclipſed the famed Hortenſius; and in the meridian of his glory, the forum and the ſenate ſerved but as a throne to raiſe him above others, and to diſplay to the view, not only of the empire, but of ſurrounding nations and diſtant ages, the royalty and magnificence of his genius. It was his chief ambition, as he profited by the example, to rival the fame of Demoſthenes; and if he did not poſſeſs the fire and energy of the Greek orator, he ſurpaſſed him in readineſs of elocution, in the harmony of his periods, and in the richneſs and variety of his ſentiments. With all the predilection of taſte, even in modern days, his ſtyle however is not deemed perfect; and he appears to have been diſapproved by his contemporaries, Brutus and Varro, as well as his admired critic Quintilian, for the technical uniformity of his arrangements, his frequently frigid attempts at wit, for the exuberance of his fancy, and the diffuſeneſs of his ſentiments.

As a philoſopher, he may be ſaid to have been a diſciple and imitator of Plato, whom he admired to enthuſiaſm, and to whoſe dignified ſtyle and enlarged principles, he acknowledged himſelf more indebted than to the artificial rules of rhetoric. In his ſcientific diſquiſitions, he avoids the rigour of the ſtoics, and the uncertainty of the ſceptics; and againſt the Epicureans, he maintains the exiſtence of a ſupreme being; the doctrine of a providence; the immortality of the human ſoul; and the natural, immutable difference between good and evil. But theſe important principles he adopted, rather on the authority of the academy, as conſonant with reaſon and virtue, than as the reſult of his own inquiry, and brought home to his conviction by irrefragable argument. We cannot therefore wonder, that, however they might amuſe his underſtanding, they had little influence on his heart, or that he ſhould have been more ſucceſsful in demoliſhing the opinions of his adverſaries, than in defining or eſtabliſhing his own. Cicero was the firſt Roman, Lucretius excepted, who diſcuſſed, in Latin, the philoſophy of Greece; and the ſeveral treatiſes which iſſued from his pen on that ſubject enriched the language, and enlarged the ideas of his countrymen. Of Grecian literature in all its branches, he had a profound and extenſive knowledge. The perſpicuity with which he ſtates the tenets of the reſpective ſchools, the frequency with which he quotes or alludes to paſſages in their philoſophers, orators, and poets, prove that their writings had not only paſſed through his hands, but were ſtill retained in his memory. He could write and ſpeak the Greek tongue with fluency; but ſome errors which he has committed, ſuggeſt a ſuſpicion that his knowledge of it was more ſpecious than ſolid, and that he was inferior in critical ſkill to his friend Atticus. See Tuſcul. Diſp. iv. 22. compar. with Dr. Clarke's note on Hom. Il. vi. 214. Guth. Tranſlation of his Letters to Attic. b. xiii. 21, laſt edition. Many of his writings are loſt; but thoſe which remain, will preſerve and endear his name, as long as literature is cultivated among men.

The works of Cicero, which are very numerous, have been commonly diſtributed into four claſſes, comprehending "Rhetorical Treatiſes," "Orations," "Philoſophical Works," and "Epiſtles." Of the firſt claſs the moſt valuable are his three dialogues: "De Oratore," the art of oratory, addreſſed to his brother Quintus; his book "De Claris Oratoribus," on illuſtrious orators, entitled, "Brutus;" and his "Orator," the orator, addreſſed to Brutus. The number of "Orations" remaining under his name, amount to fifty-ſix; and whilſt they comprehend the whole of his public life, they contain a treaſure not only of eloquence, but of other matters pertaining to hiſtory and juriſprudence. The matter of his "Philoſophical Works" was borrowed from the Grecian ſchool; of theſe, the principal that treat of the philoſophy of nature are "De Natura Deorum," a dialogue eloquently diſplaying the opinions of the Stoics and Epicureans, concerning the divine nature; "De Divinatione et Fato," exhibiting his ſuperiority to the ſuperſtitions of his age and country; "Somnium Scipionis," founded on the Platonic doctrines, concerning the ſoul of the world, and the ſtate of human ſouls after death. One of the moſt elaborate of Cicero's works that relate to moral philoſophy is entitled "De Finibus," and diſcuſſes the opinions of the Grecian ſects with regard to moral ends. His "Quæſtiones Tuſculanæ" treat of the contempt of pain and death, the remedies of grief and mental pertubation, and the ſufficiency of virtue to a happy life. His treatiſe "De Officiis" is an excellent ſummary of practical ethics, chiefly upon the principles of the Stoics. His "Quæſtiones Academicæ" contain his own opinions more directly than any other of his works. His dialogues entitled "Cato" and "Lælius" are very elegant pieces of moral writing. In his book "De Legibus" he explains the grounds of juriſprudence. His "Epiſtles," which are denominated "Familiar" with peculiar propriety, afford excellent ſpecimens of the ſtyle adapted to ſuch compoſitions, and abound with various matter, political and domeſtic. The ſuppreſſion of Cicero's "Poetry" has done no injury to his reputation.

The editions of Cicero's works, whole or in part, have been very numerous; of the former, ſome of the beſt are Elzevir's, 10 vols. 12mo. L. Bat. 1642. Gronovii, 11 vols. 12mo. 2 vols. 4to. Amſt. 1692. Verburgii, 16 vols. 8vo. 2 vols. fol. Amſt. 1724. Oliveti, 9 vols. 4to. Paris, 1740. Erneſti, 6 vols. 8vo. Halæ. 1773—77. Lallemand, 14 vols. 12mo. Paris, 1768. Oxford, 10 vols. 4to. Of his ſeparate works, all that have been edited by Grævius, Pearce, and Davis, merit recommendation. Moſt of his productions have been tranſlated into various languages. Melmoth's verſions of the "Epiſt. ad Familiares," and of the treatiſes on old age and friendſhip, are the beſt attempts of this kind in the Engliſh language. An improved edition of Guthrie's tranſlation of Cicero's Epiſtles to Atticus, with many additional notes, by Mr. J. Jones, in 3 vols. appeared in 1806. Of the various lives of Cicero, that of Melmoth is the moſt complete, though it has too much the air of a continued panegyric or apology. Aikin's Gen. Biog.

Cicero, in *Geography*, a military townſhip of America, in New York, on the S.W. ſide of Oneida lake, and between it, the Salt lake, and the Salt ſprings.

CICERONIASTRI, or Ciceroniani, in the *Hiſtory of Literature*, an appellation given to thoſe moderns who diſpute the propriety of all expreſſions and words not found in Cicero. Such was the eſtimation in which the Roman orator was held as a writer, that his admirers will not allow that he was ever equalled; and, accordingly, they ſay of him that no ſentiment occurs, in common with him and any other author, which is not beſt expreſſed by Cicero. Hence aroſe the enthuſiaſm excited by his works ſoon after the revival of literature, and the above-mentioned appellation.

CICERUM *lapis*, the *chich ſtone*, in *Natural Hiſtory*, a name given by ſome authors to a ſort of ſmall round ſtones, of the nature of the piſolithe or pea-ſtones, but ſmaller than thoſe uſually are, and of a duſky grey colour. They very exactly reſemble the fruit of the cicer or chich-pea, and are found in great abundance near the Old Jeruſalem.

CICHALIX, in *Ancient Geography*, a mountain of Aſia Minor, towards Bithynia.

CICHORACEÆ, in *Botany*, the firſt natural order in the tenth claſs of Juſſieu, with the following character; *Florets* all ſtrap-ſhaped and hermaphrodite, either entire or toothed at the tip. *Common calyx* of various forms. *Stigmas* two to each floret. *Seed* naked or downy. *Receptacle* naked or beſet with hairs or chaff. *The whole plant* lacteſcent, herbaceous, often cauleſcent. *Leaves* alternate. *Flowers* generally yellow.

Juſſieu has followed Vaillant in dividing this order into five ſections, which, though not perfectly natural, he thinks uſeful, and therefore not to be diſcarded. 1. Receptacle naked; ſeed not downy; *lampſana*, *rhagadiolus*. 2. Receptacle naked; ſeed downy; down capillary; *prenanthes*, *chondrilla*, *lactuca*, *ſonchus*, *hieracium*, *crepis*, *drepania*, *hedypnois*, *hyoſeris*, *taraxacum*. 3. Receptacle naked; ſeeds downy, down feathery; *leontodon*, *picris*, *helmintia*, *ſcorzonera*, *tragopogon*, *uroſpermum*. 4. Receptacle chaffy or hairy; down feathery or capillary; *geropogon*, *hypochæris*, *ſeriola*, *andryala*. 5. Receptacle chaffy; down awned or none; *catananche*, *cichorium*, *ſcolymus*. Ventenat has adopted the above diviſion, only adding arnoſeris, which he has formed into a diſtinct genus for hyoſeris minima of Linnæus, on account of its ſtriated ſeeds, crowned with an erect, coriaceous, entire border.

CICHORIO *affinis*, Pluk. Amalth. tab. 380, fig. 2. See SIEGESBECKIA *orientalis*.

CICHORIUM, (χιχωρη and χιχωριον; Theophraſt. lib. 7. cap. 7. and lib. 7. cap. 11.) It is ſaid by Pliny to be an Egyptian name, adopted by the Greeks. It was ſometimes written χιχορειον, whence the

"Cichorea leveſque Malvæ"

of Horace. The futile attempts of modern etymologiſts to derive it from the Greek are too contemptible to be noticed. Linn. Gen. 921. Schreb. 1251. Willd. 1427. Juſſ. 171. Vent. vol. ii. 492. Gært. 906. Tourn. Cl. 13. §. 2. Gen. 3. Chichorée; Lam. Encyc. Ill. Pl. 658. Claſs and order, *ſyngeneſia polygamia equalis*. Nat. ord. *Compoſitæ ſemifloſculoſæ*, Linn. *Cinarocephalæ*, Juſſ.

Gen. Ch. *Cal.* calycled or compoſed of two ranks of ſcales; inner ſcales commonly about eight, narrow-lanceolate, forming a cylinder before the opening of the flower, reflexed as the ſeeds ripen; outer ones about five, ſhort, looſe. *Cor. compound*, flat, uniform; florets twenty in a ring, ſtrap-ſhaped, deeply five-toothed. *Stam.* Filaments five; anthers united in a five-ſided hollow cylinder. *Piſt.* Germ oblong; ſtyle filiform, the length of the ſtamens; ſtigmas two, revolute. *Peric.* none. *Seeds* ſolitary, compreſſed, ſharply angular, crowned with an obſcurely five-toothed border, according to Linnæus. Gærtner aſſerts that it conſiſts of many leaves, or chaff like teeth, forming a kind of double ſeries. *Recep.* ſomewhat chaffy.

Eſſ. Ch. Receptacle ſomewhat chaffy. Calyx calycled. Seed crowned with a chaffy border ſhorter than itſelf.

Sp. 1. Cichorium *Intybus*. Linn. Sp. Plant. Mart. Lam. Willd. Flor. Dan. tab. 907. Gært. tab. 157. Curt. Lond. Faſc. 4. tab. 56. Woodville, Supp. tab. 248. Eng. Bot. 539. (Cichorium ſylveſtre f. officinarum: Bauh. Pin. 125. Tourn. 479. Seris picris; Lob. Ic. 128. Intybus ſylveſtris, Fuchs. 979.) Wild ſuccory. "Flowers in pairs, ſeſſile. Leaves runcinate." Linn. *Root* perennial, ſpindle-ſhaped; running deep into the ground, often branched, white, fleſhy, yielding a milky juice. *Stem* a foot and a half high and more, erect, ſtiff and firm, angular above, rough, leafy, except near the top, where it appears almoſt naked, many-flowered, branches divaricated. *Leaves* roughiſh; root ones runcinate; ſtem ones heart-ſhaped, embracing the ſtem, acuminate. *Flowers* axillary, in alternate pairs, large, handſome, blue, ſometimes white; calyx-leaves with a rough keel, finally reflexed. *Receptacle* dotted, with a few ſcattered chaffy hairs. *Seeds* angular, crowned with a ſhort border of chaff-like ſcales in a double ſeries. Whole plant bitter. A native of England and other parts of Europe, on the borders of corn fields and by road ſides, but moſt prevalent in a calcareous ſoil. When cultivated it is much more branched and riſes to the height of five or ſix feet, with longer leaves, leſs deeply cut and almoſt ſmooth. It is then Cichorium ſativum; Bauh. Pin. 125. Tourn. 479. Lob. Ic. 129. It certainly poſſeſſes conſiderable medical properties, though it has not obtained a place either in the London or Edinburgh pharmacopæas. Its virtues depend on its milky juice, which is of a penetrating bitteriſh taſte, and of no remarkable ſmell or particular flavour; the roots are bitterer than the leaves or ſtalks, and theſe much more ſo than the flowers. The roots and leaves are ſtated by Lewis to be "very uſeful aperients, acting mildly and without irritation, tending rather to abate than increaſe heat, and which may therefore be given with ſafety in hectic and inflammatory caſes. Taken freely, they keep the body open, or produce a gentle diarrhœa, and when thus continued for ſome time, have often proved ſalutary in beginning obſtructions of the viſcera, in jaundices, cachexies, hypochondriacal and other chronical diſorders." "A decoction of it," adds Dr. Woodville, "with others of the ſame kind, in whey, and rendered purgative by a ſuitable addition of polychreſt ſalt, has been found a uſeful remedy in caſes of biliary calculi, and promiſes advantages in many complaints requiring what have been termed attenuants and reſolvents; and we are warranted in ſaying, that its expreſſed juice taken in large quantities, has been found an efficacious remedy in phthiſis and pulmonalis. Its ſeeds are reckoned among the four ſmaller cooling ſeeds." Med. Bot. The juice mixed with rhubarb, according to Du Tour, (Nouveau Dictionaire), is an excellent vermifuge ſyrup for children.

It was commonly eaten by the Romans, and, when blanched, is ſtill uſed in France in ſoups or as a ſallad, but little, if at all, in England, where C. endivia is preferred. If ſteeped ſome hours in water, the water being changed every two or three hours, it loſes much of its bitterneſs. But this effect is more effectually produced by the operation of blanching, which leaves only ſo much bitterneſs as renders it not at all diſagreeable. In Italy it has long been cultivated on a large ſcale, and eſteemed, either green or dry, as an excellent fodder for horſes, kine, and ſheep. It was firſt introduced into France by Cretté de Pallael, and into England by the well-known Arthur Young, but the moiſt atmoſphere of our iſland is leſs favourable to its being made into hay. The wild ſuccory, ſays Du Tour, will grow in any kind of ſoil, but thrives beſt in a good one well manured, and is cultivated at a ſmall expence. It ſuſtains drought, exceſſive rains, and ſevere cold, and as it riſes early in the year, affords an excellent ſpring ſupply. Its growth is ſo rapid, that it may be cut three or four times every year, or more frequently. Its produce in bulk and in weight is ſuperior to that of trefoil and even of lucerne. There is no need of preparing cattle to uſe it as food; it is as wholeſome as it is abundant, ſweetens their blood, and preſerves them from diſeaſe. In particular, it cauſes cows to give more milk without communicating any of its bitterneſs, and furniſhes, eight months in the year, an excellent reſource for the former, affording the firſt herbage for cutting in the ſpring, and the laſt in autumn. In Germany its dried powdered root is mixed with coffee, in the proportion of one third or a half, and is preferred to tea as more nutritious and much cheaper. 2. C. *pumilum*, Willd. Jacq. Obſ. 4. p. 3. tab. 80. "Flowers axillary in pairs, ſeſſile; leaves inverſely egg-ſhaped, toothed." Willd. *Root* annual. *Stem* a foot or a foot and a half high, hiſpid, ſimple, or but little branched. *Upper leaves* lanceolate. 3. C. *endivia*, Linn. Sp. Plant. Mart. Lam. Willd. (C. latifolium, ſ. endivia vulgaris, Bauh. Pin. 125. Intybum ſativum, Dod. Pempt. 634.) Broad-leaved ſuccory or common endive. "Peduncles axillary, in pairs; one elongated, one flowered; the other very ſhort, with about four flowers; flowers in heads; leaves oblong, ſomewhat toothed; branches zig-zag. Willd. *Root* annual, or at moſt biennial, fibrous, milky. *Stem* two feet high, ſimple, hollow-channelled. *Leaves* alternate. There is a variety with curled leaves, which is almoſt excluſively cultivated in the ſouth of England as an early ſallad, but no kind of endive is much cultivated in the north. The French make a great conſumption of it at their tables, eating it raw in ſallads, boiled in ragouts, fried with roaſt meat, and as a pickle, and eſteeming it a wholeſome eſculent, which never diſagrees with the ſtomach. It poſſeſſes the ſame medicinal properties as cichorium intybus, from which Du Tour ſuppoſes it originally derived; but is a native of the Eaſt Indies, according to Willdenow, who aſſures us that he has in his herbarium a wild ſpecimen gathered near Coringo. 4. C. *divaricatum*, Willd. Schouſboe Maroc. p. 197. "Peduncles axillary, in pairs; one elongated; one flowered; the other very ſhort, with about two flowers; ſtem dichotomous; radical leaves runcinate; ſtem ones oblong, toothed." Willd. *Root* annual. *Branches* not zigzag. 5. C. *ſpinoſum*, Linn. Sp. Pl. Mart. Willd. Lam. Bauh. Pin. 126. Prod. tab. 62. (Chondrillæ genus elegans cæruleo flore, Cluſ. Hiſt. 2. p. 145.) "Flowers axillary, ſolitary; ſtem dichotomous; branches naked, ſpineſcent; leaves lanceolate, runcinate-toothed." Willd. *Root* biennial. *Stem* from five to eight inches high, ſtiff, ſmooth, green, much branched, panicled; ends of the ſmaller branches terminating in ſharp, ſtar-like ſpines. *Root-leaves* long, narrow, very ſmooth, blunt at the ſummit. *Stem-leaves* few, ſmall, entire. *Flowers*, like thoſe of all the other ſpecies, blue, chiefly ſituated in the forks of the ſtem and branches, but ſometimes terminal; florets few. A native of the iſlands of the Archipelago and of Sicily, in dry ſandy places near the ſea-coaſt.

C. *pratenſe luteum hirſutè aſperum*, Bauh. Pin. 126. See Picris *hieracoides*.

C. *pratenſe luteum lævius*, Bauh. Pin. 126. See Crepis *tectorum*

C. *verrucatum*, *zazintha*, Cluſ. Hiſt. 2. p. 144. See Lapsana *zazintha*, Linn.; Zazintha *verrucoſa*, Willd.

Cichorium, in *Gardening*, comprehends a plant of the eſculent kind, the broad-leaved endive or ſuccory (C. *endivia*). It is an annual or biennial plant, the ſtem of which riſes two feet in height, upright, round, thick, and branched; the root-leaves many, large, ſub-uniform, ſinuate-toothed, ſmooth on both ſides; the uppermoſt lanceolate, ſmall, of a whitiſh green colour, thick, and criſp, like coſs-lettuce, having pale, blue flowers, ſolitary, and peduncled. This is more proper for culinary uſes than for ſallads, and leſs hardy than the curled ſort. It is moſtly cultivated only for uſe in the autumn. It is a native of Japan and China.

The variety chiefly cultivated is the green, curled-leaved, which forms a circular cluſter cloſe to the ground, twelve or fifteen inches in diameter; the centre-leaves being numerous, very cloſely placed, and growing to a large, compact, finely branched, white heart. It is a fine, hardy variety, moſtly cultivated for ſallads and other culinary purpoſes. In its cultivation, the great point is to have the true ſort; as ſome have long, irregular, thinly-placed leaves, very little curled, and the heart open and looſe. In ſaving ſeed, the fulleſt leaved, moſt curly, regular, buſhy plants, that bottom well, and have the heart perfectly full, cloſe, and white, ſhould of courſe be choſen: the white, curled, which is ſmaller, having white, very fringy, curled leaves, in a circular cluſter cloſe to the ground, ten or twelve inches in diameter, very full and cloſe in the heart, is likewiſe valuable.

Method of Culture. All theſe plants are raiſed from ſeed, which ſhould be ſown at different times, from the beginning of June to the end of the following month, upon beds of fine, rich mould. And in order to have very early plants, it is a good practice to make a ſowing about the middle of May. But when the ſowings are made too early, the plants are apt to run to ſeed; and when they are deferred too long, they do not attain a ſufficient growth before they are ſet out in the autumn.

All theſe ſeparate ſowings ſhould be performed in as open an expoſure as poſſible, the ground being prepared by digging it over into proper beds, and reducing the earth well at the time. The ſeed ſhould then be ſown thinly over the ſurface, and lightly raked in. In the light ſorts of ſoil, it is the practice of ſome to tread it in, but this is ſeldom neceſſary.

Occaſional ſlight waterings ſhould be given when the weather is dry, and the plants be kept perfectly clear from weeds, and properly thinned out, ſo as not to draw up too faſt, and of courſe in a weak ſtate. When they are of ſufficient growth, as from four or five to ſix inches in height, they ſhould be planted out where they are to remain, which, for the more early plantings, ſhould be in as open a ſituation as poſſible; but, for the latter crops, the more ſouthern, ſheltered aſpects ſhould be preferred, in order that they may ſtand the ſeverity of the winter better. For this purpoſe, the ground ſhould be rich and mellow, being formed into beds about four feet in width, by digging over to a good ſpade's depth: a line ſhould then be extended the whole length, and the plants, after being taken up with their roots as perfect as poſſible, and their tops and roots trimmed when neceſſary, be ſet out in regular rows, ten or twelve inches diſtance each way, by means of a dibble, a good watering being given immediately afterwards when the ſeaſon is dry. In this mode each bed will contain four rows of plants. But they may be planted without having the ground formed into beds: the raiſed-bed method is however preferable, eſpecially for the winter crops, and where the ſoil is inclined to moiſture, as keeping the plants more free from ſtagnant wetneſs, and preventing their rotting in the winter. In theſe caſes they are often planted at ſmaller diſtances, as ſix or eight inches. Some likewiſe, for the late crops, are in the practice of forming a ſort of banks ſloping towards the ſouth, having the breadths of four or five feet, in which the plants are ſet out in rows in the ſame manner as above. In this way the plants ſtand higher, more dry, and are capable of being protected by frames or mats with greater facility, when the ſeverity of the winter renders it neceſſary. They are likewiſe more open to the influence of the ſun when the weather is fine. Where they have been ſet out cloſe, in theſe caſes, ſome may be drawn out in ſuch a manner as to leave the reſt ſtanding at the proper diſtances, which may be planted again in a warm border about February, or the beginning of the following month. Where plants of this ſort are ſet out in dry weather, it is a good method to make hollow drills, in order that the moiſture may be more perfectly retained. It is neceſſary that crops ſhould be planted out in ſome of theſe methods every fortnight or three weeks, from about the middle of June till the beginning of October, or later; by which means they will come forward in perfection, from the later ſummer months till the ſpring following, in order as they may be wanted for uſe. The only culture that is afterwards neceſſary, is merely that of keeping the plants free from weeds, by proper hoeing; and when they have attained their full growth, tying them up, in order that they may be effectually blanched, and rendered ſweet, criſp, and tender for uſe.

Method of Blanching the Plants. This is a proceſs that depends almoſt wholly upon the hearts of the plants being kept perfectly ſecluded from the action of light, and which has been attempted in many different methods, as by tying up the leaves of the plants cloſe together with pieces of baſs; by earthing the plants well up; by placing plane-tiles or boards flat upon them; and by tranſplanting the full-ſized plants into the ſides of raiſed ridges, putting them in the earth nearly up to their tops. The two firſt modes are chiefly employed in the autumn and ſpring crops, and the laſt in the winter. But the two firſt are by much the moſt effectual methods, when performed in a perfect manner, as, while they render the plants quite white and criſp in a regular manner, they do not cramp or reſtrain their growth; the latter of theſe is chiefly to be employed in dry ſoils, and ſhould be done at two or three different times, in order that too many may not be ready at once.

In the third mode, the hearts are rendered ſufficiently white and tender, but the growth of the plants is too much reſtricted, and the buſineſs is not performed in ſo regular or effectual a manner. The plants are likewiſe more liable to rot and be injured by different ſorts of inſects. The laſt is uſeful when there is danger of the plants rotting by an exceſs of moiſture. In whichever way the ætiolation of theſe vegetables is performed, it ſhould conſtantly be done when the plants are quite dry, in the middle of a fine day, as, when executed while they are wet, much loſs and injury are ſuſtained by their rotting. They moſtly become well blanched in the courſe of a fortnight or ſooner, where the light has been excluded in a very perfect manner.

In very ſevere winters, it is of great utility to cover the plants with ſome light material, ſo as to prevent their rotting and being deſtroyed.

Theſe plants may be well preſerved in the winter ſeaſon alſo, by being placed in dry ſand in a ſhed, cellar, or other convenient place which is dry.

In the ſaving of the ſeed of theſe plants, great care ſhould be taken to collect it from the beſt and moſt perfect of the different varieties, and to have it perfectly ripened, as without care in this reſpect it never anſwers well as ſeed in raiſing the different crops.

CICHYRA, or CICHYRUS, in *Ancient Geography*, a town of Epirus, according to Pauſanias; ſituated near Cocyta of the Acheron and the marſh Acheruſia.

CICIMENI, a name which, according to Pliny, was given to an ancient people who inhabited the banks of the Tanais.

CICINDELA, in *Entomology*, a beautiful genus of the *Coleoptera* tribe, found in general in dry ſandy places, and in none more abundantly or in greater variety than on the arid tracts of land upon the ſea-ſhore. They are extremely voracious, and prey on every other kind of inſects they can overcome, and on other animal ſubſtances. The larvæ of the cicindelæ are furniſhed with ſix feet; they are commonly whitiſh, ſoft, and long, and have the head ſcaly. Theſe larvæ live chiefly under ground, and, when waiting for prey lurk in a round perpendicular hole, with the head juſt emerging to the ſurface to ſeize upon other inſects that may happen to fall into the cell, or approach near it.

Species.

LONGICOLLIS. Thorax elongated, cylindrical, blue; thighs ferruginous. Olivier. Deſcribed and figured as a Siameſe inſect from a ſpecimen in the Bankſian Cabinet.

APTERA. Thorax elongated, cylindrical; body black; thighs ferruginous. Fabr. *Cicindela aptera*, Lund. Act. Soc. Hiſt. Nat. Havn. i. t. 5. An Eaſt Indian ſpecies.

ANGUSTATUS. Thorax cylindrical, blue; wing-caſes teſtaceous, with the tip black. Paykull. Inhabits Germany.

3. PUSTULATUS. Thorax cylindrical, black; wing-caſes with two ſpots at the baſe, and band in the middle ferruginous. Fabr. Inhabits Paris. Muſ. Tigny.

GROSSA. Black; wing-caſes pointed, with three white ſpots. Olivier.

Deſcribed from the Bankſian Cabinet. Inhabits the coaſt of Coromandel.

CYANEA. Blue, gloſſy; mouth teſtaceous. Fabr. Inhabits India.

MEGACEPHALA. Black, braſſy; wing-caſes ſtriated with dots; mouth, antennæ, and legs teſtaceous. Olivier. A native of Senegal.

BICOLOR. Green, gloſſy; wing-caſes duſky blue, and without ſpots; margin of the abdomen teſtaceous. Fabr. An Indian ſpecies. Bankſian Cabinet.

CAMPESTRIS. Green; wing-caſes with five white dots. Linn. Geoff. Donov. Brit. Inſ.

A general inhabitant of Europe. Found in ſandy places, and is a beautiful and common inſect.

GERMANICA. Green; wing-caſes with a dot and lunule near the tip white. Linn.

Inhabits Europe. Found in England, but not common. Donov. Brit. Inſ.

SYLVATICA. Purpliſh, fuſcous; wing-caſes with an undulated band, and three dots of whitiſh. Marſh. Ent. Brit. *Cicindela ſylvatica*. Linn.

An European ſpecies; a native of England, but very rare; it has been found on Martleſham Heath near Woodbridge, in Suffolk. Vide Donov. Brit. Inſ.

HYBRIDA. Somewhat purpliſh; band and two lunules on the wing-caſes white; body ſhining gold. Linn. Found in Europe.

ARENARIA. Head and thorax duſky coppery; wing-caſes with black, two lunules and a band in the middle white; body black. Fabr. A native of Barbary.

LITTORALIS. Duſky, braſſy; wing-caſes blackiſh, with ſix whitiſh dots, that at the baſe lunated, the middle one tranſverſe. Fabr. Inhabits the ſhores of Barbary.

TRISTIS. Black; wing-caſes with a yellow ſpot in the middle. Olivier. Native place unknown.

INTERRUPTA. Wing-caſes brown, with a yellow dot at the baſe, three interrupted yellow bands, and a ſmall line at the tip. Fabr. Inhabits Africa.

LUNULATA. Black; wing-caſes with two lunules, and two white ſpots, the inner one tranſverſe. Forſter. Native country unknown. Bankſian Cabinet.

LURIDA. Duſky; wing-caſes with two dots, and three lunules of white, the middle one flexuous. Forſter. Country unknown.

CHINENSIS. Blue and gloſſy; wing-caſes greeniſh, with two black ſpots, the poſterior one with two white ſpots. Degeer, &c. A native of China.

FLEXUOSA. Duſky; wing-caſes with four dots and three lunules of white, the middle one flexuous. Fabr. Found on the Spaniſh coaſt. Dahl.

CAPENSIS. Somewhat braſſy; wing-caſes white, with a tri-ramoſe line. Linn. Inhabits the Cape of Good Hope.

TURERCULATA. Thorax fuſcous, with two tubercles;

wing-caſes fuſcous and green, varied; margin white, and three-toothed. Fabr. Inhabits New Zealand.

Unipunctata. Pale purple; tip and dot on the wing-caſes white. Fabr. An American ſpecies.

Bipunctata. Black; wing-caſes with a white dot; legs yellow; thighs black. Olivier. Country unknown. Bankſian Cabinet.

Sex-Punctata. Braſſy-green; wing-caſes with the diſk more duſky, and three white dots. Olivier.

Quadrilineata. Braſſy-green; wing-caſes duſky; margin and line in the middle white. Olivier.

Cincta. Black; wing-caſes with a lateral ſtripe, and three dots of white. Olivier. Inhabits Africa. Hunterian Cabinet.

Biramosa. Duſky, braſſy; wing-caſes margined with a double branching white line. Herbſt. *Cicindela tridentata*, Thunberg. Inhabits India.

Sex-Guttata. Green, ſhining; wing-caſes with three marginal white dots. Olivier. Inhabits Virginia.

Catena. Braſſy-green; wing-caſes whitiſh, with ſix green concatenate dots. Fabr. Thunb. &c. Inhabits India.

Marginata. Green; wing caſes with a white margin, waved band, and two dots of white. Fabr. Inhabits Virginia.

8-Guttata. Duſky; wing-caſes with four dots on the diſk, and two marginal lunules of white. Olivier. Inhabits America.

Trifasciata. Duſky; wing-caſes with three white ſtreaks, the ſecond flexuous. Fabr. An American ſpecies. A ſmall variety is ſaid to inhabit Italy.

Carolina. Green, ſhining; tip of the wing-caſes, mouth, antennæ, and legs yellow. Linn. A native of North America.

Virginica. Shining; mouth, antennæ, and legs teſtaceous. Linn. Inhabits Carolina.

Cajennensis. Above fuſcous, beneath blue; tail and ſhanks of the poſterior legs teſtaceous. Fabr. Inhabits Cayenne. Rohr.

Emarginata. Blue; mouth, antennæ, and legs rufous; wing-caſes emarginate at the tip. Fabr. *Carabus dentatus*, Roſſi.

Æquinoctialis. Yellow; wing-caſes with two broad black bands. Linn. Found in Surinam.

Maura. Black; wing-caſes with ſix white dots, the third and fourth parallel. Linn. Inhabits the Eaſt Indies.

Minuta. Braſſy; wing-caſes with four marginal yellow lunules. Fabr. Inhabits India.

Japonica. Violet; wing-caſes with the baſe, tip, and band coppery; and a yellow band and two dots. Thunberg. Inhabits Japan.

Austriaca. Green; breaſt, and baſe of the abdomen beneath red bronzed; wing-caſes with a very thin golden margin and a few white dots. Schrank. Inhabits Auſtria.

Riparia. Braſſy-green; wing-caſes with broad excavated ſpots. Linn.

Inhabits Europe, and is found, though generally ſparingly, in England. Donov. Brit. Inſ.

Uliginosa. Braſſy-green; wing-caſes ſtriated with blue impreſſed dots. Panoz. &c. Inhabits Europe.

Aquatica. Braſſy, gloſſy; head ſtriated. Linn. Inhabits Europe.

Striata. Braſſy; wing-caſes ſtriated; legs yellowiſh. Paykull, &c.

Diſcovered on the ſandy coaſt of Glamorganſhire by Mr. Donovan. Vide "Deſcriptive Excurſions, South Wales, &c."

Semipunctata. Braſſy and gloſſy; wing-caſes dotted; back very glabrous. Gmel. *Cicindela ſtriata*, Degeer. Found in Europe.

Flavipes. Duſky-braſſy; wing-caſes ſomewhat clouded; legs pale yellow. Linn. An European ſpecies.

Biguttata. Braſſy; wing-caſes poliſhed, and yellowiſh at the tip. Gmel. &c. Inhabits England, and other parts of Europe.

CICINES, in *Ancient Geography*, a people of Greece, in Attica. Heſychius places them in the Acamantide tribe.

CICISBEO, an Italian term, in its etymology ſignifying a *whiſperer*; which has been beſtowed in Italy both on lovers, and on thoſe who to outward appearance act as ſuch, attending on married ladies with as much attention and reſpect as if they were their lovers. When the cuſtom of ſecluding the wife from all mankind but her huſband took place in Italy, it became the faſhion that ſhe ſhould never be ſeen with her huſband, and yet always have a man at her elbow. The Italian huſbands, finding that confinement was a plan generally reprobated, and that any appearance of jealouſy ſubjected the huſband to ridicule, agreed that their wives ſhould go into company or attend public places, but always with a friend whom they could truſt, and who, at the ſame time, ſhould not be diſagreeable to the wife. As this compromiſe could not fail of being acceptable to the women, the ſyſtem ſoon became univerſal all over Italy, for the woman to appear at public places leaning upon the arm of a man; who, from their frequently whiſpering together, was called her Ciciſbeo. It was ſtipulated, at the ſame time, that the lady, whilſt abroad under his care, ſhould converſe with no other man but in his preſence, and with his approbation; he was to be her guardian, her friend, and gentleman-uſher. The preſent cuſtom is, that this obſequious gentleman viſits the lady every forenoon at her toilet, where the plan for paſſing the evening is ſettled; he diſappears before dinner, for it is uſual in Italy for the huſband and wife to dine together tête-à-tête, except on great occaſions, as when there is a public feaſt. After dinner the huſband retires, and the Ciciſbeo returns and conducts the lady to the public walks, the converſazioné, or the opera; he hands her about wherever ſhe goes, preſents her coffee, ſorts her cards, and attends with the moſt pointed aſſiduity till the amuſements of the evening are concluded; he accompanies her home, and delivers up his charge to the huſband, who is then ſuppoſed to reſume his functions. At the beginning of this inſtitution, the huſbands, ſays Dr. Moore (View of Society and Manners in Italy, vol. 2.) preferred the Platonic ſwains, who profeſſed only the metaphyſics of love, and whoſe lectures they imagined might refine the ideas of their wives, and bring them to the ſame way of thinking. In many inſtances, no doubt it would happen, that the Platonic admirer acted with "leſs ſeraphic ends;" but theſe inſtances ſeem only as proofs that the huſbands were miſtaken in their men; for however abſurd it may appear in the eyes of ſome people, to imagine that the huſbands believe it is only a Platonic connection which ſubſiſts between their wives and the Ciciſbeos; it is ſtill more abſurd to believe, as ſome ſtrangers who have paſſed through this country ſeem to have done, that this whole ſyſtem of Ciciſbeiſm was from the beginning, and is now, an univerſal ſyſtem of adultery, connived at by every Italian huſband. To get rid of this difficulty, it is ſuppoſed that the men, who, of all the inhabitants of Europe, were the moſt ſcrupulous with regard to the chaſtity of their wives, ſhould acquieſce in, and in a manner become ſubſervient to, their proſtitution.

tion. In ſupport of this ſtrange doctrine, it is aſſerted, that the huſbands being the Ciciſbeos of other women, cannot enjoy this privilege on any other terms; and are therefore contented to ſacrifice their wives for the ſake of their miſtreſſes, Dr. Moore has no doubt, that ſome individuals may be profligate enough to act in this manner; but that ſuch a ſyſtem is general, or any thing near it, in Italy, ſeems to him perfectly incredible, and contrary to the beſt information received by him, whilſt he remained in the country. It is alſo urged, that moſt of the married men of quality in Italy act in the character of Ciciſbeo to ſome woman or other; and thoſe who are not Platonic lovers, ought to ſuſpect that the ſame liberties are taken with their wives which they take with thoſe of their neighbours. However men have a wonderful faculty of deceiving themſelves on ſuch occaſions. So great is the infatuation of their vanity, that the ſame degree of complaiſance, which they conſider as the effect of a very natural and excuſable weakneſs, when indulged by any woman for themſelves, they would regard as a horrible enormity if admitted by their wives for another man; ſo that whatever degree of licentiouſneſs may exiſt in conſequence of this ſyſtem, the majority of huſbands (as Dr. Moore is convinced) make exceptions in their own favour, and their ladies find means to ſatisfy each individual that he is not involved in a calamity, which, after all, is more general in other countries, as well as in Italy, than it ought to be. The Ciciſbeo is, in many inſtances, a poor relation or humble friend, who, not being in circumſtances to ſupport an equipage, is happy to be admitted into all ſocieties and to be carried about to public diverſions, as an appendage to the lady. There are alſo Ciciſbeos of a very different ſtamp, whoſe figure and manners might be ſuppoſed more agreeable to the ladies they ſerve, than to their lords. But, ſometimes, the huſband is poor, and the Ciciſbeo rich. This ſyſtem is unknown to the middle and lower ranks; inſomuch that a perſon who attempts to viſit the wife or miſtreſs of any of the trades-people without their permiſſion, is in no ſmall danger of a coltellata. This Italian cuſtom has been ſpoken of very reproachfully by ſome writers: Mr. Baretti (Account of the Manners, &c. of Italy, vol. i. c. 8.) has taken great pains to vindicate it. He aſcribes it to a ſpirit of gallantry, derived from the ages of chivalry, and much heightened and refined by the revival of the Platonic philoſophy in Italy, about the thirteenth century; and by the verſes of Petrarch in compliment to the beautiful Laura, and his numerous imitators.

In France, under the old ſyſtem, there was an important claſs of females, who might not improperly be denominated female Ciciſbeos. When the rank of a woman of faſhion had enabled her to preſerve a degree of reputation and influence in ſpite of the gallantries of her youth and the decline of her charms, ſhe adopted this kind of equivocal character, and, relinquiſhing the adoration claimed by beauty, and the reſpect due to age, charitably devoted herſelf to the inſtruction and advancement of ſome young man of perſonal qualifications and uncertain fortune. By her exertions he was promoted in the army, or diſtinguiſhed at the levee, and a career, begun under ſuch auſpices, often terminated in a brilliant eſtabliſhment.

CICLA, in *Botany*. See BETA *cicla*.

CICLUT, in *Geography*, a fortreſs of Dalmatia, ſeated on an iſland formed by the river Narenta; taken from the Turks by the Venetians in 1694; 5 miles S.W. of Narenta, and 40 N. of Raguſa.

CICOLES, in *Ancient Geography*, a port of Thrace, which, according to Suidas, was that of Terone.

CICOLI, in *Geography*, a town of Naples, in the province of Abruzzo Ultra; 13 miles S.W. of Celano.

CICONES, in *Ancient Geography*, a people of Aſia placed by Pliny between the Indus and the Attæciani.—Alſo, a people of Thrace, who inhabited the country lying between the Hebrus and the Melas. The city of Enos, famous on account of the tomb of Polydorus, was their capital. Homer (Iliad. β) ſpeaks of three of their kings. In his Odyſſey, he ſpeaks of them as a numerous, well-diſciplined, and warlike people. From Herodotus we learn, that they had formerly inhabited part of the Samothracian towns, ſince the promontory of Serrhium had belonged to them; and that, in proceſs of time, they were driven more to the north and to the weſt by the Samothracians.

CICONIA, in *Ornithology*, the ARDEA *Ciconia* of Linnæus and Gmelin, or *Ardea alba*, with black orbits and wing-quills, and ſanguineous bill, legs, and ſkin. This is the *white ſtork* of Pennant and Latham, and the *la cicogne blanche* of Buffon. It inhabits Europe, Aſia, and Africa, but is more rarely met with in Italy and England; ſettling in towers, chimnies, and ruins near our dwellings, fiſhing in our rivers, purſuing its prey in our gardens, and occaſionally taking up its abode in the midſt of cities. For a further account of it, ſee STORK.

CICONIA *nigra*, *ardea fuſca*, having its breaſt and belly white, the *cicogne noire* of Buffon, the black ſtork of Pennant, Ray, Willughby, and Latham. It is found in the Swiſs Alps, Poland, Pruſſia, Lithuania, Sileſia, and many other parts of Germany, and as far as the Caſpian ſea. This ſpecies is ſavage and ſolitary, ſhunning the habitations of men, and haunting the deſert fens. Theſe birds ſoar to a great height. Numerous flocks of them paſs in the ſpring over Sweden, and ſtretch farther towards the north; they return towards the ſouth in autumn. See STORK.

CICONIA *americana* of Briſſon, Ray, and Willughby, the *maguari* of Buffon, the *ardea maguari* of Gmelin, and *American ſtork* of Latham. It inhabits the hotter parts of America, particularly Braſil, and was firſt deſcribed by Marcgrave. Its orbits and legs are red, its bill cinereous, the quills and great coverts of the wings black, gloſſed with green; and the whole body, head, neck, and tail inveſted with white feathers, which below the neck are of a conſiderable length and pendulous.

CICONIÆ, one of the five ſections of the *ardea* genus, according to Gmelin, including the three preceding ſpecies. See ARDEA.

CICONIUM PROMONTORIUM, in *Ancient Geography*, a promontory of Aſia Minor, upon the Boſphorus of Thrace.

CICONUM FLUMEN, a river of Thrace, paſſing through the country of the Cicones, and mentioned both by Pliny and Ovid.

CICONUM *Mons*, a mountain of Thrace, ſuppoſed to be the ſame with Iſmanus.

CICOYRUS, a town of Epirus, in Theſprotia, ſituated, according to Strabo, on the "Dulcis portus," who ſays that it was once called Ephyra.

CICSITANUS, an epiſcopal town of Africa, in the proconſular province.

CICUS, a river of Thrace, which diſcharged itſelf in the port of Byzantium.

CICUTA, in *Botany*, (in Latin authors, denotes the internode or ſpace between the joints of a reed, or of any plant uſed by ſhepherds for making their rural pipes; and as the hollow ſtems of ſeveral plants belonging to the natural family of umbelliferæ, known in England by the popular name of kecks or keckſies, were frequently employed for that purpoſe, the name was particularly applied to them, eſpecially to thoſe which are of a poiſonous nature,

ture, one of them having been employed by the Athenians as a mode of capital puniſhment.) Linn. Gen. 354. Mart. ſub. voce. Willd. 550. Cicutaria; Riv. Lam. Juſſ. Vent.) Claſs and Order, *pentandria digynia*. Nat. Ord. *Umbellatæ*, Linn. *Umbelliferæ*, Juſſ.

Gen. Ch. *Umbel univerſal* roundiſh; rays many, equal; involucre none, or conſiſting of one or two linear leaves. *Umbel partial* roundiſh; rays many, equal, ſetaceous; involucre, many-leaved; leaves briſtly, ſetaceous, ſhort. *Calyx* of the florets ſcarcely viſible. *Cor.* Florets all fertile conſiſting of five, egg-ſhaped, inflected, nearly equal petals. *Stam.* Filaments five, capillary, longer than the corolla. *Piſt.* Germ inferior; ſtyles two, filiform, longer than the corolla, permanent; ſtigmas headed. *Peric.* none; fruit ſomewhat egg-ſhaped, furrowed, diviſible into two. *Seeds* two, convex and ſtriated on one ſide, flat on the other.

Eſſ. Ch. Fruit ſomewhat egg-ſhaped, furrowed.

Sp. 1. C. *viroſa*. Linn. Sp. Pl. Mart. Willd. Flor. Dan. tab. 208. Eng. Bot. 479. Woodv. Sup. tab. 248. (Cicutaria aquatica; Lam. Sium; Bauh. Pin. 154, n. 3. Hal. Helv. n. 781. Mor. Hiſt. 3, tab. 5. fig. 4. Umb. tab. 5. S. paluſtre alterum, foliis ſerratis; Tourn. 308. Lob. Ic. 208.) Long-leaved water hemlock. "Umbels oppoſite the leaves; petioles margined, obtuſe." *Root* perennial, tuberous, hollow, cellular; fibres ſomewhat whorled. *Stem* three or four feet high, branched, furrowed, leafy; branches rather erect. *Leaves* twice ternate; larger ones pinnate; leaflets lanceolate, acute, ſerrated, ſmooth; ſtipulæ linear, adnate to the petioles, and a little ſhorter. *Umbels* erect, many-rayed; partial ones denſe. *Flowers* white, regular, ſmall; calyx five-parted; petals rolled inwards. *Fruit* compreſſed, rounded, almoſt didymous, ribbed. A native of ſtagnant pools and the margins of rivers in England and all the north of Europe, but not common in England. Towards the end of autumn, the root for the ſucceeding ſummer is formed out of the lower part of the ſtem; and being tranſverſely divided into many large unequal cells, ſo as to become ſpecifically lighter than water, it is buoyed up when the rivers or pools ſwell in winter. The old root then rots, floats all the winter, and in rivers is frequently carried to conſiderable diſtances. In the ſpring the old root is waſhed away, and the new one, on coming near the ſoil, ſends out many ſlender fibres, by which it is again fixed, grows, and flowers. It is reckoned one of the moſt virulent of our vegetable poiſons to the human race, and is equally fatal to cows and ſwine; but horſes, hogs, and goats eat it with impunity. The beſt remedy againſt its deleterious effects, when unfortunately taken into the ſtomach, is a ſpeedy emetic, ſucceeded by vegetable acids or oils. 2. C. *bulbifera*, Linn. Sp. Pl. Mart. Willd. (Cicutaria bulbifera; Lam. Enc. Ammi foliorum laciniis capillaribus caule angulato; Gron. Virg. 31. Umbellifera aquatica, foliis in monatiſſima et plane capillaria ſegmenta diviſis. Rai. Sup. 260.) "Stem bulbiferous," Linn. "Leaves divided into very numerous linear ſegments; branches bulbiferous." Lam. *Stem* a foot and a half high, ſmooth, branched; branches not bearing umbels, very ſlender, zig-zag, furniſhed with ſimple narrow leaves, and frequently with other ſmall axillary branches; from the axils of each branch ſprings an oval bulb, ſcarcely the ſize of a grain of wheat. *Flowers* white, ſmall, forming a ſmall umbel at the ſummit of the ſtem; univerſal umbel of one or two leaves. A native of Virginia and Canada. 3. C. *maculata*. Linn. Sp. Pl. Mart. Willd. (Cicutaria maculata. Lam. Enc. ægopodium foliolis lanceolatis, acuminatis, ſerratis; Gron. Virg. 32. Angelica caribæarum; Pluk. Alm. tab. 76. fig. 1. A. virginiana, foliis acutioribus, ſemine ſtriato; Moriſ. Hiſt. 3. p. 281. Myrrha; Mitch. Gen. 18.) "Serratures of the leaves mucronate, petioles membranous, two-lobed at the tip." Linn. "Leaves twice-pinnated; leaflets ſerrated; partial involucres ſhorter than their umbels." Lam. *Root* perennial, creeping. *Stem* a foot and a half or two feet high, upright, ſmooth, hollow, purple-brown, ſpotted near the bottom, a little branched towards the top. *Leaves* twice pinnated; leaflets lanceolate, green, finely ſerrated. *Flowers* white, ſmall, almoſt regular, generally without an univerſal involucre. A native of watery places in Virginia.

C. *domeſtica*, Moriſ. Umb. p. 18. c. 6. See CONIUM *maculatum*.—C. *major*, Bauh. Pin. See CONIUM *maculatum*.—C. *minor petroſelino ſimilis*, Bauh. Pin. 160. See ÆTHUSA *cynapium*.—C. *arbor virginiana*, Pluk. Mant. 49. See CHÆROPHYLLUM *arboreſcens*.

CICUTA, in the *Materia Medica*. *Conium Maculatum*, Linn. Hemlock.

The poiſonous qualities of this plant have been known for a great length of time; but it was ſcarcely adopted in medicine before the experiments of Dr. Stork, in 1760, ſince which time it has been introduced in moſt of the pharmacopœias of Europe. Although it has by no means anſwered the ſanguine expectations which were entertained of its virtues in ſeveral of the moſt formidable, and hitherto incurable diſeaſes, it is ſtill found to poſſeſs ſeveral valuable medicinal qualities.

The whole of the plant appears to poſſeſs the ſame power of affecting the human body, ſo that this power reſides in the common juice which pervades the plant. The part actually employed in medicine is all above the root, and as the plant is very ſucculent, it readily yields a conſiderable quantity of juice on ſtrong preſſure, which, when gradually inſpiſſated by evaporation, affords a brown *extract*, or *inſpiſſated juice*, which, with the dried leaves, are the only pharmaceutical preparations in uſe. This plant has a ſtrong and unpleaſant ſmell, but little, if any, peculiar taſte. When taken in a large doſe it produces vertigo, coma, convulſions, and ſometimes death. In ſmaller doſes it occaſions a trembling of the limbs, ſickneſs, head-ach, and ſenſe of fullneſs in the eyes; ſometimes temporary deafneſs, and now and then diarrhœa. Its effects, therefore, properly require it to be claſſed among the *narcotic* medicines, and it often ſhows only the more valuable properties of narcotics, in relieving pain and irritation of the body, and inducing ſleep.

The following are Dr. Withering's directions for preparing the extract, or inſpiſſated juice. "Let ſeveral people be employed to gather the plant, and as faſt as it is cut let others carry it in hand-baſkets to the preſs. Let the juice be immediately ſqueezed out, and as faſt as it runs out of the preſs it muſt be put over the fire and boiled, till three parts out of four of the whole liquor is waſted. Then it muſt be removed to a water-bath, and evaporated to the conſiſtence of honey. If it is now taken and ſpread thin upon a board or marble ſlab, and expoſed to the ſun and air, it will ſoon be of a proper conſiſtence to make pills."

In this ſimple method is the extract of cicuta prepared. This extract is of a dark greeniſh brown, almoſt black, of a ſtrong diſagreeable ſmell, and a ſlightly pungent taſte, but without bitterneſs. Like the other extracts of herbaceous plants (for the chemical properties of which ſee the article EXTRACT) it contains but little reſin, but is conſiderably deliqueſcent, owing to the preſence of ſome acetite of potaſh, as may be at once perceived by adding a few drops of ſulphuric acid, which will diſengage a pungent vapour of acetous acid. Owing to this deliqueſcence the extract ſhould be kept in pots covered with bladders, for in the open air it ſoon moulds, and its virtues are loſt.

Some pharmaceutical authors direct that the expreſſed juice ſhould ſtand a ſhort time to clarify, and only the clearer part evaporated; but this is decidedly injurious, as there

there is every reaſon to believe that the part, which would in this caſe be rejected as feculence, is at leaſt as efficacious as the clear juice, ſo that, as Dr. Withering has directed, the entire juice ſhould be employed. More care is required to avoid empyreuma in the preparing of this extract, than in that of gentian, cinchona, and other plants, where the bitter principle is chiefly required, for the virtue of the hemlock is ſoon injured by heat. But as inſpiſſation in the water-bath is exceſſively tedious, many chemiſts uſe ovens very moderately heated, or ſtoved chambers, which in the large way are preferable, as they afford a greater ſurface for evaporation. Inſtead of compleating the evaporation to the proper pillular conſiſtence, ſome direct that the ſoft extract ſhould be made into a pillular maſs, by adding about a fifth of its weight of the leaves of the plant dried and powdered.

With all the care that can be taken in keeping this extract, its virtues are materially impaired in a few months, ſo that thoſe who are in the habit of employing it ſhould always provide a freſh ſtock every year. The ſeaſon for gathering this, as of moſt other herbaceous plants uſed in medicine, is when the plant is full grown, and about to flower. From the teſtimony of Dr. Withering, the dried leaves are more uniform in their operation, and leſs liable to ſpoil by keeping, than the extract. They ſhould be kept in cloſely-ſtopped bottles, and in the dark. In exhibiting the hemlock, the extract is uſually made into pills of about two grains each, of which one may be taken for a doſe three times a day, and this may be rapidly increaſed, till ſome of the peculiar effects of the hemlock be perceived, after which the ſame doſe, or nearly ſo, may be perſiſted in for as long a time as is thought proper. Of the powder, from fifteen to twenty grains may be taken twice or thrice a day. Of all the powerful narcotics the cicuta is perhaps the moſt uncertain in its operation in a given doſe. This, no doubt, in part depends on the want of uniformity in the ſtrength of the ſeveral preparations; but even with the ſame individual preparation, ſome perſons will be ſenſibly affected by a few grains, and others will bear perhaps eight or ten times the quantity. In its moſt favourable operation it ſimply alleviates pain, without occaſioning ſickneſs, or head-ach, and often, without producing a greater tendency to ſleep than what belongs to the mere effect of the ſuſpenſion of pain in haraſſing and chronic diſeaſes; ſo that it is then a moſt valuable ſubſtitute to opium, the good effect of which it ſecures, without occaſioning the inconveniences inſeparable from this valuable medicine. Unfortunately, however, it is (comparatively ſpeaking) but rarely that the cicuta operates in this favourable manner, and very frequently it either produces no effect at all, except nauſea, or ſuch a degree of head-ach, vertigo, and debility, which render it unſafe to continue its uſe.

The cicuta was chiefly recommended by Dr. Stork, as a new and valuable remedy for cancer, and ſchirrous tumours of all kinds, for chronic ulcerations depending on ſcrofula, or any conſtitutional diſeaſe. The obſervations of others, however, have led to a juſter eſtimation of its powers, for (in this country at leaſt) no dependence can be placed on it as a cure for cancer, though it is often uſeful as a palliative. It has been employed alſo with ſome ſucceſs in the hooping cough, and other ſpaſmodic diſorders. As an external application, it is of great uſe in painful and extenſive ſores of a cancerous nature, when applied as a warm fomentation or poultice, giving conſiderable eaſe, and changing the nature of the diſcharge, from a thin fœtid ſanies to healthy pus. In this, part of the good effect is doubtleſs to be aſcribed to the narcotic quality of the plant, but part alſo to the mode of application, and to the efficacy which appears common to almoſt all freſh vegetables; ſince a ſimilar advantage is derived from the carrot poultice, from the marſh-mallow fomentation, and from many other of the medicinal herbs in common uſe.

The cicuta of the ancients, is a ſecret now ſcarce poſſible to be diſcovered. Wepfer, in an expreſs treatiſe on the ſubject, will have it the ŒNANTHE *cicutæ facie, ſucco viroſo;* which he deſcribes by the name of *cicuta aquatica;* and of the diſmal effects of which he gives a very ample relation. At leaſt the violence of this plant makes it a much fitter inſtrument of haſty death than the common cicuta or hemlock, which is much leſs malignant. Though ſome have ſuggeſted, that the poiſonous draught to which the Athenians doomed their criminals, was an inſpiſſated juice compounded of the juice of cicuta and ſome other corroſive herbs. Vid. Mead's Eſſay on Poiſons, ap. Bibl. Anal. Med. tom. iii. p. 281.

Socrates drank the cicuta. Plato, in his Dialogue on the Immortality of the Soul, obſerves, that "The executioner adviſed Socrates not to talk, for fear of cauſing the cicuta to operate too ſlowly." M. Petit, in his "Obſervationes Miſcellaneæ," remarks, that this advertiſement was not given by the executioner out of humanity, but to ſave the cicuta: for he was only allowed ſo much poiſon *per ann.* which if he exceeded, he was to furniſh the reſt at his own expence. This conſtruction is confirmed by a paſſage in Plutarch: the executioner who adminiſtered the cicuta to Phocion, not having enough, Phocion gave him money to buy more; obſerving, by the way, that it was odd enough, that at Athens a man muſt pay for every thing, even his own death.

CICUTARIA *major vulgaris,* in *Botany,* Cluſ. Hiſt. 2. 200. See CONIUM *maculatum.*

CICUTARIA *latifolia fœtida,* Bauh. Pin. 161. Moriſ. Umb. tab. 6. See LIGUSTICUM *peloponenſe.*

CICUTARIA *paluſtris tenuifolia,* Bauh. Pin. 161. Lob. Ic. 735. See PHELLANDRIUM *aquaticum.*

CICUTARIA, Riv. Pent. tab. 76. See CICUTA *viroſa.*

CICUTARIA *apiifolia,* Bauh. Hiſt. 3. p. 179. —— *fatua,* Lob. Ic. 280. See ÆTHUSA *cynapium.*

CICUTARIA *vulgaris,* Dod. Pemp. 701. Bauh. Hiſt. 3. 181. See CHÆROPHYLLUM *ſylveſtre.*

CICUTARIA *bulboſa,* Bauh. Pin. 162. Bauh. Hiſt. 3. 183. See CHÆROPHYLLUM *bulboſum.*

CICUTARIA *paluſtris latifolia alba & rubra,* Bauh. Pin. 161. —— *latifolia hirſuta,* Bauh. Hiſt. 3. 182. See CHÆROPHYLLUM *hirſutum.*

CICUTARIA *arbor virginiana,* Rai. Sup. 257. See CHÆROPHYLLUM *arboreſcens.*

CID, in *Biography,* a Spaniſh hero, whoſe real name was DON RODRIGO DIAZ DE BIVAR, was deſcended from Diego Laynez, a perſon of conſiderable family, and was brought up at the court of the kings of Caſtile. On account of his great valour, he was, at an early age, created a knight. Before he received this honour, five Mooriſh kings had united their forces and plundered Caſtile. On the mountains of Oca, Rodrigo fell upon them as they were removing their ſpoil, recovered the whole booty, and took the five kings priſoners, whom he treated with reſpect, and diſmiſſed on a promiſe of tribute. The ſpoil he diſtributed among his followers. King Fernando, having received tidings of this victory, turned his arms againſt the Moors of Portugal, and beſieged Coimbra, which he took. Here Rodrigo was knighted. When meſſengers arrived at Zamora with tribute to Rodrigo from the five kings, he offered a fifth of it to his ſovereign as his due. Fernando would not accept it; and hearing the Moors addreſs Rodrigo by the title Cid or lord (Cid being the Arabic term for lord), he ordered him from that time to bear this honourable name. Upon the king's death, he divided his kingdoms among his children; allotting Caſtile to Sancho, the eldeſt; Leon to Alonſo, and other portions to Garcia, and to his two daughters.

This partition occaſioned a conteſt among the brothers. When Sancho came to the crown, Rodrigo was his lieutenant-general in his war againſt his brother Alonſo. He followed his ſovereign to the ſiege of Zamora, where Sancho was ſlain by treachery, and conducted back in good order the Caſtilian troops, with the dead body of the king. Alonſo was invited to the crown on condition of purging himſelf by oath of all ſuſpicion of concern in his brother's death. None of the nobility, who, as a body, had impoſed the condition, dared venture to exact the oath at the convention; Rodrigo, with a ſpirit of true loyalty to his departed maſter, admininiſtered it, and even obliged the king to repeat it. Before theſe adventures, he had married, with the concurrence of king Fernando, Ximena, daughter to count Gomez, whom he had killed in ſingle combat becauſe he had inſulted his father in his old age; an event, which, affording a fine diſplay of the contending paſſions in the perſon of the heroine, as at once the daughter and lover, has been the ſubject of a Spaniſh play, imitated by Corneille in the tragedy of "The Cid." Rodrigo, finding that Alonſo continued to reſent his conduct in exacting the above-mentioned oath, aſſembled his friends, and thoſe on whoſe fidelity he could rely, at the head of whom he entered Arragon, ravaging and plundering the country. He made himſelf maſter of the caſtle Alcocer, where, being joined by a number of freebooters, attracted by his fame, he made perpetual incurſions into the neighbouring Mooriſh territories. He afterwards ſold Alcocer to the Moors, and diſtributed its price among his followers. At length he penetrated ſouth of Saragoſſa, and fixed his reſidence in a ſtrong fortreſs called to the preſent times, the Roek of the Cid, where he maintained himſelf as an independent ſovereign. In the mean while Alonſo's hatred to the Cid had gradually abated; and when his aſſiſtance was needed, a reconciliation between them took place. Having accompanied Alonſo to the ſiege of Toledo, and accompliſhed that ſervice, he returned to Saragoſſa. Hearing of the murder of Yahia, king of Valencia, he deſired the aſſiſtance of Alonſo to enable him to revenge the deed; the requeſt was granted, and Rodrigo, in 1094, took Valencia, and held it till his death in 1099. Fiction has detailed ſeveral circumſtances that preceded and followed his death, which it is beſides our purpoſe to relate. As the Moors approached the city, he gave orders that the event of his death ſhould be concealed; and having aſſured his followers of victory, he expired. Having collected the whole treaſure of Valencia, and placed upon a war horſe the dead body of the Cid, they formed a proceſſion in order to leave the city. His wife, Ximena, with 600 knights as her guard, formed part of the train. The Moors were attacked and totally routed; and the Chriſtians, ſpoiling their camp as they paſſed through it, proceeded with the body towards Caſtile. Inſtead of burying the body, which was preſerved by the myrrh and balſam, with which it had been embalmed, in an apparently ſound ſtate, they placed it upright upon his ivory ſeat in the church, at the right hand of the altar. Ximena took up her daily abode in the church, and having ſurvived her huſband four years, was buried at his feet. After ten years, the body began to moulder; it was then interred in its garments, and with the ſword, by the ſide of Ximena. The hiſtory of the Cid, who flouriſhed from the year 1064, when he is firſt mentioned, till his death in 1099, under the reigns of Fernando the Great, and his ſons Sancho el Bravo, and Alfonſo VI. in whoſe time he eſtabliſhed himſelf as conqueror in the city of Valencia, is blended with fiction of the moſt beautiful kind. It is furniſhed both by his chronicle, and alſo by the "General Chronicle of Spain," compiled by order of Alfonſo the Wiſe, in the middle of the 13th century, about 150 years after Rodrigo's death. There is a poem upon his life which is probably a century older.

CIDAGER, or Cidaia, in *Geography*, a town of the iſland of Java.

CIDARES Kleinii, in *Natural Hiſtory*, hemiſpheric or ſpheroidal ſections of the Echinus.

CIDARIS, a ſpecies of Echinus; and a ſpecies of Turbo.

Cidaris, in *Ancient Geography*, a river of Thrace, which diſcharged itſelf into the harbour of Byzantium.

Cidaris, in *Scripture Hiſtory*, the mitre uſed by the Jewiſh high prieſts. Whenever there is mention of the high prieſt's mitre, the Hebrew word made uſe of to expreſs it is always *miznepheth*; and *mygbaoth* is uſed to ſignify the bonnet belonging to common prieſts. The rabbins ſay the ſame thing is meant by both theſe terms, and that the bonnet uſed by prieſts in general was made of a piece of linen cloth ſixteen yards long, which covered their heads like an helmet or a turban; and they allow no other difference to be between the high prieſt's bonnet, and that of other prieſts, than this, that one is flatter, and more in the form of a turban, whereas the other worn by ordinary prieſts roſe ſomething more in a point. Exod. xxviii. 4.

It is to be obſerved, that the Hebrew prieſts never appeared in the temple without covering their heads. And ſtill at this day it is reckoned an incivility in the Eaſt, and a mark of contempt, for any man to pull off his hat or turban to another, or to ſhew his naked head before any one.

CIDER. See Cyder.

CIDES, in *Ancient Geography*, a town of Aſia Minor, in Ætolia.

CIDIAS, in *Biography*, an ancient Greek painter, contemporary with Eufranor, about the hundred and fourth olympiad. Amongſt other works, he painted a picture of the Argonauts, which was afterwards bought by Hortenſius for the ſum of forty-four thouſand ſeſterces (about fourteen thouſand four hundred florins), and placed it in a ſmall temple, built on purpoſe to receive it, in his villa at Tivoli. It was afterwards removed by M. Agrippa to the Portico of Neptune which he had fabricated in Rome. Dion. Caſſ. lib. 53. Della Valle, Vite dei Pittori Antichi.

CIDNUS, in *Geography*, a river of Cilicia, which ſprung from the Antitaurus, paſſed through Tarſus, and diſembogued itſelf into the Mediterranean, near the city of Anchiale. It was famous for the rapidity of its ſtream, and the coldneſs of its waters, which proved very dangerous to Alexander.

CIDYESSUS, a town of Aſia, ſituated in the northern part of Phrygia, between the towns of Midæum and Nacoleia. This town, like others of the proconſular province of Aſia, was governed by a ſenate, the preſidents of which were denominated archontes. The worſhip of Cybele was eſtabliſhed at Cidyeſſus. The inhabitants of this town rendered alſo a particular worſhip to Jupiter. The firſt miniſter of his temple preſided at the celebration of the games which had been eſtabliſhed in this place in honour of that deity. Cidyeſſus was an epiſcopal town in Pacatian Phrygia.

CIECIEREF, in *Geography*, a river which riſes in Poland, and runs into the Dnieper, 28 miles W. of Kiov.

CIEKANOW, a town of Poland, in the palatinate of Maſovia; 40 miles N. of Warſaw.

CIENFUEGIA, in *Botany*, Willd. 1277. Cavan. diſſ. 3. p. 174, tab. 72. fig. 2. Claſs and order, *monadelphia dodecandria*. Eſſ. Ch. Calyx double, outer one twelve-leaved; leaflets briſtle-ſhaped. Corolla five-petalled, ſtyle filiform, ſtigma club-ſhaped. Capſule three-celled, three-ſeeded.

Sp. C. *digitata*. *Root* perennial. *Leaves* alternate, petioled, ſmooth, three or five-cleft; ſegments lanceolate, rather obtuſe, either quite entire or toothed. *Peduncles* one-flowered, axillary. *Outer calyx* ſhort; inner one five-cleft. Nearly allied to Hibiſcus, but diſtinguiſhed from it by its club-ſhaped ſtigma, and three-celled capſule, with one ſeed in each cell.

CIEUX, in *Geography*, a town of France, in the department of Upper Vienne, and diſtrict of Bellac, containing about 1200 inhabitants; 13 miles N.W. of Limoges.

CIFUENTES, a town of Spain in New Caſtile; 22 miles S. of Siguença.

CIGALE and CIGALON, in *Natural Hiſtory*, names given by the French to ſpecies of the *Cicada*.

CIGLIANO, in *Geography*, a town of Italy, in the Orvietan; 4 miles N. of Orvieto.

CIGNANI, Carlo, in *Biography*, an hiſtorical painter, of conſiderable eminence, born at Bologna in the year 1628. In infancy he received inſtruction from a maſter of little note, Gio. Batt^{a} Cairo; but afterwards became the diſciple of Albano, the amenity of whoſe inventions he was ever deſirous to emulate: his ſtyle, however, both as to drawing and colouring, is principally founded on the model of Correggio, whoſe works he attentively ſtudied, and to which he not unfrequently added ſomething of the grace of Guido: and although he fell far ſhort of his great prototype, he is deſervedly conſidered one of the beſt painters Italy could boaſt, in the degenerate times in which he lived.

He painted many large works in the place of his nativity, as well as in other cities of Italy, and excelled equally in freſco and in oil. Amongſt his moſt admired performances, are four ſmall ovals, containing ſacred ſtories, and each ſupported by two beautiful boy-angels, at St. Michele in Boſco at Bologna; and an altar-piece repreſenting, as it is called, the conception of the virgin, in a monaſtery at Piacenza. The virgin, with a graceful dignity, bruiſes with her foot the head of the ſerpent, and the child, who is between her knees, ſuperadds the preſſure of his own little foot to that of his mother.

The Abbé Lanzi, in his *Storia Pittorica*, ſpeaks with rapture of this picture, which, for thought and execution, he conſiders one of the chef d'œuvres of Cignani. There is likewiſe a large work by this maſter in a room in the garden of the Ducal Palace at Parma, with ſubjects alluſive to the power of love. But his greateſt work is at Forli, where Cignani ſpent the latter part of his life: it is a cupola, which, in imitation of his admired Correggio, he painted in freſco, with the ſubject of the aſſumption of the Madona, amidſt a multitude of the angelic choir. This, in the opinion of ſome of the beſt judges, is the moſt intereſting work of painting of the period in which it was produced: it is ſaid to have employed the artiſt 20 years.

He painted, amongſt other cabinet pictures, many ſmall madonas and holy families in oil on copper, upon which his hiſtorian, Zannotti, beſtows the higheſt encomiums.

The ſtyle of Cignani is ſimple, broad, and of great relief, but ſeldom evinces loftineſs of conception, or more than ordinary force or delicacy of expreſſion. He died in the year 1719, at the advanced age of 91. Zannotti, Accademia Clementina. Lanzi, Storia Pittorica.

CIGNAROLI, Giovanni Bettino, a Veroneſe painter, one of the beſt of his time, was born in the year 1706, and was educated in the ſchool of Santo-Prunati. The works of Cignaroli were ſo admired, that he many times received the moſt preſſing invitations to ſettle in foreign courts, but the love of his country proved ſuperior to every other inducement, and he never could be prevailed on to quit Verona.

The works of Cignaroli are diſperſed in the galleries and churches of the different parts of Italy, as well as the palaces of foreign potentates: they are by no means, however, of equal merit. Amongſt others is a flight into Egypt, in the church of St. Antonia Abate at Parma, upon which Lanzi beſtows the higheſt encomiums.

The Virgin with the child is repreſented paſſing over a little narrow bridge, and old Joſeph is aſſiſting them on the dangerous occaſion, with a care of anxiety for their ſafety, which is admirably expreſſed: ſo entirely is he abſorbed in this one idea, that he pays no attention to part of his own mantle which is floating in the ſtream. The angels, who, in the cuſtomary manner, are introduced, poſſeſs much grace, and the madona has a dignified deportment, ſomewhat reſembling thoſe of Carlo Maratti.

There is frequently a pleaſing expreſſion and novelty of conception in the works of Cignaroli, and his compoſition is good; but his colouring is ſometimes more plauſible than true, and he was rather extravagant in the uſe of reds and greens in his fleſh: we may add, that his effects of chiaroſcuro are not unfrequently too far-fetched, and ſeem to want their foundation in nature.

He left many ſcholars, among whom was a brother named Giandomenico Cignaroli, whoſe pictures in Bergamo are ſaid to poſſeſs merit.—Gio. Bettino Cignaroli died in the year 1770, and the particulars of his life were publiſhed by P. Gregorio Bevilacqua. Lanzi, Storia Pittorica.

Cignaroli, (by ſome called Cingiaroli), Martino and Pietro, two brothers, Veroneſe painters, who, educated in the ſchool of Giulio Carpione, afterwards ſettled in Milan, where they were eſteemed for their landſcapes and bambocciate, and where Martino had a ſon called Scipione, who became a landſcape painter of ſome eminence. If, as it is ſaid, they were living in Milan in 1718, they muſt have been very old. Lanzi, Storia Pittorica.

Cignaroli, Scipione, the ſon of the above-mentioned Martino, was a landſcape painter of ſome note; he is ſaid to have been the ſcholar of Cavalier Tempeſta (P. Molyn called Cav. Tempeſta died 1701) but owed great part of his advancement to the ſtudies which he made at Rome upon the works of Gaſpar Pouſſin and Salvator Roſa. From Rome he returned to Milan, where he painted many pictures which did him credit, till, having acquired conſiderable reputation, he was invited to the court of the duke of Savoy, where he lived in high eſtimation for the remainder of his life. Orlandi. Pilkington.

CIGOLI. See Ludovico *Cardi*.

CIGURRI, in *Ancient Geography*, a people of Spain who, according to Pliny, inhabited the country at preſent called Aſturia.

CILBIANA Juga, a mountain of Aſia Minor, in Lydia, in which was the ſource of the river Caiſter. It is mentioned by Pliny and Strabo.

CILBIANI, the name of a people who inhabited a country in Aſia Minor, near the Caiſter. As this country conſiſted partly of mountains, called "Cilbiana Juga," and partly of a plain, denominated "Cilbianus Campus," we may diſtinguiſh between thoſe who inhabited the former, called "Cilbiani Superiores" and thoſe who occupied the latter, contra diſtinguiſhed by the name of "Cilbiani Inferiores."

CILBICENI, a people of Spain, placed by Feſtus Avienus, in Bœtica, on the ſea coaſt, and in the vicinity of the town Tarteſſus: they occupied the banks of the river "Cilbus."

CILENDROS, an epiſcopal town of Aſia, in Iſauria.

CILENI, a people of Spain who inhabited the territory called Tarragonenſis. Ptolemy calls them Cilini, and aſſigns to them the town of "Udata Thermæ."

CILERY, in *Architecture*, a term uſed to denote the drapery or leavage on the heads of columns.

CILIA, in *Anatomy*, the hairs which are implanted on the borders of the eye-lids, and which in common language are termed eye-laſhes. See Eye.

CILIARIS Musculus, a few fibres of the orbicularis palpebrarum muſcle, which immediately ſurround the opening of the eyelids, and are deſcribed by Albinus, as a diſtinct muſcle, under the abovementioned name.

CILIARY Arteries, are branches of the ophthalmic artery, diſtributed to the choroid coat of the eye, and the iris. See Arteries.

Ciliary *ducts*, thoſe minute canals on the inner ſurface of the eyelids into which the Meibomian glands pour their ſebaceous ſecretion. See Eye.

Ciliary *proceſſes*, the folds on the inner ſurface of the anterior portion of the choroid coat of the eye, which adhere to the front of the vitreous humour. See Eye.

CILIATED, in *Botany*, a term applied to ſuch leaves and other parts of a plant as have their edges beſet with parallel hairs reſembling thoſe of the human eye-laſh.

CILIBÆ or Cillibæ, in *Ancient Military Language*, round tables, on which the Greek and Roman ſoldiers placed their bucklers, when they returned from any expedition.

CILICES, coarſe cloths woven or wrought of horſe-hair, and goats-hair, ſtitched and filled or ſtuffed with cow-hair or flocks of wool between every two of them, which the ancients ſtretched and ſuſpended before their parapets, ditches, and over breaches to ſtop arrows, darts, and ſtones thrown from *manubaliſtæ*, *baliſtæ*, or *catapultæ*.

CILICIA. See Cilicium.

Cilicia, in *Ancient Geography*, a country of Aſia Minor, lying between the 36th and 40th degrees of north latitude, and bounded by Syria on the eaſt, or rather by mount Amanus, which ſeparates it from that kingdom, by a chain of mountains that divided it from Piſidia and Pamphylia on the weſt, by Iſauria, Cappadocia, and Armenia Minor on the north, and by the Mediterranean on the ſouth. This country is ſo ſurrounded by ſteep and craggy mountains, chiefly the Taurus and Amanus, that it may be defended by a few men againſt a whole army; there being but three narrow paſſes leading into it, commonly called "Pylæ Ciliciæ," or the gates of Cilicia, one on the ſide of Cappadocia, called the paſs of mount Taurus, and the other two called the paſs of mount Amanus, and the paſs of Syria, leading from Syria. The Perſian army marched through the ſtraits of mount Amanus, while that of Alexander was encamped at Iſſus, not far from the ſtraits of Syria, which lie more to the ſouth, and were guarded by a body of Macedonians under the command of Parmenio: the ſtraits of mount Taurus Alexander had paſſed in entering Cilicia, the Perſians who guarded that paſs having retired at the approach of the Macedonians. The whole country of Cilicia was divided by the ancients into Cilicia Aſpera, and Cilicia Campeſtris. The former called by the Greeks Trachæa, or ſtony, is bounded by Iſauria on the north, Pamphylia on the weſt, Cilicia Campeſtris on the eaſt, and the Mediterranean on the ſouth. The cities mentioned by the ancients in this part of Cilicia are Sydra, or Syedra, Nagidus, Anemurium, Arſinoe, Celenderis, or Celandris, Aphrodiſias, Holmus, or Holmia, Sarpedon, Zephyrium, and Sebaſte. Theſe were the moſt noted towns on the coaſt of Cilicia Aſpera; the inland cities were Seleucia, Domitiopolis, Philadelphia, Lamus, and Scandeloro. The chief cities of Cilicia, properly ſo called, or Cilicia Campeſtris, were Soli, or Solæ, afterwards known by the name of Pompeiopolis, Tarſus, Anchiale, Anazarbum, Epiphania, Mopſueſtia, Iſſus, and Alexandria. The rivers of principal note in Cilicia are the Pyramus, the Cidnus, the Calycadmus, the Lamus, the Sarus, the Pyramus, and ſeveral others of leſs note, which water this province, and diſcharge themſelves into that part of the Mediterranean, called by the ancients the "Sea of Cilicia," and extending near 250 miles from eaſt to weſt. Cilicia Campeſtris is repreſented by Ammianus Marcellinus as one of the moſt fruitful countries of Aſia; but the weſtern part equally barren, though famous even to this day for an excellent breed of horſes, of which 600 are annually ſent to Conſtantinople for the uſe of the Grand Signior. The air in the inland cities is reckoned very ſalubrious, but equally dangerous on the ſea-coaſt, eſpecially to ſtrangers.

Joſephus ſays (Antiq. l. i. c. 7.), that this country was firſt peopled by Tarſhiſh, the ſon of Javan, and his deſcendants, whence the whole country was called Tarſis. The ancient inhabitants, it is ſaid, were, in proceſs of time, expelled by a colony of Phœnicians, who, under the conduct of Cilix, the ſon of Agenor, and brother to Cadmus, firſt ſettled in the iſland of Cyprus, and from thence paſſed into the country, which, from their leader, they called Cilicia. Strabo ſays (lib. xvii.), that this Phœnician colony paſſed from Cyprus into Phrygia, where they lived in ſubjection to the kings of Troy, and, after the Trojan war, poſſeſſed themſelves of that country, which was afterwards called Cilicia. Several colonies from other countries in ſubſequent periods ſettled in this kingdom; ſome, particularly, from Syria and Greece, whence the Cilicians in ſome places uſed the Greek tongue, in others the Syriac, but the former greatly corrupted by the Perſian, the predominant language of the country being a dialect of that tongue. Bochart derives the name of Cilicia from the Phœnician word "Challekim," or "Challukim," ſignifying a ſtone; that part of Cilicia, which the Greeks call Cilicia Trachæa, being very ſtony, and to this day called by the Turks, "Tes Wileieth," that is, the ſtony province.

The Cilicians, according to the relations of the Greek and Latin writers, were a rough race of people, unfair in their dealings, cruel, great liars, and in the Roman times, entirely addicted to piracy. Hence proceeded the proverbs, "Cilix haud facile verum dicit. Cilicium exitium;" and the ſaying of Pherecrates, "Dii ſemper nobis imponunt, more Cilicium," *i. e.* "A Cilician ſcarcely ever ſpeaks the truth. Cilician cruelty. The Goths, like the Cilicians, always deceive us."

The Cilicians, before they ſettled in the country now called Cilicia, occupied that diſtrict of Myſia, called alſo Cilicia, S. of the mountains that bound Dardania, and having to the weſt the gulf of Adramyttium. This was divided into "Cilicia Thebaica," and "Cilicia Lyrneſſia," after the names of the two cities, Thebes and Lyrneſſus. The firſt, ſituated to the north, was ſeparated from the ſecond, placed to the ſouth, by the river Evenus. At this time they were governed by kings. But after they ſettled in the other Cilicia, we find no mention of their kings till the time of Cyrus, to whom they voluntarily ſubmitted. They continued ſubject to the Perſians till the overthrow of that empire; but were governed to the time of Artaxerxes Mnemon by kings of their own nation. Herodotus, indeed, (l. iii. c. 90.) refers Cilicia to the claſs of Perſian Satrapies; but other writers (ſee Xenophon Cyropæd. l. vii. Diodor. l. xvi. Curt. l. ii.), lead us to conclude, that the Cilicians were governed by kings of their own in the time of Xerxes and Artaxerxes Mnemon. After the extinction of the Perſian empire Cilicia became a Macedonian province. On the death of Alexander it fell to the ſhare of Seleucus, and continued under his deſcendants till it was reduced by Pompey. As a proconſular province it was firſt governed by Appius Claudius Pulcher, and after him by Cicero, who reduced ſome ſtrong holds on mount Amanus, and for his ſucceſs was ſaluted by the army with the title of Imperator, or general. The whole of Cilicia being thus brought under ſubjection, it was at firſt divided into Cilicia Campeſtris and Trachæa; the former became a Roman province; but the latter was governed by kings appointed by the Romans till the reign of Veſpaſian, when this part was alſo made a province of the empire, and the whole divided into Cilicia Prima, Cilicia Secunda, and Iſauria. The firſt comprehended the whole of Cilicia Campeſtris; the ſecond included the coaſt of Cilicia Trachæa; and the laſt the inland parts of the ſame diviſion; and in this ſtate it continued till the diviſion of the empire. In Cilicia Prima there were eight epiſcopal ſees, viz. Tarſus, Pompeiopolis, or Soli, Sebaſte, Corycus, Adana, Aguria, or Auguſtopolis, Malchus, or Malus, and Zephyrium. The epiſcopal towns of Cilicia Secunda were the following nine, viz. Anazarba, Roſus, or Roſſus, Mopſueſtia, Ægæ, Epiphania, Alexandria, Irenopolis, Flavias, and Caſtabala.

Cilicia is now a province of Caramania, bounded on the N.W. by the long ridge of mountains which ſeparates it from Iſauria and Lycaonia; on the N. by Cappadocia and Lower Armenia; on the E. by Comagene; and on the S. by Syria and the Mediterranean. The eaſtern part, as we have already obſerved, is a fine flat fertile country; the other very hilly, rocky, and barren. The Cilicians were the inventors of a kind of manufactory of hair-cloth, chiefly of goat's-hair, called ſack-cloth, and much uſed in the penitentiary humiliations of the Jews and primitive Chriſtians. Adana is much reſorted to from other towns of Cilicia, eſpecially from the mountain ſide, for its wines, corn, and other fruit, hence diſperſed into the moſt barren parts.

Cilicia is alſo a country and province of Cappadocia. Ptolemy ſays that it is the name of a prefecture, or military government.

Cilicia *Terra*, in the *Natural Hiſtory of the Ancients*, a bituminous ſubſtance, though called an earth, which, by boiling, became tough like bird-lime, and was uſed inſtead of that ſubſtance to cover the ſtocks of the vines, for preſerving them from the worms. It probably ſerved both to drive thoſe animals away by its nauſeous ſmell, and entangle them if they chanced to get among it.

CILICIUM, a ſort of habit made of coarſe ſtuff, of a black or dark colour, formerly in uſe among the Hebrews, in times of mourning or diſtreſs. It was called *Cilicium*, becauſe it came from Cilicia, or rather becauſe the Cilicians invented this kind of habit, made of goat's hair, and uſed principally in camps and ſhips, by ſoldiers and mariners.

Cilicium *Mare*, in *Ancient Geography*, a name given by the ancients to that part of the Mediterranean ſea, which bathed the coaſts of Cilicia. Pliny calls it "Cilicius Aulon."

Cilicium *Inſula*, the name of an iſland in the Euxine ſea, in the Pontus-pelamoniacus, 15 ſtadia from the promontory of Jaſon, according to Arrian.

CILIMBENSII, a people placed by Ptolemy in the northern part of the iſland of Corſica.

CILINA, or Cælina, a town of Venetia, towards the north.

CILISARUM, or Ciliza, a town of Aſia in Syria, between Cyrrhæ and Edeſſa. See Itinerary of Antonine.

CILIUM, an epiſcopal town of Africa, in the Byzacene.

CILIZA, a town of Aſia in Syria, ſituated near the mountains on a ſtream W. of Deba.

CILLA, a town of Aſia Minor in Ætolia, according to Herodotus. From Strabo, it appears that this town was at the foot of a mountain of the ſame name.—Alſo, a town of Africa Propria, according to Appian. It was epiſcopal.

CILLABA, a town of Africa, ſituated towards the deſerts beyond the leſſer Syrtis.

CILLÆ, or Cellæ, a town of Thrace upon the route from Rome to Conſtantinople, between Philippopolis and Opizum; according to the Itinerary of Antonine.

CILLENE, a mountain of Arcadia, ſaid to be the higheſt in the whole country.

CILLEUS Fluvius, a river of Aſia Minor, which had its ſource in mount Ida, ran near a place named Cilla, before the town of Thebes in Cilicia.

CILLEY, in *Geography*, a town of Germany, in the duchy of Stiria, on the river Saan, and capital of a diſtrict, which extends as far as Pettaw. The inhabitants, who ſpeak German and Sclavonian, are ſaid by ſome to have been brought hither by the duke of Bavaria to oppoſe the Romans. Cilley is ſaid to have once belonged to the Romans, and afterwards to have been deſtroyed; but when it was given by Lewis, the old king, and duke of Bavaria, to Hezillon, duke of Moravia, he re-built it. The diſtrict, or Comté, was once an independent principality; and governed by its own counts; 130 miles S.S.W. of Vienna. N. lat. 46° 21'. E. long. 15° 16'.

CILLUTA, in *Ancient Geography*, an iſland of the Indian Ocean, mentioned by Arrian, (l. vi. c. 19.) that ſeems to have been ſituated in the principal mouth of the river Indus; it was of conſiderable extent, and had ſeveral commodious ports.

CILMA, or Oppidum Chilmanense, now *Gelma*, a town of Africa, in Byzacium, ſituated 6 leagues to the E. of Sufetula; it appears to have been a large city, and has the area of a temple ſtill remaining.

CILNIANA, Cilmana, Ciluana, or Silviaca, a place of Spain, in Bœtica, between Gades and Calpé. M. D'Anville marks it in his chart upon the ſea-coaſt, in the country of the Baſtuli, S. of Munda.

CILOCA, in *Geography*, a town of South America, in Peru. on the coaſt of the Pacific Ocean; 40 miles W. of Arequipa.

CILURNUM, Walwick-Chesters, the ſixth ſtation on the wall of Severus, in Britain, according to the Notitia Imperii. See Station.

CIMA, in *Architecture*. See Cyma.

CIMABUE, Giovanni, in *Biography*, an Italian painter, who is generally honoured with the appellation of the father of modern painters; but although the arts of deſign have the greateſt obligations to this extraordinary man, who firſt emerged from that hereditary barbariſm of ſtyle, which for ſo many centuries had marked the wretched efforts of European painters; yet, it is equally certain, that, without any reference to the Greek artiſts who are ſuppoſed by Vaſari to have been the maſters of Cimabue, Italy for at leaſt two or three centuries prior to the period of Cimabue's birth, had conſtantly poſſeſſed artiſts, and artiſts of her own, ſufficiently inſtructed, to paint the miſerable and ghoſt-like objects of ſuperſtition and devotion. See Painting, *Hiſtory of.*

Cimabue, according to the authority of Vaſari, was born of a noble family in Florence, in the year 1240, and, at a very early period, having evinced a ſtrong deſire and genius towards the art, was put under the tuition of ſome Greek painters, who were at that time employed to paint a chapel under the church of St. Maria Novella. Theſe he quickly ſurpaſſed, and gave ſuch ſtriking proofs of his ſuperior talents, that he ſoon became employed in the moſt conſiderable undertakings.

Of his numerous works at Florence little now remains, except his celebrated Madona, larger than the life, at St. Maria Novella; and another at the church of St. Trinita: they are both painted in diſtemper, and well preſerved. The former of theſe works was conſidered, when finiſhed, ſo extraordinary an effort of the pencil, that Vaſari informs us it was carried in proceſſion, accompanied by trumpets, from the houſe of the painter to the church; which circumſtance, together with other rejoicings on the occaſion, cauſed the ſtreet through which the picture paſſed to be called, as it is to this day, "Il Borgo Allegri." But an adequate idea of the genius of Cimabue can alone be formed by examining his decayed freſcoes ſtill remaining in the church of St. Franceſco of Aſſiſi. Here, on one ſide of the church, he painted in ſixteen compartments, with figures ſomething larger than life, the hiſtories of the Old Teſtament, from the creation of the world, to the ſtory of Joſeph and his Brethren; and on the oppoſite ſide the ſame number of ſtories from the New Teſtament, beginning with the Annunciation, and ending with the Reſurrection; beſides the four Doctors of the Church, and many other figures on the ceiling, and ſeveral ſtories from the Revelations in other parts of the church,

church. Although the greater part of theſe pictures has ſuffered greatly from the deſtructive hand of time, yet ſeveral of them are tolerably, and ſome of them perfectly preſerved; and are, notwithſtanding the rudeneſs of their execution, in ſo grand and ſo ſimple a ſtyle, as to ſtrike with aſtoniſhment the traveller who has been taught to expect in the firſt efforts of the art nothing beyond the humble and imperfect attempt of ſervile imitation. Some of the conceptions and compoſitions in this work would not do diſcredit to the genius of Raffaele at an early period, and certainly poſſeſs an energy and boldneſs of expreſſion far ſurpaſſing the tame though careful performances of his maſter, P. Perugino: and although Giotto and his followers, who immediately ſucceeded Cimabue, gave a greater ſoftneſs and variety to their draperies, and more diverſity in the characters and expreſſions of their heads, yet it is difficult to find inſtances in their works where the naked parts of the figure are ſo well drawn, as in ſome of the above-mentioned compoſitions. He died aged 60 in the year 1300. Vaſari. Lanzi, Storia Pittorica, MS.

CIMAEON MONS, in *Ancient Geography*, a mountain of Aſia Minor, placed by Ptolemy towards the Troade. It was probably the chain of mountains that ſeparated the Troade from the country of the Lelegi.

CIMARA, a town of India, on the other ſide of the Ganges, according to Ptolemy.

CIMAROSA, DOMINICO, in *Biography*, maeſtro di cappella to the king of Naples, was a native of that capital, born at Capo di Monte; he ſtudied muſic at the conſervatorio of Loretto, and was a diſciple of the admirable Duronte. He was carefully educated in other reſpects, and his docility and ſweetneſs of temper, during his youth, gained him the affection of all who knew him. On quitting the conſervatorio his talents were ſoon noticed, and his operas, chiefly comic, became the delight of all Italy. But though he compoſed for buffo ſingers, his ſtyle was always graceful, never groteſque or capricious. There is an ingenuity in his accompaniments which embelliſhes the melody of the voice part, without too much occupying the attention of the audience. His operas of "Il Pittore Parigino," and "L'Italiana in Londra," were carried to Rome, and thence to the principal cities of Italy, where their ſucceſs was ſo great in 1782 and 1783, that he received an order from Paris to compoſe a cantata for the birth of the Dauphin, which was performed by a band of more than 100 voices and inſtruments. In 1784 he was engaged to compoſe for the theatres and cities which ſeldom had operas expreſsly compoſed for them; bringing on their ſtage ſuch as were ſet for great capitals, ſuch as Rome, Naples, Venice, and Milan. By theſe means the expences of poet and compoſer were ſaved. Cimaroſa's ſucceſs and fame were more rapid than thoſe of any compoſer of the laſt century, except Piccini, and the fame of his comic opera of "L'Italiana in Londra," ſeems to have been as extenſive as that of the "Buona Figliuola."

In 1787 he ſucceeded Sarti at Peterſburg, and compoſed ſeveral operas for that court. The ſame year he furniſhed Milan with the comic opera of "Le Trame Deluſe," and in 1788, with that of "Il Fanatico Burlato;" though he remained in Ruſſia till 1790; when he went to Madrid, for which capital he compoſed two operas, one ſerious, intitled "La Virgine del Sole," and one comic, "Il Fanatico Burlato." In 1792, we believe he was at Vienna, where he produced two of his operas, both comic; one, "Le Trame Deluſe," compoſed in 1787, and "Il Matrimonio Segreto." We find but few ſerious operas by Cimaroſa. "Giunio Bruto" ſeems to have been the firſt, and "Ines di Caſtro," and "La Vendetta di Mino," for Spain, with "Penelope" for Naples, the laſt. His latter comic operas were, "Amor Rende Sagace," for Vienna; "I Fraci Amanti," and "Le Artuzie Femminile," both for Naples, in 1794. "L'Impegno Superato," with "L'Impreſario in Anguſtia," both likewiſe for Naples, 1795; and "I Nunici Generoſi," for Rome, 1796.

We are acquainted with his productions no further. Italy was in ſuch a revolutionary confuſion in ſubſequent years, that no art ſeems to have been cultivated there but that of war and its concomitants, rapine and ſlaughter.

Cimaroſa, unfortunately for his fame and fortune, manifeſted a partiality for the French during their poſſeſſion of Naples, which occaſioned his diſgrace at the court of his patron and natural ſovereign, and he narrowly eſcaped the fate of convicted rebels and traitors. He was however allowed to die in his bed in 1801, in the 50th year of his age, extremely regretted by the lovers of muſic, as an original and exquiſite compoſer, and an amiable man, of ſo obliging and ſweet a temper, that being uncommonly corpulent, his immenſe ſize was aſcribed to his good humour and placid diſpoſition.

CIMARUS PROMONTORIUM, in *Ancient Geography*, a promontory which was ſituated, according to Strabo, on the northern coaſt of the iſle of Crete.

CIMBINA, or CIBINA, a town of Aſia, in Media.

CIMBIS, a maritime place of Spain, which, according to Livy, was ſituated in the vicinity of Gades.

CIMBRI, the moſt northern people of Germany, mentioned by Pliny, Strabo, Mela, Tacitus, and Plutarch; but they are not agreed with reſpect to their origin; ſome tracing them to the Scythians, and others to the Cimmerians. They anciently occupied the peninſula which ſtretches out into the German ſea and known under the name of the Cimbric Cherſoneſus. (See CHERSONESUS *Cimbrica.*) About the year 645 of Rome they left their own country, and joining the Teutones, Ambrones, and Tigurians, ravaged part of Germany, Helvetia, and the Lyonneſe and Narbonneſe Gauls, and penetrated into Italy. In their progreſs they defeated the Romans in ſeveral pitched battles, and threw Italy into the greateſt conſternation. In the firſt of theſe actions they vanquiſhed the conſul Papyrius Carbo; in another they defeated M. Junius Silanus, another conſul, who was called to a ſevere account for his bad ſucceſs; in the third, L. Caſſius; and in a fourth, the brave M. Aurelius Scaurus, whom they took priſoner and put to death, by order of their king, Bolos, for ſpeaking too warmly in praiſe of the Romans. However, after ſeveral other ſucceſſes in Italy, during a war of eight years, they were totally defeated and deſtroyed by the valour and policy of Marius and Catulus, A. U. C. 653, as they were endeavouring to enter Italy through Noricum, now the Tyrol; 120,000 being killed and 60,000 taken priſoners. How highly the Romans eſtimated this victory may be deduced from the triumph and other ſingular honours which they decreed both to Marius and to Catulus, as well as from the monuments which theſe cauſed to be erected in memory of this tranſaction. Thoſe Cimbri, who eſcaped the dreadful ſlaughter, probably returned into their own country; for they are ſaid to have afterwards ſent a ſubmiſſive embaſſy to Auguſtus, and are likewiſe mentioned by authors of later date, as the moſt warlike of all the northern Germans, down to Claudian's time, who calls the North Sea by their name; but their name was ſunk either in that of the Teutones, or of the Saxons, who, being their neighbours, joined with them in their excurſions, and gradually became more powerful.

The Cimbri, ſuppoſed by Mr. T. Warton to be a Scandinavian tribe, and by others to be the northern CELTS, the anceſtors of the Welſh, called Cymri, were accompanied at their aſſemblies by venerable and hoary-headed propheteſſes, apparelled in long linen veſtments of ſplendid

did white. Their matrons and daughters acquired a reverence from their ſkill in ſtudying ſimples, and their knowledge of healing wounds, arts reputed myſterious. The wives frequently attended their huſbands in the moſt perilous expeditions, and fought with great intrepidity in the moſt bloody engagements. Theſe northern nations dreaded captivity more on the account of their women than on their own; and the Romans availing themſelves of this apprehenſion, often demanded their nobleſt virgins for hoſtages. Tacit. de Mor. Germ. cited by Warton. Hiſt. of Engliſh Poetry, vol. i. diſſ. i.

CIMBRIANÆ, a place of Mœſia, on the route from Sirmium to Carnuntum, between Tricciana and Criſpiana, according to the Itinerary of Antonine. The Notitia Imperii places it under the department of the ſecond Mœſia.

CIMBRISHAMN, or Cimbrishaven, in *Geography*, a ſea-port of Sweden, in Weſt Gothland, and province of Schonen; 24 miles S. of Chriſtianſtadt.

CIMEGES, a town of France, in the department of the Dordogne, and diſtrict of Bergerac; 7 miles S.W. of Bergerac.

CIMELIANTHUS, in *Natural Hiſtory*, a name given by authors to a ſpecies of the *oculus beli*. It is deſcribed to be of a white colour, reſembling that of marble, with a yellow pupil in the middle. It was found on the ſhores of the Euphrates.

CIMELIARC, in *Church Architecture*, the room where the plate, veſtments, &c. belonging to the church are kept. In Engliſh, a veſtry.

CIMELOS, in *Ancient Geography*. See Cimolus.

CIMETERRE. See Scimitar.

CIMETRA, in *Ancient Geography*, a town of Italy in the country of the Samnites, taken by Fabius in the year of Rome 455. Livy.

CIMEX, in *Entomology*, a genus of hemipterous inſects. Linnæus defines the genus cimex in the following manner. Roſtrum or ſnout inflected; antennæ longer than the thorax; wings folded together croſs-wiſe; the wing-caſes coriaceous on the upper part; back flat; thorax margined; legs formed for running. Theſe he divides into many ſections. The firſt, *apteri*, are thoſe without wings as in the common houſe-bug. The *ſcutellati*, thoſe in which the eſcutcheon is extended ſo far as to cover the abdomen and wings. The *coleoptrati* have the wing-caſes entirely coriaceous inſtead of having the extremity membranaceous as in the other cimices. The *membranacei* have, on the contrary, the wing-caſes entirely membranaceous, and are much depreſſed. The *ſpinoſi*, thoſe which have the thorax armed each ſide with a ſpine. The *rotundati* are of an oval form, without ſpines on the thorax. The *ſeticornes* have the antennæ ſetaceous towards the tip. The *oblongi* are of an oblong form. The *ſpinipedes* have the thighs armed with ſpines; and the *lineares* have the body of a linear form.

Linnæus could not be aware of the amazing extent of the cimex genus as he had inſtituted it. The number of inſects poſſeſſing the ſame characters which he propoſed for the cimices that were known to him were comparatively few, amounting perhaps at the utmoſt to ſcarcely more than a tenth portion of thoſe deſcribed ſince his time by various writers. With ſuch ſcanty materials Linnæus found it ſufficient for his purpoſe to diſpoſe of inſects very different in other reſpects, though according with his generic character, to ſome one of the ſections he had formed, or to frame a new ſection for its admiſſion. But conſidering the prodigious number of new ſpecies of this tribe that have been recently diſcovered, it will be found, we are perſuaded, that the Linnæan genus is no longer adequate to the reception of the whole. Inſects poſſeſſed of ſuch very diſſimilar characters, though truly Linnæan cimices, if brought together under a ſingle genus, would preſent a moſt incongruous aſſemblage. Fabricius has been aſſiduous in the formation of new generical improvements in this tribe; he has availed himſelf of the diſcoveries of naturaliſts and collectors of the preſent time, and has been able by that means to introduce to our acquaintance many hundred ſpecies of this tribe that were before unknown. Fabricius conſtitutes of the Linnæan cimices ſeven diſtinct genera, acanthia, cimex, coreus, lygæus, miris, gerris, and reduvius. We are not the partizans of innovation on any eſtabliſhed ſyſtem, and above any other of that originally founded by Linnæus; but we really think it might be right to conſtitute even a ſtill further number of genera than Fabricius has done to include the whole of thoſe inſects which ſtand as Cimices in the Linnæan ſyſtem. But whatever may be our ideas in this reſpect, we ſhall, for the preſent, purſue only a middle line, retaining, ſomewhat after the manner of Gmelin, ſome of the Fabrician genera, as ſub-diviſions of the Linnæan cimices, and allowing others, which we think ought abſolutely to ſtand as genera diſtinct from Cimex, to form an appendage to our article. It will be thus perceived, that in the Linnæan arrangements, the whole are Cimices, and in the Fabrician ſyſtem ſo many diſtinct genera.

Genus *Cimex*. Linn.—Genus *Acanthia*. Fabr.

Species.

Lectularius. Apterous; body ferruginous. Linn. *Acanthia lectularia*, Fabr. Common houſe bug. The hiſtory of this fœtid and nauſeous inſect is well known; it is the inhabitant of moſt houſes; crawls from its lurking places in walls and furniture to ſuck the blood of thoſe that are aſleep during the night, in the day conceals itſelf; it is ſaid to have an averſion to elder and tobacco. Scopoli pretends that it has been found with wings, ſome account of which ſeems to have been publiſhed in an old German pamphlet, but we cannot credit the aſſertion of the writer.

Ater. Gloſſy black; thorax with a white dorſal line. *Acanthia atra*, Fabr. Inhabits Germany.

Zosteræ. Black; wing-caſes coriaceous, and as long as the abdomen; tip hyaline and ſtriated. Fabr. Inhabits Germany.

Flavipes. Black; wing-caſes coriaceous, as long as the abdomen, and immaculate; legs pale. Fabr. Inhabits Saxony. C. *Saxonicus*, Gmel.

Pallicornis. Black and gloſſy; wing-caſes coriaceous, abbreviated, and without ſpots; antennæ and legs pale. Fabr. Inhabits Saxony.

Grylloides. Apterous, black; thorax and wing-caſes margined with white. Fabr. C. *grylloides*, Linn. Inhabits Germany.

Coriaceus. Apterous; ſhells coriaceous, black-grey. *Acanthia coriacea*, Fabr.

Clavipes. Apterous; black; legs pitchy; anterior thighs thickened and dentated. Fabr. Inhabits Tranquebar.

Nigricornis. Black; anterior part of the thorax greeniſh; wing-caſes coriaceous and greeniſh. Fabr. C. *nigripennis*, Gmel. Inhabits Germany.

Clavicornis. Wing-caſes with reticulated punctures; antennæ clavated. Panzer. Inhabits Germany.

Crassicornis. Wing-caſes duſky aſh; extreme joint of the antennæ compreſſed and lanceolate. Fabr. Inhabits Germany.

Virescens. Greeniſh; laſt joint of the antennæ ovate, thick, and black. Fabr. Inhabits the South American iſlands.

Lavateræ. Black; wing-caſes and abdomen at the baſe rufous. Fabr. A native of Barbary.

Serratulæ. Black; wing-caſes paliſh; tip of the wings fuſcous. Fabr. Found in England.

Fasciatus. Black; wing-caſes paliſh, with two abbreviated black bands. Fabr. A native of Germany.

Maculatus. Brown; thorax with three white ſpots; abdomen beneath white, the edge dotted with black. *Acanthia maculata*, Fabr. Inhabits Tranquebar.

Pallipes. Black; wing-caſes pale with black baſe and marginal ſpot. Fabr. C. *marginalis*, Gmel.

Littoralis. Wing-caſes ſordid grey with white dots; body black. Fabr. Inhabits the north of Europe.

Rugosus. Wing-caſes pale; body oblong; anterior thighs very thick. Linn. A. *rugoſa*, Fabr. A native of North America.

Lunatus. Thorax lunate, with prominent margin: abdomen ſerrated. A. *lunata*, Fabr. An Indian ſpecies.

Corticalis. Membranaceous; abdomen imbricated at the ſides; body black. Fabr. Inhabits Europe. *Cimex corticalis*, Linn.

Depressus. Membranaceous; fuſcous; thorax with four elevated lines; wing-caſes white, with a raiſed fuſcous ring. *Acanthia depreſſa*, Fabr. Inhabits Germany.

Planus. Membranaceous, black; thorax with four raiſed black lines; wing-caſes, and wings white, ſpotted with black. *Acanthia plana*, Fabr. Inhabits Saxony.

Paradoxus. Membranaceous; thorax and abdomen lobated and ciliated with ſpines. Sparrman act. Holm. 1777. Inhabits the Cape of Good Hope, and reſembles a dead leaf.

Lævis. Black; abdomen ſmooth and brown; wings pale. Fabr. An Engliſh inſect.

Betulæ. Membranaceous; thorax denticulated; head ſpinous; anterior part of the wing-caſes dilated. Linn. A native of Europe.

Grisatus. Depreſſed, grey; abdomen beneath with a black ring. *Acanthia griſea*, Fabr. Found in Barbary.

Erosus. Membranaceous, abdomen yellow with black band; margin of the thorax ſinuate; anterior ſhanks thick. Linn. *Cimex Scorpio*. Degeer. A native of Surinam.

Monstrosus. Membranaceous, black; abdomen ſerrated, angular with white tip; head and thorax ſerrated; anterior ſhanks thickened. A. *monſtroſa*, Fabr. A native of Barbary.

Gibbus. Black; ſcutel and wing-caſes white, with a black dot at the tip. A. *gibba*, Fabr. Inhabits the Eaſt Indies.

Campestris. Black; wing-caſes white with fuſcous tip, and whitiſh ſpot; wings without ſpots. Fabr. Inhabits New Zealand.

Nemoralis. Black; wing-caſes with a white dot in the middle; wings fuſcous, at the baſe white. Fabr. Inhabits Zealand.

Pratensis. Black; wing-caſes yellowiſh, tip duſky; wings white with fuſcous ſpot at the tip. Fabr. Inhabits Germany.

Sylvestris. Black; wing-caſes white, with a black arch at the tip. Linn. Found in woods in Europe.

Alatus. Thorax with four raiſed fuſcous lines; wing-caſes pale, with a fuſcous ſpot at the tip. Fabr. Inhabits Sweden.

Costalis. Thorax with three raiſed lines; body brown; rib of the wing-caſes dotted with black and white. Fabr. An European inſect.

Sacchari. Thorax and ſcutel with three raiſed lines; body brown; wings hyaline and reticulated at the tip. Fabr. Inhabits South American iſlands.

Cardui. Thorax and ſcutel with three raiſed lines; tip of the antennæ black. Fabr. A native of Europe.

Humuli. Thorax with three raiſed lines; the margin very thick; body beneath black, legs rufous. Fabr. Inhabits Germany.

* *Scutel as long as the abdomen.*

Stockerus. Ovate; body green, with black ſpots; abdomen ferruginous. Linn.

Inhabits China. Donov. Inſ. China. Beneath ferruginous, at the ſides blue; colour above variable from gloſſy-green to blue.

Eques. Ovate; body green, with black ſpots; abdomen deep black; margin green, with black dots. Fabr.

Smaller than the preceding. Deſcribed from a ſpecimen in the cabinet of Lund, received from Tranquebar. We have ſeen the ſame from Africa.

Nobilis. Oblong, blue, gloſſed with golden, and ſpotted with black. Linn.

An Aſiatic inſect, much reſembling *Cimex ſtockerus*, but of a more oblong form, and far more rare.

Signatus. Oblong; thorax and ſcutel bluiſh, with ſix black ſpots. Fabr.

A native of Senegal, in the cabinet of Rouſſillon. Reſembles the preceding ſpecies.

Regalis. Thorax golden, with two bluiſh dots; ſcutel golden, with two bluiſh ſpots. Fabr. A native of New Holland. Donov. Inſ. N. H. Very rare.

Imperialis. Thorax and ſcutel rufous; abdomen blue, with a ſanguineous margin. Fabr.

Inhabits the ſame country as the preceding. Donov. Inſ New Holland.

Banksii. Violaceous; on the thorax an anchor-ſhaped ſpot, with two curved lines, and three ſpots on the ſcutel ſanguineous. A new ſpecies. Donov. Inſ. New Holland.

Carinthis. Dull black, and without ſpots. Fabr. Inhabits Africa.

Dispar. Red, or fleſh colour; thorax and ſcutel with yellow ſpots, ſome containing a black pupil or dot. Fabr. Donov. Inſ. China. *Cimex ocellatus*, Thunberg.

Nigellæ. Dull black; anterior part of the thorax, edge of the abdomen, and legs white. Fabr. A native of Barbary. Found on the Nigella.

Annulus. Greeniſh, with black annular ſpots. Fabr. *Cimex argus* of Drury's Exotic Inſects. Inhabits Senegal.

6-Punctatus. Above teſtaceous; thorax with four; ſcutel with two black-blue dots. Fabr.

Deſcribed from the Hunterian Cabinet. Inhabits South America.

Arcuatus. Grey; thorax and ſcutel with two black curves. Fabr. A native of South America.

Druræi. Above red, with large irregular black ſpots. Drury Inſ. Inhabits America.

Fabricii. Somewhat purpliſh, with fulvous dots. Fabr. Inhabits Cayenne.

Argus. Black, with numerous ocellar fulvous ſpots. Stoll. Reſembles the former. Inhabits Surinam.

Schulzii. Braſſy black; ſcutel with a ſcarlet ſpot on each ſide at the baſe. Fabr. Found in Cayenne.

Paganus. Azure; ſcutel and abdomen rufous, with azure ſpots. Fabr. Donov. Inſ. New Holland. Bankſian Cabinet.

Illustris. Glaucous; thorax and ſcutel with two fuſcous dots. Fabr. Inhabits the Cape of Good Hope.

Furcifer. Brown; ſcutel with two black dots, and tridentated fulvous ſpot behind. Stoll. Cab. Holthyſen. Same country as the preceding.

Lineola. Above blue; head and thorax with a dorſal line of red, and two dots of the ſame colour on the ſcutel. Fabr. Inhabits the Cape of Good Hope.

Trilineatus. Black, with three yellowiſh lines. Fabr. Inhabits South America.

Nigrolineatus. Red; thorax with five black lines; ſcutel with three; abdomen yellow, dotted with black. Fabr. Inhabits South of Europe. Linn.

Semipunctatus. Above rufous; thorax with ten black dots; ſcutel with four lines of black. Fabr. Inhabits America.

Silphoides. Braſſy-black; margin of the abdomen beneath, and legs yellow. Fabr. A native of India.

Anchorago. Azure; ſcutel at the baſe and tip yellowiſh; margin of the abdomen yellow, dotted with black. Solander. Inhabits America.

Grammicus. Body yellowiſh, with a black longitudinal litural mark or daub. Linn. A native of Africa.

Pædemontatrus. Rufous, with numerous white ſpecks. Fabr. *Cimex allioni*, Gmel. An Italian ſpecies.

Coſtatus. Grey; rib of the wings at the baſe and the legs rufous. Fabr. Donov. Inſ. New Holland. A ſpecimen in the Bankſian Cabinet was found in Rotterdam Iſland.

Hottentotta. Ferruginous, and immaculate. Fabr. Inhabits the Eaſt. Prof. Forſkahl.

Maurus. Cinereous; ſcutel with two white dots at the baſe. Linn. A native of the ſame part of the world as the preceding.

Lynceus. Duſky teſtaceous, dotted with black; ſcutel with two fulvous dots at the tip. Fabr.

Albo-lineatus. Thorax ſomewhat ſpinous, grey, and ſtriated with white. Fabr. A native of Italy. Dr. Allioni.

Ruſticus. Fuſcous; head and anterior part of the thorax ferruginous; beneath varied with white, and fuſcous.

Irroratus. Greeniſh, ſpeckled with fuſcous. Fabr. A native of America.

Lanatus. Braſſy-black, with grey hairs. Pallas. Inhabits Siberia.

Globus. Globoſe, gloſſy-black; margin of the abdomen ferruginous. Fabr. Inhabits the ſouth of Europe.

Scarabæoides. Body entirely braſſy. Linn. Found on flowers of the ranunculus.

Pallipes. Braſſy-black; margin of the ſcutel, and abdomen, with the legs pale. Inhabits Africa. *Cimex acaroides*, Thunberg.

Flavipes. Braſſy-black; whole margin, and the legs yellow. Fabr.

Deſcribed from a ſpecimen in the Bankſian Cabinet. Inhabits New Holland.

Deſfontainii. Thorax ſpinous; above grey, beneath whitiſh. Fabr. Inhabits Barbary.

Fuliginoſus. Scutel ſooty, with five black litural marks or blotches, the poſterior one white. Linn. Inhabits Europe.

Vahlii. Gloſſy black; head with two yellowiſh blotches; margin of the thorax, ſcutel, and legs yellow. Fabr. Inhabits the Eaſt.

Tuberculatus. Duſky; ſcutel ſcabrous, before the tip tuberculated. Fabr. A native of Italy.

Litura. Black; two ſmall yellow lines at the baſe, and dot at the tip white. Fabr. Inhabits Arabia according to Forkſkahl.

Inunctus. Black; ſcutel at the baſe, with the legs grey. Fabr. An Engliſh ſpecies.

Arabs. Thorax ſpinous; body ovate, livid; tail bidentated. Linn. Found in American iſlands.

Stolidus. Thorax ſomewhat angulated; body above green, beneath yellow; tail armed with two teeth. Linn. An Indian ſpecies.

* *Thorax ſpinous each ſide.*

Cervus. Green; wing-caſes fuſcous, with white margin; ſpines of the thorax obtuſe, and ſomewhat bifid. Stoll. A native of Cayenne.

Taurus. Grey; ſpines of the thorax advanced, compreſſed, and truncated. Fabr. Inhabits the Coromandel coaſt.

Dama. Grey; ſpines of the thorax obtuſe and emarginate. Fabr. This is of a large ſize and inhabits the Eaſt Indies.

Vacca. Olive; thorax obtuſely ſub-ſpinous; antennæ rufous at the baſe; ſternum ſhort and compreſſed; tail armed with four teeth. Fabr. A large ſpecies. This inhabits Guadaloupe.

Gazella. Thorax obtuſely ſub-ſpinous; above greeniſh; head and anterior part of the thorax yellowiſh; abdomen ſerrated. Fabr. Inhabits Martinique. Iſert.

Tarandus. Thorax ſpinous, above blue-black; anterior margin of the thorax, three dorſal lines, and tip of the ſcutel white. Fabr. A ſpecies of large ſize, deſcribed from an inſect in the Britiſh Muſeum. Native country unknown.

Bidens. Spines of the thorax ſharp; body grey; antennæ rufous. Linn. Found in gardens in Europe.

Sanguinipes. Spines of the thorax obtuſe; body fuſcous; ſcutel at the tip whitiſh; ſpots on the margin of the abdomen and legs black. Fabr. Inhabits Italy.

Rufipes. Spines of the thorax obtuſe; body grey; legs rufous. Linn. Inhabits Europe. Found in Gardens.—*Obſ.* In ſome ſpecimens the tip of the ſcutel is rufous.

Luridus. Spines of the thorax obtuſe, greeniſh; wing-caſes grey with a fuſcous ſpot; ſhield emarginate. Fabr. Deſcribed by Fabricius as an Engliſh inſect on the authority of the Bankſian cabinet. Taken in woods near London, but rare. Donov. Brit. Inſ.

Cuſtos. Thorax obtuſely ſpined, grey; antennæ yellow, with two black annulations. Fabr. A native of Germany.

Nigricornis. Thorax obtuſely ſpined, ſub-ferruginous; ſpines and antennæ black. Fabr. A nativeof Saxony.

Nigriſpinus. Thorax obtuſely ſpined; above grey; head and ſpines black; antennæ with a black ring. Fabr. Inhabits China.

Ictericus. Oblong; above reddiſh; beneath yellow. Linn. Amœn. Acad. Inhabits America.

Punctatus. Thorax ſomewhat ſpinous; fuſcous, abdomen variegated at the margin; ſhanks with a white ring. Fabr. A native of Europe, ſometimes found in England.

Varius. Thorax obtuſely ſpined; above rufous, beneath yellowiſh; ſcutel black, with the baſe and tip white. Fabr. Inhabits Spain. Vahl.

Lunula. Thorax obtuſely ſpinous; above rufous; on the anterior part of the thorax five little yellow lines; two lunules at the baſe of the ſcutel, and the tip white. Fabr. Inhabits Barbary.

Albipes. Thorax ſomewhat ſpinous; above blackiſh; margin of the thorax and ſcutel tip white. A Fabrician ſpecies deſcribed from the cabinet of Dr. Allioni. A native of Italy.

Dentatus. Thorax ſlightly ſerrated; body varied with cinereous and black. Fabr. An Eaſt Indian ſpecies.

Floridanus. Black, varied with red; ſcutel with three red ſpots, Linn. A native of America.

Armatus. Spines of the thorax acute; ſcutel black, two dots and tip teſtaceous; antennæ and legs red. Fabr. Inhabits New Holland. Bankſian cabinet.

Hæmorrhous. Black; abdomen rufous; wing-caſes, with five black linear dots. A Linnæn ſpecies. Inhabits America.

2-Pustulatus. Black; wing-caſes livid; head with two ſcarlet dots. Linn. A native of Surinam.

Punicus. Black; lunule on the ſcutel, and tip red. Linn. An African inſect.

Ypsilon. Livid; ſcutel with a yellow y-like mark. Linn. Found in Surinam.

Clypeatus. Green, with yellowiſh band; head ſhielded. Fabr. A native of China. Gronovius.

Elector. Above grey, beneath yellowiſh, with black dot; antennæ black; band before the tip yellow. Fabr. Country unknown.

Albicollis. Thorax dentated; above green; head, fore part of the thorax, and baſe of the ſcutel yellow. Fabr. *Cimex flavicollis*, Drury. A native of Jamaica.

Hæmorrhoidalis. Thorax obtuſely ſpinous; ſomewhat greeniſh; antennæ black; ſternum projecting, Linn. An European ſpecies. Found in England, Donov. Brit. Inſ. &c.

Spinideus. Spines of the thorax acute; fuſcous; ſcutel at the tip and margin of the upper wings white. Fabr. Found in Tranquebar.

Sagittata. Thorax acutely ſpined and ſerrated; grey; under-wings with a black filet; antennæ and legs yellow. Fabr. Inhabits South American iſlands.

Oculatus. Grey; ſcutel with two yellow dots; anterior tarſi of the legs compreſſed and membranaceous. Fabr. A native of China.

Annulatus. Grey; ſhanks annulated with white. Fabr. A native of Virginia.

4-Pustulatus. Thorax obtuſely ſpined, and crenated, with two rufous dots; ſcutel with two rufous dots at the baſe. Fabr. An American ſpecies.

Maculatus. Greeniſh; thorax obtuſely ſpined, with four brown ſpots; tip of the ſcutel and wing-caſes brown. Fabr. Same country as the former.

Pugnax. Thorax acutely ſpined, oblong and greeniſh; antennæ rufous. Fabr. Inhabits America.

Emeritus. Thorax acutely ſpined, greeniſh; abdomen with two lines of white. Fabr. A New Holland ſpecies in the Bankſian cabinet.

Gladiator. Thorax acutely ſpined, and with the ſcutel yellow dotted with black; wing-caſes rough with white dots. Degeer, &c. An American inſect.

Ferrugator. Thorax acutely ſpined; above grey; head and ſpines black; abdomen ferruginous, Paykull, &c. Inhabits Sweden.

Crenator. Thorax crenated; above grey, beneath yellowiſh. Fabr. A native of the American iſlands. Smidt.

Furcatus. Thorax acutely ſpined and ſerrated; fuſcous; ſhield of the head acuminated and bifid. Fabr. Deſcribed from an inſect in the Bankſian Cabinet, found on the coaſt of Patagonia.

Pugillator. Thorax acutely ſpinous; fuſcous; margin yellow, beneath fulvous dotted with black. Fabr. Inhabits Africa.

Perditor. Thorax acutely ſpinous, with two dots and band in the middle brown; margin of the abdomen varied with fulvous and green. Fabr. Inhabits American iſlands.

Victor. Thorax acutely ſpined; fuſcous; tip of the ſcutel rufous; legs pale, dotted with black. Fabr. Inhabits American iſlands.

Delirator. Thorax acutely ſpined; black; antennæ ferruginous; legs pale, dotted with black. Fabr. Inhabits American iſlands.

Ciliatus. Thorax ciliated, obtuſely ſpinous, and black; margin and band behind yellow; poſterior thighs ſerrated. Fabr. An American ſpecies.

Melacanthus. Thorax acutely ſpinous; duſky ferruginous; ſpines black; abdomen black with yellowiſh ſtripes. Fabr. Inhabits Africa.

Aggressor. Thorax acutely ſpinous; tail four toothed; body yellowiſh; ſpines ſame colour. A new Holland ſpecies, deſcribed from the Bankſian cabinet. Fabr.

Vittatus. Thorax ſomewhat ſpinous; greeniſh; wing-caſes with a yellow ſtripe near the margin. Fab. Inhabits the Cape of Good Hope.

Hamatus. Thorax acutely ſpined; green; abdomen ſerrated, the denticles black. Fabr. An Eaſt Indian ſpecies.

Velox. Thorax acutely ſpined, with two dots; wing-caſes with a yellow dot at the baſe, and ſtreak at the tip yellow. Fabr. Inhabits America.

Humeralis. Green; wing-caſes yellow at the baſe. Thunberg. Country unknown.

Comma. Cinereous; ſcutel with a yellow line. Thunb. Inhabits Africa.

Transversus. Green; head and anterior part of the thorax yellow. Thunb. Same country as the former.

Fullo. Black, ſpecked with white; head and thorax with a white line. Thunb. Inhabits Japan.

Tibialis. Cheſnut-brown, with white and brown lines; ſcutel with two white ſpots. Thunb. Country unknown.

* *Ovate; thorax unarmed.*

Aurantius. Orange; head, anterior margin of the thorax, maginal ſpots on the abdomen, and legs black. Fabr. Donov. Inſ. China. Inhabits China and other parts of India.

Punctatum. Above blackiſh; thorax behind orange; wing-caſes white with a black dot. Fabr. *Cimex nigripes*, Sulz. Inhabits Java.

Nigripes. Above ſanguineous; ſcutel with two ſpots and wing-caſes with one ſpot of black. Fabr. *Cimex incarnatus*, Drury. An Eaſt Indian inſect.

Iserti. Teſtaceous; head, thorax behind, ſcutel anteriorily, band on the wing-caſes, with the wings and legs, blue. Fabr. According to Dr. Iſert, inhabits the woods of Guinea.

Papillosus. Olive; antennæ black; ſternum gibbous, and compreſſed. Fabr. *Cimex Chinenſis*, Thunberg. Deſcribed perhaps erroneouſly as a native of Sierra Leone, Africa. We have received the ſpecies from China. Donov. Inſ. China and India.

Rubens. Red; head, anterior part of the thorax and ſcutel greeniſh; margin of the abdomen ſpotted with yellow. Fabr. An Eaſt Indian ſpecies.

Danus. Sanguineous; head, ſcutel at the baſe, and wings, black. Fabr. *Cimex danus*, Stoll. *Cimex afer*, Drury. Inhabits American iſlands.

Obscurus. Fuſcous; thorax, wing-caſes, and ſcutel duſky olive; laſt joint of the antennæ yellow. Fabr. Inhabits the Eaſt Indies.

Torquatus. Green; head, and anterior part of the thorax, yellowiſh. Fabr. A native of Italy.

Ritulans. Green and braſſy; a ſanguineous band on the anterior part of the thorax; fore part of the ſcutel and wing-caſes yellowiſh. Fabr. An African ſpecies.

Guttatus. Braſſy green, with whitiſh dots; anterior ſhanks dilated and membranaceous. Fabr. A native of Siam. Bankſian cabinet.

Viridulus. Above yellow, dotted with green; beneath green. Linn. A native of India.

Prasinus. Green, and without ſpots; laſt joints of the antennæ rufous with the tip fuſcous. Linn. Found in woods in Europe; in England rarely. Donov. Brit. Inſ.

Dissimilis. Above green, beneath ferruginous. Fabr. A native of Germany.

Juniperinus. Green; margin entirely and tip of the ſcutel yellow. Fabr. Found on the juniper in Europe.

Smaragdulus. Green, ſcutel with three yellow ſpots at the baſe. Inhabits Madeira.

Azureus. Duſky-green; mouth and legs yellowiſh. Fabr. A native of Guinea.

Beryllus. Pale; margin of the thorax orange; wing-caſes with a ferruginous ſpot, and marginal little lines of black. Fabr. An Eaſt Indian inſect.

Calidus. Above fuſcous, beneath teſtaceous; antennæ black. Fabr. Inhabits Sierra Leone. Dr. Pflug.

Lynx. Greeniſh; margin of the abdomen with black ocellar ſpots. Fabr. A native of Hungary.

Cœlebs. Greyiſh-brown; three dots on the ſcutel with the tip yellowiſh. Inhabits New Holland. Deſcribed by Fabricius from a ſpecimen in the Bankſian cabinet.

Iratus. Green-brown, thorax with a yellow band. Fabr. Inhabits Cayenne.

Dumosus. Duſky; dorſal line, two dots on the ſcutel, and ring on the ſhanks rufous. Linn. Inhabits the North of Europe.

Tripunctatus. Yellowiſh; three lines on the head, and three dots on the ſcutel black. Fabr. An American ſpecies.

Atomarius. Grey and fuſcous varied; wings white, dotted with fuſcous. Fabr. Inhabits America.

Nubilis. Grey and black varied; wings white, ſtriated with black. Fabr. A native of the Cape of Good Hope. Bankſian cabinet.

Tristriatus. Yellowiſh; wing-caſes with an ocellar black ſpot at the tip; abdomen with three white lines. Fabr. An Italian inſect. Dr. Allioni.

6-Punctatus. Pale yellow and black varied; thorax pale yellow, with ſix black dots. Linn. An Indian ſpecies.

Signatus. Grey; ſcutel with a black ſtripe. Fabr. A native of Sierra Leone.

Gravis. Fuſcous; ſcutel with two yellow dots; wing-caſes with a black dot. Fabr. A native of New Zealand.

Meditabundus. Above green; wing-caſes fuſcous, beneath yellowiſh. Fabr. A South American ſpecies. Dr. Iſert.

Cinctus. Green; margin of the thorax and abdomen ſanguineous. Fabr. *Cimex Forſkahlii*, Gmel. Inhabits the Eaſt.

Rubrofasciatus. Greeniſh; thorax with a ſanguineous band. Fabr. Inhabits Tranquebar, and is deſcribed from a ſpecimen in the cabinet of Hybner. Gmelin alters the Fabrician ſpecific name to Hybneri.

Agathinus. Punctured yellowiſh; ſcutel with a black band; abdomen above black; tail roſy. Fabr. A German ſpecies.

Lituratus. Green ſpeckled with brown; thorax with a band; wing-caſes with a blotch of ſanguineous. Fabr. Inhabits Italy.

Cruentus. Green; thorax, margin of the abdomen, with the antennæ and legs ferruginous. Fabr. A native of Surinam.

Geniculatus. Duſky; thorax and margin of the abdomen yellowiſh; tail and joints of the legs ferruginous. Fabr. Inhabits Cayenne.

Mixtus. Punctured, grey, ſpotted with black; margin of the abdomen black, with yellow dots. Fabr. Same country as the former.

Picus. Grey; antennæ and ſhanks of the legs black, with white rings. Fabr. An Indian ſpecies.

Griseus. Grey; ſides of the abdomen varied with black and white; ſternum projecting. Linn. Found in gardens in Europe.

Interstinctus. Grey; margin of the abdomen with black ſpots. Linn. Inhabits Europe.

Funebris. Ovate, black, antennæ, legs, and wings ſame colour. Fabr. Inhabits Sierra Leone.

Baccarum. Somewhat fulvous; margin of the abdomen ſpotted with fuſcous. Linn. An European inſect.

Mucoreus. Black, ſpeckled with white; head black; margin and line in the middle white. Fabr. Inhabits China.

Ornatus. Black and red varied; head and wings black. Linn. Inhabits Europe.

Festivus. Black and red varied; thorax with ſix black dots; wings fuſcous, margin whitiſh. Linn. *Cimex dominulus*, Scop. Found in the ſouth of Europe.

Cruciatus. Black and pale varied; ſcutel black with a white croſs. Fabr. Inhabits the Eaſt Indies.

Bioculatus. Above black; thorax rufous with two black dots; margin of the ſcutel rufous. Fabr. An American inſect.

Gramineus. Roundiſh, green, and without ſpots. Fabr. A native of Tranquebar.

2-Punctatus. Duſky rufous; two dots on the ſcutel, and tip white; margin of the abdomen dotted with black. Fabr. A native of Italy. Called by Gmel. C. *Italicus*.

Bicolor. Black; wing-caſes white and black varied; wings white. Linn. Found in gardens in Europe. An Engliſh ſpecies. Donov. Brit. Inſ.

Oleraceus. Blue-braſſy; ſmall line on the thorax, tip of the ſcutel, and dot on the wing-caſe white or red. Linn. Geoffr. &c. Found in gardens in Europe.

2-Guttatus. Black, with the whole margin white; wing-caſes with white dots. Linn. Inhabits Europe; lives chiefly in gardens.

Histrio. Variegated; head and abdomen black with white lines. Fabr. Inhabits Tranquebar. Hybner.

Cæruleus. Blue and without ſpecies. Linn. An European ſpecies.

Albo-Marginellus. Blue; margin of the thorax, wing caſes, and tip of the ſcutel white. Fabr. Inhabits Germany. *Cimex albo-marginatus*, Geoffr.

Nigrita. Black; wings white; legs rufous; ſhanks ſerrated. Fabr. Inhabits Germany.

Flavicornis. Black; wings white; antennæ yellow; thorax and ſhanks ciliated. Fabr. Inhabits Europe.

Morio. Deep black; feet rufous. Linn. &c. Found on plants in Europe.

Tristis. Deep black; ſhield orbicular; thorax retuſe. Fabr. *Cimex ſpinipes*, Schranck.

Spinipes. Black; legs pitchy; ſhanks very ſpinous. Fabr. An African ſpecies.

Æthiops. Black; thorax with an impreſſed line in the middle; ſhanks very ſpinous and black. Fabr. Inhabits Cayenne. Rohr.

Lugens. Fuſcous; thorax, ſmall line on the ſcutel and margin of the abdomen white. Fabr. A native of America.

Melanocephalus. Grey; head and baſe of the ſcutel braſſy black. Fabr. A native of England.

Perlatus. Grey; head black; ſcutel with a white dot each ſide. Fabr. Inhabits Germany. Smidt.

Decrepitus. Black; head and legs fuſcous. Fabr. Found on graſs in Denmark.

Acuminatus. Front attenuated, whitiſh with fuſcous ſtreaks; tip of the antennæ rufous. Lin.

Elegans. Dark green; thorax yellow with four blackiſh ſpots; margin of the ſcutel and tranſverſe band yellow.

low. Donov. Inſ. New Holland. A recently diſcovered ſpecies.

Genus *Coreus*, Fabr. *Cimex*, Linn.

Marginatus. Thorax obtuſe ſpinous; margin of the abdomen acute; antennæ in the middle rufous. Fabr. *Cimex marginatus*, Linn.

Scapa. Thorax obtuſely ſpined; margin of the abdomen acute, and ſpotted with white; two ſpines on the anterior part of the head. Fabr. Inhabits Germany.

Spiniger. Thorax obtuſely ſpinous, and dentated; head with four ſpines. Fabr. Inhabits Italy.

Venator. Thorax obtuſely ſpinous, duſky grey; beneath yellowiſh; antennæ and legs ferruginous. Fabr. An Italian ſpecies. Dr. Allioni.

Bellator. Thorax ſpinous, above fuſcous; beneath yellowiſh; antennæ black with white rings. Fabr. A native of Cayenne.

Armiger. Thorax acutely ſpinous, grey; ſcutel with two dots; antennæ and legs pale. Fabr. An African ſpecies in the Bankſian cabinet.

Lanciger. Thorax acutely ſpined, yellowiſh; thorax behind, and wing-caſes fuſcous; wing-caſes with a white band. Fabr. Inhabits Guinea. Dr. Iſert.

Hastator. Thorax acutely ſpined, duſky grey; margin of the abdomen whitiſh with black dots. Fabr. Inhabits ſame country as the laſt.

Scorbuticus. Thorax obtuſely ſpinous, fuſcous; poſterior legs dotted with black. Fabr. Found in the iſlands of America.

2-Guttatus. Thorax acutely ſpined, grey, with two callous white dots on the ſcutel. Fabr. Inhabits the Eaſt Indies.

Delirator. Thorax acutely ſpined, yellowiſh, dotted with black; poſterior part of the thorax and the wing-caſes fuſcous.

Defensor. Thorax acutely ſpined; tail four-toothed; body green; ſpines black. Fabr. A native of New Holland. Bankſian cabinet.

Pugnator. Thorax acutely ſpined, oblong; above fuſcous, beneath yellowiſh; antennæ rufous with the tip black. Fabr. Inhabits Tranquebar. Hybner.

Fasciculatus. Thorax ſomewhat ſpinous cinereous; wings fuſcous; legs with faſciculated hairy tubercles. Fabr. Inhabits the Cape of Good Hope.

Insidiator. Thorax acutely ſpinous; above rufous, beneath yellowiſh. Fabr. Inhabits Barbary.

Calumniator. Thorax acutely ſpinous, cinereous-brown; beneath yellowiſh with ſtreaks of black dots. Fabr. A native of India. Prof. Abildgaard.

Hirticornis. Thorax acutely ſpinous, ſerrated, and rufous; antennæ hairy; poſterior thighs ſerrated. Fabr. Inhabits Barbary.

Sulcicornis. Thorax obtuſely ſpinous; above rufous, beneath yellowiſh; antennæ triangular, abdomen ſomewhat ſquare. Fabr. A native of Barbary. Muſ. Desfontaines.

Rhombeus. Thorax acutely ſpined; abdomen dilated, rhombic, and armed behind with ſix teeth. Linn. *Coreus rhombea*, Fabr. An African inſect.

Quadratus. Thorax obtuſely ſpinous; above fuſcous, beneath yellowiſh; abdomen ſquare. Fabr. A native of Germany.

Hastatus. Thorax acutely ſpinous, and dentated; wing-caſes duſky with a poſterior white ſtreak. Fabr. Inhabits Tranquebar. Hybner.

Gravidator. Thorax ſerrated, duſky cinereous; margin of the wing-caſes dotted with black; wings white; antennæ fuſcous. Fabr. Inhabits South American iſlands.

Genus *Lygæus*, Fabr. *Cimex*, Linn.

* *Thorax ſpinous.*

Valgus. Thorax ſpinous and ſerrated; poſterior thighs incurvated, and with the ſhanks armed with a ſingle tooth. Linn. Inhabits the Cape of Good Hope.

Serratus. Head, thorax and abdomen ciliated with ſpines; body black. Fabr. Inhabits America.

Merianæ. Thorax ſomewhat ſpinous; wing-caſes fuſcous, reticulated with white; abdomen ſpinous at the baſe. Fabr. A native of Surinam.

Grossipes. Thorax ſerrated, lineated with red; poſterior thighs thick, and with the abdomen at the baſe ſcabrous; ſhanks with a ſingle tooth. Fabr. Inhabits Tranquebar.

Tragus. Spines of the thorax compreſſed, lunulated, and ſerrated; poſterior ſhanks membranaceous and ſerrated. Fabr. A native of China. Dr. Pflug.

Tenebrosus. Thorax ſomewhat ſpinous; poſterior thighs incurvated, and clubbed; baſe of the abdomen with three ſpines. Fabr. &c. An Eaſt Indian ſpecies.

Fulvicornis. Thorax ſpinous, and ſerrated; brown; thighs bidentated; poſterior one with many teeth. Fabr. An Eaſt Indian ſpecies.

Incubator. Thorax obtuſely ſpined, and ſerrated; ſnowy before the margin; body grey. Fabr. Inhabits Carolina.

Heros. Thorax obtuſely ſpined, and ſerrated; fuſcous; poſterior thighs clavated and dentated; ſhanks membranaceous and ſerrated. Fabr. Inhabits the Eaſt Indies.

Femoratus. Thorax ſlightly ſpined; poſterior thighs incurved, and dentated; poſterior ſhanks compreſſed. Fabr. Inhabits India. Bankſian cabinet.

Curvipes. Thorax acutely ſpined; thighs bidentated at the tip; poſterior ones incurved. Fabr. Inhabits Africa.

Clavipes. Thorax ſerrated, duſky; thighs with many ſpines; poſterior ones thick. Fabr. A native of China.

Dentator. Thorax ſerrated, duſky; poſterior thighs dentated; ſhanks pale. Fabr. A native of Italy. Dr. Allioni.

Pictor. Thorax ſpinous, and ſerrated; ochraceous; wing-caſes ſpeckled with black. Fabr. A native of the Eaſt Indies.

Compressicornis. Thorax ſpinous and ſerrated, with ocellar black ſpots; body black; laſt joint of the antennæ compreſſed and white at the baſe. Fabr. A native of St. Jago.

Membranaceus. Thorax ſpinous and without ſpots, blackiſh; wing-caſes with a whitiſh band; poſterior ſhanks membranaceous and dentated. Fabr. Inhabits South America.

Auctus. Thorax ſomewhat ſpinous and black; two ſpots fulvous; wing-caſes with a yellow band; poſterior ſhanks membranaceous and yellow. Fabr. A native of America.

Sanctus. Thorax acutely ſpined, oblong, rufous; wing-caſes black, with a ferruginous croſs. Fabr. A Braſilian inſect.

Lætus. Thorax ſpinous, green; head, band on the wing-caſes, abdomen, and thighs, yellow; wing-caſes black. Fabr. Inhabits Cayenne.

Kermesinus. Thorax ſomewhat ſpinous, oblong, rufous, with a whitiſh band, dotted with black; poſterior thighs with many teeth. Linn. A native of Surinam.

Australis. Thorax ſomewhat ſpinous, oblong, black; a red band on the thorax before; poſterior ſhanks membranaceous. Fabr. Deſcribed from a ſpecimen taken in Otaheite. Bankſian cabinet.

Balteatus. Thorax ſomewhat ſpinous; ferruginous; wing-caſes with a tranſverſe yellow line; poſterior thighs with many teeth. *Cimex balteatus*, Drury. Inhabits South America.

Sinuatus. Thorax acutely ſpined, livid; poſterior ſhanks compreſſed, ſinuated and black. Fabr. A native of Cayenne.

Serripes. Thorax acutely ſpined, rufous; poſterior thighs dentated. Fabr. A native of New Holland.

Dentipes. Thorax ſpinous, elongated; poſterior thighs long and ſerrated; body fuſcous beneath; ſides white. Fabr. Inhabits Africa.

Linearis. Thorax acutely ſpined, elongated, fuſcous; poſterior thighs lengthened, and dentated. Fabr. A native of China. Drury.

Crenulatus. Thorax dentated and rufous, with a black ſpot; poſterior thighs dentated; body black. Fabr. Inhabits American iſlands.

4 **Spinosus.** Elongated, red; thorax armed with four ſpines. Linn. A native of America.

* *Thorax unarmed.*

Phasianus. Fuſcous; poſterior thighs arched, clavated, and armed with a ſingle tooth; abdomen at the baſe beneath gibbous. Fabr. An African inſect.

Bellicosus. Fuſcous; poſterior thighs arched and dentated; abdomen four-ſpined. Fabr. An African ſpecies. Bankſian cabinet.

Meleagris. Fuſcous; extreme joint of the antennæ, and anterior ſhanks yellow; all the thighs ſerrated. Fabr. A native of China.

Gallus. Wing-caſes fuſcous with yellow ſtreaks; diſk of the abdomen rufous; poſterior thighs ſerrated. Fabr. Inhabits Surinam.

Faber. Black; abdomen fuſcous, with yellow margin; anterior thighs bidentated at the tip. Fabr. A native of Paulicondor.

Indus. Abdomen red, and bidentated; wing-caſes fuſcous with pale ſtreaks. Linn. A native of Cayenne.

Civilis. Red and black varied; thorax with two red lunules; wings fuſcous, ſpotted with white. Fabr. Inhabits Tranquebar.

Saxatilis. Black; thorax with the lateral margins and line down the middle red; wing-caſes with three red ſpots; wings immaculate. Fabr. Inhabits the ſouth of Europe.

Hyosagami. Black and red varied; wings fuſcous and without ſpots. Linn. An European ſpecies.

Varicolor. Black and red varied; wing-caſes black; with two yellowiſh ſpots. Fabr. Found in Trinity iſland.

Scabrosus. Black; margin of the thorax and two bands on the upper wings reddiſh. Fabr. A native of America.

Leucurus. Black; wing-caſes red; wings black, the baſe and tip white. Fabr. Inhabits Amſterdam iſland.

Koenigii. Teſtaceous; wing-caſes with a black dot; wings deep black. Fabr. Inhabits Tranquebar.

Slanbuschii. Sanguineous; thorax with an abbreviated band; ſcutel, dot on the wing-caſes, and the wings black. Fabr. Inhabits China. Donov. Inſ. China.

Ægyptius. Red and black varied; wing-caſes red, with a black dot. Linn. A native of Egypt.

4-**Guttatus.** Wing-caſes rufous, with black band; wings with two white dots. Fabr.

Punctato Guttatus. Black; wing-caſes rufous, with a middle black dot; wing black with two white dots. Fabr.

Suturalis. Rufous; antennæ and wings black; the ſuture entirely white. Fabr.

Rolandri. Black; wings with a rhombic yellow ſpot. Linn. Found on the pine in Europe.

Sordidus. Black; thorax behind, wing-caſes and legs grey. Fabr. Inhabits Tranquebar.

Genus *Miris*, Fabr. *Cimex*, Linn.

Dolabratus. Wing-caſes ferruginous, whitiſh at the ſides; antennæ black. Linn. A native of Europe.

Lævigatus. Whitiſh; ſides white. Degeer. A native of Europe.

Lateralis. Black; ſides whitiſh. Fabr. An European ſpecies.

Holsatus. Whitiſh; two lines on the thorax brown, and wing-caſes brown within. Fabr. Inhabits Europe.

Pabulinus. Green, without ſpots; wings hyaline. Linn. Inhabits Europe.

Virens. Green; ends of the feet, and tips of the antennæ rufous. Fabr. An European ſpecies.

Pallens. Pale; head and body black. Paykull. A native of Sweden.

Calens. Head, thorax, and wing-caſes black; ſcutel fulvous. Linn. A native of India.

Gronovii. Thorax and wing-caſes black, with a yellow line forming a band. Linn. Inhabits India.

Ferus. Grey and without ſpots. Linn. Found in European woods.

Vagans. Grey; head and line on the thorax black; legs teſtaceous. Fabr. A native of Sweden.

Cingulatus. Fuſcous; head, and three lines on the thorax, with the margin of the wing-caſes white. Fabr. A native of India.

Marginellus. Black; three lines on the thorax white; wing-caſes edged with white, and at the tip a ſcarlet ſpot. Fabr. An Italian inſect.

Striatus. Black; wing-caſes yellow ſtriated with brown; tip and legs rufous. Linn. Inhabits Europe.

Abietis. Fulvous ſpotted; legs rufous; thighs thick and dentated. Degeer. Inhabits Europe.

Ulmi. Above ruſt colour; wing-caſes ſtreaked with ſanguineous; wings varied behind with brown and white. Fabr. Linn. &c. Found on the elm in Europe.

Genus *Gerris*, Fabr. *Cimex*, Linn.

Lacustris. Black; anterior legs very ſhort. Linn. Very common in ditches during ſummer. Donov. Brit. Inſ.

Paludum. Black; beneath ſilvery; margin of the abdomen ſomewhat ferruginous. Fabr. Twice the ſize of the laſt. A native of Europe.

Fossarum. Above fuſcous; margin, thorax, ſcutel, and dorſal line yellow. Fabr. A native of the Eaſt Indies.

Stagnorum. Nearly round; blackiſh; thorax with two globular dots in the middle. Linn. Inhabits England.

Rivulorum. Black, dotted with white; abdomen fulvous. Fabr. Inhabits the mountainous rivulets of Alſace.

Pallipes. Black; legs pale; breaſt two-ſpined. Fabr. An Italian inſect. Cabinet of Dr. Allioni.

Culiciformis. Thorax armed with many ſpines; grey; wing-caſes with many blotches. Fabr. An American ſpecies.

Mantis. Fuſcous; ſtreak on the wing-caſes and joints of the legs white. Fabr. Country unknown.

Tipuliformis. Sanguineous; wings and legs black; antennæ very long. Fabr. A native of Guinea.

Præcatorius. Brown; head and thorax two-ſpined;

margin of the thorax elevated behind and obtuſe; antennæ very long. Fabr. A native of Guinea. Dr. Iſert.

Pedestris. Body fuſcous and yellow varied; poſterior thighs elongated and toothed. Fabr. Inhabits the Eaſt Indies.

Filiformis. Antennæ ferruginous; body linear, pale, and greeniſh. Fabr. A native of America.

Oratorius. Greeniſh; antennæ before the tip white. Fabr. A native of India.

Angustatus. Above grey, beneath yellowiſh; antennæ and legs ſomewhat teſtaceous. Fabr. A native of China. Dr. Pflug.

Filum. Fuſcous; wings abbreviated; legs very long. Fabr. An Eaſt Indian ſpecies in the cabinet of the late Dr. Fothergill.

Longipes. Black; margin of the thorax and band on the wing-caſes ſanguineous. Fabr. An American ſpecies.

Cursitans. Above fuſcous, beneath cinereous; legs very long; tail bidentated. Fabr. A New Holland inſect. Bankſian cabinet.

Tipularius. Whitiſh; all the legs long; thighs clavated; antennæ biclavated. Fabr.

Vagabundus. Wing-caſes with the wings fuſcous and white varied; legs very long, ringed with cinereous. Fabr. An European inſect.

Clavipes. Cinereous; thighs clavated, antennæ biclavated. Fabr. Inhabits Sweden.

Apterus. Apterous, fuſcous; abdomen fulvous; ſpot at the baſe black with white dots. Fabr. An Italian inſect.

Currens. Apterous, fuſcous; margin of the abdomen raiſed, fulvous with black dots. Fabr. A native of Italy.

Genus *Reduvius*, Fabr. *Cimex*, Linn.

Gigas. Black; margin of the thorax and obſolete flexuous band on the wing-caſes rufous. Fabr. Inhabits the Eaſt Indies.

Personatus. Antennæ capillary at the tip; body beneath ſubvillous and fuſcous. Linn.

Villosus. Villous, black; ſcutel at the tip recurved and pointed. Fabr. A native of Barbary.

Barbicornis. Black; thorax and baſe of the abdomen olive. Fabr. Inhabits Sierra Leone.

Maculatus. Rufous; thorax with four; wing-caſes with three black ſpots. Fabr. An African ſpecies.

Stridulus. Glabrous, black; wing-caſes rufous; thin margin cinereous, and dotted with black. Fabr. Inhabits Europe.

Nitidulus. Black; thorax olive; anterior thighs rufous. Fabr. Inhabits Africa.

Pilipes. Black, thorax and wing-caſes at the tip villous with grey hairs. Fabr. A native of Cayenne.

Longipes. Red; wing-caſes black; baſe and band red. Linn. A native of American iſlands.

Phalangium. Rufous; antennæ and legs elongated and black. Fabr. A native of the American iſlands.

Nigripennis. Rufous; wing-caſes and abdomen beneath black; ſcutel bidentated. Fab. Inhabits the Eaſt Indies.

Marginatus. Above rufous, wing-caſes black; abdomen deep black with rufous margin. Fabr. Inhabits the Eaſt Indies. Bankſian cabinet.

Rufipes. Deep black; wing-caſes grey veined with black; margin of the abdomen and poſterior legs rufous. Fabr. A native of Cayenne.

2-Pustulatus. Above black; a rufous dot at the tip of the wing-caſes. Fabr. Inhabits Surinam. Bankſian cabinet.

Annulatus. Tip of the antennæ capillary; body black, beneath ſpotted with ſanguineous. Linn. Geoffr.

Sanguineus. Black; margin of the abdomen ſanguineous ſpotted with black. Fabr. A native of Barbary.

Bicolor. Deep black; thorax behind, wing-caſes, and margin of the abdomen pale. Fabr. An African ſpecies. Bankſian cabinet.

Litura. Dull, fuſcous; tip of the antennæ and blotch in the middle of the wing-caſes white. Fabr. A native of Cayenne.

Attelaboides. Teſtaceous and black varied; anterior part of the thorax teſtaceous, with two black teeth. Fabr. A New Holland inſect.

Diadema. Black; head and thorax ſpinous. Fabr. A native of North America.

4-Spinosus. Thorax four-ſpined, black; wing-caſes teſtaceous; head and legs yellow. Fabr. Inhabits Cayenne.

Fasciatus. Head and thorax black; wing-caſes yellowiſh; band and wings at the tip black. Fabr. A native of Cayenne.

Maurus. Ferruginous, margin of the abdomen ſpotted with black; anterior part of the thorax ſomewhat ſpinous. Fabr.

Fornicatus. Thorax raiſed, vaulted, pale with three brown ſpots. Fabr. A native of Cayenne.

Acantharis. Thorax ſpinous; abdomen ciliated with ſpines. Fabr. Inhabits Jamaica.

Guttula. Gloſſy black; wing-caſes and legs ſanguineous; wings with a white dot. Fabr. A native of Germany. Dr. Heiſſe.

Elongatus. Elongated, rufous; antennæ and legs black. Fabr. Inhabits Africa.

Minutus. Black, ſcutel at the tip, and wing-caſes at the baſe white. Fabr. Inhabits Paris.

CIMICIFUGA, in *Botany*, (ſo called from its driving away bugs). Linn. gen. 1282. Schreb. 933. Gært. 810. Juſſ. 234. Claſs and order, *polyandria tetragynia*. Nat. Ord. *Multiſiliquæ*, Linn. *Ranunculaceæ*, Juſſ.

Gen. Ch. *Cal.* four or five-leaved; leaflets roundiſh, concave, caducous. *Cor.* Nectaries reſembling petals, pitcher-ſhaped, membranous. *Stam.* Filaments twenty, projecting a little out of the flower; anthers didymous. *Piſt.* Germs four to ſeven; ſtyles recurved: ſtigmas adhering longitudinally to the ſtyle. *Peric.* Capſules from four to ſeven, oblong, opening with a lateral ſuture, Linn. (opening at the ventral ſuture, Gært.) *Seeds* many, covered with ſpreading ſcales.

Eſſ. Ch. Calyx four or five-leaved. Nectaries four, pitcher-ſhaped. Capſules from four to ſeven.

Sp. C. *fœtida*, Mart. Lam. Willd. Gmel. Sib. 4. tab. 70. Lam. Ill. Pl. 487. Gært. tab. 140. (Actæa cimicifuga, Linn. Sp. Pl. Thalictroides fœtidiſſimum, Chriſtophorianæ facie, Amm. ruth. 102.) *Root* perennial, thick, knotty, ſhort, with many thickiſh fibres creeping tranſverſely. *Stem* ſix feet high, cylindrical, ſlightly ſtriated, a little hairy, hollow, with alternate branches. *Leaves* pinnated; leaflets egg-ſhaped, ſerrated; terminating one commonly three-lobed. *Flowers* in long alternate terminal racemes, on ſhort peduncles. *Capſules* netted, beaked with the ſhort curved ſtyle, one-celled, opening at the interior or ventral ſuture. *Seeds* ſeveral, oblong, covered with linear-oblong flexile pale ſcales, attached to the ſuture. The whole plant, eſpecially in its wild ſtate, has an almoſt inſupportable ſmell. According to Linnæus it bears a great reſemblance to Actæa racemoſa. A native of Siberia, from the river Jeniſea, flowering in the middle of July, and ripening its ſeed in Auguſt. It varies much in the number of parts in the calyx, corolla, and piſtils; nor is either the ſex or proportion conſtant.

CIMIER, the French term in *Heraldry* for a creſt. See Crest.

Cimier, in *Military Language.* The ancient knights, or chevaliers, in France and other countries, put each of them a *cimier* on his helmet by way of ornamenting it. But it was ſo incommodious, by its weight, that ſubſequent chevaliers laid it aſide, and contented themſelves with placing ſmall allegorical figures in its ſtead. See Crest.

CIMINIA, in *Ancient Geography*, a country of Italy, in Etruria.

CIMINIUS *lacus*, a lake of Italy, in Etruria, mentioned by Livy.

Ciminius *Mons*, a mountain of Etruria, ſituated N. and N.E. of the lake of the ſame name.

CIMKOWICZKE, in *Geography*, a town of Lithuania, in the palatinate of Novogodrek, 18 miles W. of Sluck.

CIMMERII, in *Ancient Geography*, the name of a people, who, according to Poſidonius, were the ſame with the Cimbri. The firſt appellation, by which they were diſtinguiſhed, is unknown; but it appears that they did not acquire the ſecond before they inhabited the town of "Cimmerium," built in Aſia upon the bank of the ſtrait that ſeparates it from the Tauride. The time of the eſtabliſhment of the Cimmerians muſt have been very ancient; for it appears they had gained celebrity in the 9th century before the Chriſtian æra, becauſe Homer mentions them in his "Odyſſey" as a people who inhabited the northern and north-weſtern parts of Greece, in a climate approaching the pole. Strabo ſuggeſts (l. iii.) that from the time of Homer, the Cimmerians and Amazons entered into Aſia Minor, and penetrated into Æolia and Ionia; and Euſebius, in his Chronicle, marks, in the year 1076 before Chriſt, an incurſion of the Cimmerians and Amazons into Aſia Minor. Oroſius alſo mentions another about the year 782, thirty years before the foundation of Rome. The Cimmerians, according to Poſidonius, advanced gradually from the ſea-coaſt to the interior of Germany, and at length occupied the whole country, which extended from the ocean to the Euxine ſea. The principal eſtabliſhment of the Cimmerians was towards the banks of the Tyras, according to Herodotus (l. iv. c. 12.) who ſays, that they there aſſembled to hold a general council of the nation, on the ſubject of the Scythian invaſion. Having advanced towards the eaſt, they had traverſed the Boryſthenes and the Hypanis, and had paſſed the Cherſoneſus or peninſula, which has always preſerved their name. From this country they proceeded to the Boſphorus, or the ſtrait which ſeparates it from Aſia, and by which the waters of the Tanais, after having formed the Palus-Mæotide, diſcharge themſelves into the Euxine ſea.

The country bordering on the Palus Mæotis, and the Boſphorus, which was inhabited by the Cimmerii, is repreſented by the ancients as an inhoſpitable place, covered with foreſts and fogs, which the ſun could not penetrate (See Bosphorus); and their frightful deſcription of it gave Cicero and Ovid occaſion to ſay, that an eternal night reigned in this gloomy climate, and that ſleep had taken up its abode here. Hence "Cimmerian darkneſs" became, according to Lactantius, proverbial, ſignifying an impenetrable darkneſs, and likewiſe a gloomy and ſtupid mind.

Herodotus adds, that they took poſſeſſion of the two banks of this ſtrait, and there conſtructed forts, the veſtiges of which remained in his time. Strabo, ſpeaking (l. xi.) of Cimmerium, ſays, that it was built on the Aſiatic bank of this ſtrait. Herodotus ſays, moreover, that the Cimmerians, after having croſſed the ſtrait, proceeded along the ſea-coaſt; and advanced into Aſia Minor, which they ravaged, whilſt the Scythians were pillaging Media and Paleſtine. He adds, that the Cimmerians penetrated into the peninſula of Sinope, which they found to be a deſert. We have an account, ſince the year 1076, of two expeditions of the Cimmerians into Aſia Minor. In one of theſe, it is ſaid, on the authority of Ariſtotle, they ſeized poſſeſſion of the town of Antandros, ſituated at the foot of Mount Ida, at the bottom of the gulf of Adramyttium. He adds, that theſe people gave the name of "Cimmeris" to this town, and that they continued maſters of it for a century. In theſe two invaſions, the Cimmerians pillaged the town of Sardes. Strabo ſays (l. i.) that Midas, king of Phrygia Major, having been conquered by the Cimmerians, killed himſelf, in order to avoid falling into their hands. Euſebius places the death of Midas at the year 697, or about the 4th year of Gyges. Strabo farther informs us (l. xiv.) that the Cimmerians remained maſters of the plains of Caiſter or of Lydia, for a conſiderable time after the deſtruction of Magneſia, and the pillage of Sardes. However, he ſometimes diſtinguiſhes the people who deſtroyed Magneſia and pillaged Sardes, ſometimes by the name of Cimmerians, and ſometimes by that of Treres, or Trerones, and calls their chief Lygdamis; and this, according to Callimachus, was the name of the king of the Cimmerians, who came from Scythia, or the coaſt of the Euxine ſea, to ravage the plains of Caiſter. Heſychius alſo informs us, that this Lygdamis pillaged the town and burnt the temple of Epheſus. Strabo (l. xiv.) ſays, that this Lygdamis, after having ravaged Lydia and Ionia, loſt his life in Cilicia; that is unqueſtionably the Cilicia of the Troade, where the Cimmerians had their place of arms (Id. l. i.). This author always gives the ſurname of Cimmerians to the Treres or Trerones of Aſia, in order to diſtinguiſh them from thoſe of Thrace. Herodotus ſays, that after the council held on the banks of the Tyras, already mentioned, the Cimmerians, conceiving themſelves unable to reſiſt the Scythians, migrated towards the eaſt; and that the Scythians, having taken poſſeſſion of their country, diſpatched an army to purſue them, but that this army having loſt its way in the mountains, wandered, in croſſing the Caucaſus, and followed the courſe of a valley, which led them to the coaſt of the Caſpian ſea. The Cimmerians, at length, proceeded along the coaſt of the Euxine, and returned to the Colchide in Aſia Minor.

The Cimmerian nation conſiſted, at the time of the Scythian invaſion, of three diviſions; viz. thoſe of Aſia Minor, the colony of the Cherſoneſus, and the principal body of the nation, which inhabited the regions ſituated between the Danube and the Boryſthenes, the moſt conſiderable eſtabliſhments of which were formed on the bank of the river Tyras. The Cimmerians of Aſia Minor, accuſtomed to plunder, were attacked by Alyattes, a valiant and active prince, who deſtroyed moſt of them that remained, and thoſe who eſcaped the ſword of the conquerors were made ſlaves, and diſperſed through the countries of Lydia and Myſia. The Cimmerians of the Cherſoneſus and the Boſphorus poſſeſſed cities on both ſides of this ſtrait; but they found it difficult to defend themſelves againſt the Scythians. They probably, therefore, abandoned the plains of the iſthmus and Boſphorus, and retired into the mountains to the ſouth and eaſt of the peninſula: mountains that were fertile, and yet difficult of acceſs to the cavalry of the Scythians. As to the principal body of the Cimmerians, who inhabited the country between the Danube and the Boryſthenes, the Scythians continued maſters of their country

500

500 years before Chriſt. The Greeks had many colonies on the ſea-coaſt, and theſe colonies extended their commerce into the interior parts of the country. It is from the inhabitants of theſe colonies, and from a Scythian prince, that Herodotus derived his information concerning theſe territories. It is probable that the Cimmerians aſcended the Carpathian mountains, and deſcended on the weſtern ſide of it. After their flight, when this event took place, the different people which compoſed the Cimmerian league, ſeparated from one another, and ſettled in different places; and as the league no longer ſubſiſted, each people reſumed its ancient name. and began to form a diſtinct ſtate.

The learned M. Pezron, in his "Antiquities of Nations," &c. maintains, that the Cimmerians were of the ſame family with the *Sacæ;* and that whilſt theſe were proceeding from Bactriana, which they had previouſly occupied, by the ſouth, the Cimmerians, who likewiſe came from the ſame country, took their route by the north of Aſia; and he repreſents them as making their way by force of arms, till they ſettled upon the Palus Mæotis. In proof of the opinion which he advances, he appeals to Plutarch, Poſidonius, Diodorus, and Strabo. Herodotus, however, to whom we have already referred, aſſigns to their march a quite contrary direction, from the Palus Mæotis towards Caucaſus and the eaſt (l. iv. c. 12.) The writers above cited, ſays Mr. Bryant (Anal. Anc. Mythol. vol. iii.), have not a ſyllable to the purpoſe for which M. Pezron alleges their authority. That there were ſuch people as the Cimmerians upon the Mæotis, is, indeed, as certain as that there were Phrygians in Troas, and Spartans at Lacedæmon. But that they came from Bactria, and fought their way through different countries; that they were the brethren of the Scythians, ſtyled Sacæ, and took the upper route, when the others were making their inroad below, are circumſtances which, ſays Mr. Bryant, have not the leaſt ſhadow of evidence. They are not mentioned by the authors to whom M. Pezron appeals, nor by any writers whatever. Indeed Strabo expreſsly ſays (l. xi.), that the Cimmerians were driven out of their country by the Scythians.

Cimmerii, a people of Italy, who inhabited the environs of Baiæ and Cumæ near the lake *Avernus*, which ſee. Thoſe that have given an account of this colony, among whom are Lycophron, Pliny, Euſtathius, Servius, &c. inform us, that the ſun never ſhines in this ſmall canton; but Strabo, who was better acquainted with theſe countries, deſcribes them as abounding with all the neceſſaries of life, and rather pleaſant than diſagreeable.

CIMMERIUM, a town of Aſiatic Scythia, or the Cimmerian Boſphorus. It was the laſt city to the right, when a perſon paſſes this ſtraight from the ſouth or the north.

Cimmerium, *Eſki-krim*, a town in the interior of the Tauric Cherſoneſus, according to Ptolemy and Strabo. M. le Peyſſonel, in his Obſervations hiſtorical and geographical, ſays, that this town, now reduced to a wretched burgh, was formerly large and flouriſhing; as appears from ſeveral exiſting monuments. It was ſituated to the north of Mount Cimmerius, and to the W.N.W. of Theodoſia.—Alſo, a town of Italy, in Campania, ſituated, according to Pliny, near the Lucrine and Avernian lakes.

Cimmerium *Promontorium*, a promontory of Aſia, on the ſouthern coaſt of the Palus Mæotis, marked by Ptolemy between the town of Apatura and the mouth of the river Vardan.

CIMMERIUS Bosphorus. See Bosphorus.

Cimmerius *Mons*, *Aghirmiche-Daghi*, a mountain in the Tauric Cherſoneſus, according to Strabo, who ſays, that it derived its name from the Cimmerii, a people who anciently occupied the whole Boſphorus. See Cimmerii, *ſupra*.

CIMOLIA, a place of Greece in the Peloponneſus. Diodorus Siculus reports that the Athenians gained in this place a victory over the inhabitants of Megara.

Cimolia, in *Mineralogy*. This term occurs in ſome of the ancient pharmacopæias as deſignating pipe-clay and fuller's earth, of which the former was denominated cimolia alba, and the latter cimolia purpuraſcens. See Pipe Clay and Fuller's Earth.

Cimolia *Terra*. See Cimolite.

CIMOLIS, or Cimolus, in *Ancient Geography*, one of the Cyclades, or iſlands of the Archipelago. It was alſo called *Echinuſſa*, or Viper Iſland, on account of the great number of thoſe reptiles with which it abounded, at a time, when little frequented by men, it was covered only by rocks, foreſts, and brambles. It was anciently known by the ſubſtance which was found in it, and to which it gave the name of "Cimolia Terra." It was ſituated a little to the N.E. of Melos, and to the S.S.W. of Siphnos. The Greeks at this day call it "Kimoli;" but it is more generally known by the name of "Argentiera," which ſee. The virtues of the earth which it produces are recited by Pliny (N. H. l. xxxv. c. 17.), Dioſcorides (l. v. c. 133.), and Galen (Epitome de Curatione Morborum). See Cimolite.

Cimolis, an epiſcopal town of Aſia Minor in Paphlagonia.

CIMOLITE of Klaproth, *Cimolia* of Pliny, in *Mineralogy*, is a mineral of a light, greyiſh, white colour, inclining to pearl-grey; but by expoſure to the air it acquires a reddiſh tint. It occurs in maſs, forming large ſtrata; its fracture is earthy, uneven, and its texture more or leſs ſlaty. It is opake, of a greaſy texture, and may be ſcraped with a knife like ſteatite. It adheres firmly to the tongue, ſtains the fingers in ſome degree, and though ſoft, is very tough, and difficultly pulverizable. Sp. gr. 2.

When expoſed by itſelf to the action of the blow-pipe, it becomes at firſt of a dark grey colour, but afterwards recovers its whiteneſs with little or no alteration: with microcoſmic ſalt it runs into a colourleſs globule; with borax it forms a light-brown glaſs. Its component parts are

63	Silex
23	Alumine
1.25	Oxyd of iron
12	Water
99.25	

It abounds in the iſland of Cimolis (whence its name), now called Argentiera, and was highly valued by the Greeks and Romans for its detergent properties: at preſent its uſe is almoſt entirely confined to the inhabitants of that iſland. When triturated with a little water it forms a ſoft, pap-like maſs, and being applied in this ſtate to ſilk or woollen cloth, and allowed to dry on, it abſorbs all the greaſe which they may contain, like Fuller's earth, but more effectually, and is again diſcharged by a ſlight waſhing, leaving the cloth reſtored to its original luſtre.

CIMON, in *Biography*, an Athenian, ſon of Miltiades, by Hegiſipyle, the daughter of a Thracian king. He ſerved under his father in his youth, and was more addicted to active purſuits, than to thoſe ſtudies and accompliſhments, for which the Athenians peculiarly valued themſelves. As he advanced in life he ſhowed that he was not deficient in abilities; he poſſeſſed a natural eloquence, which, united to an openneſs and generoſity of temper, rendered him well qualified to make his way in a popular government. When his father died he was impriſoned, becauſe unable to pay the fine impoſed upon him. He was releaſed from confinement chiefly by means of his ſiſter Elpinice, who regarded him with the tendereſt affection. Cimon paſſed ſome of his younger days in licentious pleaſures; but at the time of the Perſian invaſion, his martial ſpirit, and reſolute temper ſhone forth with great luſtre. At the advice of Themiſtocles, he quitted the city, embarked on board the fleet, and greatly diſtinguiſhed himſelf in the naval combat of Salamis. Ariſtides having formed a favourable opinion of his integrity and talents, initiated him in public buſineſs, with a view of bringing him forward to counterbalance the influence of Themiſtocles. After the expulſion of the Perſians, Cimon was made admiral of the Athenian fleet, which was commanded by Pauſanias. In this ſituation, his diſpoſition being a perfect contraſt to that of Pauſanias, he gained univerſal reſpect and eſteem, ſo that after the commander was recalled, the confederates readily accompanied him in an expedition to Thrace. In this, among many other brilliant and important achievements, he reduced the iſland of Scyros, inhabited by pirates, and returned to Athens with the bones of Theſeus, to be interred in the native city of the hero, which he had quitted four hundred years before. Having re-inforced his fleet, he proceeded to the coaſt of Caria, thence to Cyprus, where he was informed that the Perſian fleet lay at anchor. He purſued it to the mouth of the Eurymedon, and there completely defeated it, deſtroying many veſſels and capturing two hundred. Then landing his men on the ſame day, he gained a ſignal victory over the land forces of the enemy. This action, which is ſo celebrated in ancient hiſtory, took place B. C. 470. Cimon afterwards got poſſeſſion of eighty Phœnician ſhips in the port of Cyprus, and he brought back to Athens an immenſe booty, which enabled the Athenians to build the ſouth wall of their citadel, and to lay the foundations of the long walls which were to connect the city with the port. Cimon might have enriched himſelf by this expedition in the moſt honourable manner, but he choſe rather to expend his wealth upon his native city. He had a plain but plentiful repaſt provided daily at his houſe for a numerous company, to which the pooreſt citizens were made welcome. He not only fed the hungry, but clothed the naked, and was ready at all times to ſupply the needy with ſums of money to aſſiſt them in their various exigencies. Many of his public acts of benevolence carried with them the air of oſtentation; it has, however, been aſſerted, that Cimon never aimed at courteſy, the populace being in reality attached to the ariſtocratical party, which he alſo favoured in his political conduct. As a ſtateſman, he confirmed the naval ſuperiority of his country, not only by his ſplendid victories, but by the wiſdom of his policy. For, many of the Greek ſtates, which were bound by treaty to furniſh ſhips to the allied fleet, chuſing rather to compound this ſervice for money, he adviſed the acceptance of their compoſition, but at the ſame time he would not hear of ſuch an indulgence to the Athenians. The conſequence of which was, that the other ſtates loſt all their practice in, and ſpirit for, naval affairs, while the Athenians were kept in full exerciſe and diſcipline. The Perſians renewed their hoſtilities, which gave Cimon a new opportunity for achieving more victories: he then reduced the Thracians, who had revolted from the Athenians, joined the Perſians, and ſeized the gold mines in Thrace. About this period, the Lacedæmonians ſent to requeſt aid from Athens in ſupport of their authority over the Helotes. Ephialtes oppoſed the grant of it, with a view of keeping the Spartans in as depreſſed a ſtate as poſſible, but Cimon vindicated their cauſe, and prevailed. He was ſent to their relief with a conſiderable force, and obtained much honour in the ſervice. Some time afterwards another body of Athenian troops, marching in to the aſſiſtance of the Lacedæmonians, was diſmiſſed by them with circumſtances of ſuſpicion, which offended the citizens of Athens, and indiſpoſed them againſt the friends of Sparta. Pericles began to poſſeſs influence in Athens, as the head of the popular party, in conjunction with Ephialtes. They, envying the glory acquired by Cimon, conceived his ruin to be a neceſſary ſtep to the eſtabliſhment of their power. He was proſecuted at their inſtigation for having received bribes from Alexander, king of Macedon, to ſtop the progreſs of the Grecian arms againſt that country. Cimon, indignant at the ingratitude which he experienced for the ſervices that he had performed, could ſcarcely deign to vindicate his honour, which his enemies themſelves believed to be unſullied. He was, however, baniſhed; but in a ſhort time afterwards the Athenians became involved in a war with the Lacedæmonians, in which the armies of both nations met at Tanagra in Bœotia; a ſevere action enſued, but neither of the contending parties could claim the victory. The battle was on the point of being renewed the next day, when Cimon appeared, and requeſted to fight as a volunteer in his country's ſervice. His petition was rejected, and himſelf commanded to leave the army. Before he retired, he addreſſed himſelf to his friends, who had been conſidered as acceſſaries with him in the conſpiracy againſt the ſtate, and intreated them to act in ſuch a manner as to convince the Athenians, that they had not among them either braver or more honourable men than Cimon and his friends. They requeſted him to leave his armour, ſince their generals would not allow him to fight at their head. They formed cloſe round it, to the number of about a hundred, and, ruſhing amidſt the thickeſt of the foe, fought with undaunted courage till they were every man killed. Victory decided againſt the Athenians, and the ſubſequent events of the war cauſed them to regret the abſence of Cimon, of whoſe real patriotiſm no one now entertained a doubt. Pericles, at whoſe inſtigation chiefly he had been ſent away, himſelf drew up and ſupported a decree for his recal. On his return, he ſpeedily made peace between the Athenians and Spartans.

Such was become the conſtitution of the Athenian commonwealth, and ſo great the effects which the continuance of war had produced on the minds of the people, that, in order to preſerve quiet at home, Cimon ſaw the neceſſity of turning the ſpirit of enterpriſe towards foreign conqueſt, and againſt the common enemy of Greece. He determined to attack Cyprus, that his countrymen might deſiſt from making war upon the Lacedæmonians, or oppreſſing their allies. For this purpoſe, he took the command of a powerful fleet, part of which he detached to Egypt to diſtract the attention of the Perſian government. With the remainder he attacked Citium and Malum, of which he made himſelf maſter. He afterwards defeated the Phœnician fleet, obtained a victory over the Perſian army encamped in Cilicia, and, re-embarking the troops, returned to Cyprus, and laid ſiege to the principal city. In the camp before that place, Cimon died in the arms of victory. It is not known whether his death was occaſioned by ſickneſs, or by a wound which he had received. His remains were carried to Athens and buried there, and a magnificent monument was erected to his memory, which exiſted there in the time of Plutarch. The death of this great man was not leſs honourable than his life had been glorious. When he found that he was about to expire, he gave ſuitable directions to the principal commanders, ordered them to conceal his diſeaſe, and to embark immediately for Athens. Great as was the military character of Cimon, his wiſdom, integrity, and moderation, and conciliatory conduct, were virtues for which the loſs of him was moſt ſeverely felt and deplored. Others might command fleets and armies, and obtain victories, but they could not, or did not, like him, free Greece from civil feuds and domeſtic wars. It has alſo been remarked in praiſe of this great man, that he, in the midſt of wealth, as well as Ariſtides in poverty, preſerved the reputation of patriotiſm unimpeached. Corn. Nepot. Plutarch. Univer. Hiſt.

CINA, or Kinah, in *Ancient Geography*, a town of Judæa, in the tribe of Juda. It was the town of the Cinæani, who deſcended from Jethro, the father in-law of Moſes. —Alſo, a town of Aſia Minor, in Galatia, called Ciœna and Cenes.

CINABARENSIS, an epiſcopal ſee of Aſia Minor, placed by the Greeks in Phrygia Salutaris.

CINABORIUM, a town of the Greater Phrygia.

CINÆDA, in *Natural Hiſtory*, the name of a ſtone found in the head of a fiſh, of a whitiſh colour, and oblong figure. The ancients ſuppoſed it preſaged tempeſts when its ſurface looked duſky and obſcure; and, on the contrary, fair weather, when it looked bright and clear.

CINÆDOCOLPITÆ, a name given by Ptolemy to a people of Arabia Felix; he adds that their country was watered by the river Baetius, and aſſigns to them two towns and two villages ſituated on the coaſt of the Red Sea.

CINÆDOLOGIA, among the *Ancients*, a kind of ſatyrical poetry, the chief ſubject of which were the *Cinædi*.

CINÆDOPOLIS, in *Antient Geography*, an iſland of Aſia Minor, in the Doride. Pliny ſays that it was ſituated at ſome diſtance from the continent, in the Ceramic gulph.

CINÆDUS, in *Antiquity*, is uſed to ſignify a dancer or pantomime.

At firſt they performed only on the ſtage, but afterwards were admitted to the entertainments of princes.

Cinædus, or Cynædus, in *Ichthyology*, the name of a fiſh common in the Archipelago, about the ſhores and rocks, ſuppoſed by many to be the ſame ſpecies with the alpheſtes, and of the labrus kind, only with its back fin prickly all its length. It is of a yellowiſh hue all over, blended and variegated with an admixture of purple: its ſcales are rounded and indented; and its teeth very ſtrong and firm, and diſpoſed in two rows in each jaw, and are long and ſharp.

CINÆTRUM, in *Ancient Geography*, a mountain of Greece, in the Peloponneſus, towards the iſle of Cythera.

CINALOA, in *Geography*, a province of N. America, in the country of Mexico, or New Spain; bounded on the weſt by the gulph of California, on the ſouth by the province of Culiacan, on the eaſt by Leon, and particularly by the high craggy mountains called Tepecſuan, or Topia, 30 or 40 leagues from the ſea, and on the north by New Biſcay; from S.E. to N.E. it is about 100 leagues, and at its greateſt breadth not above 40. It was firſt diſcovered in the year 1552 by Nunez de Guzman. The country is well watered, the air is pure and ſalubrious, the land is fertile, and produces all ſorts of fruit, grain, and cotton; and the rivers abound with fiſh. The natives are robuſt and warlike, and make uſe of bows with poiſoned arrows, clubs of red wood, and bucklers; they are alſo induſtrious, and manufacture cotton cloth for their own wearing. The political ſtate of theſe people reſembles that of the inhabitants of N. America. They have neither laws nor kings, nor have they any ſpecies of authority or political government for puniſhing any crime, or reſtraining them in any part of their conduct. They acknowledge, indeed, certain caziques, who are heads of their families or villages; but their authority appears chiefly in war, and the expeditions againſt their enemies. This authority the caziques obtain, not by hereditary right, but by their valour in war, or by the power and number of their families and relations. Sometimes they owe their pre-eminence to the eloquence with which they diſplay their own exploits. Some tribes in this province ſeem to be among the rudeſt people of America united in the ſocial ſtate. They neither cultivate nor ſow; they have no houſes in which they reſide. Thoſe in the inland country ſubſiſt by hunting; thoſe on the ſea-coaſt chiefly by fiſhing. Both depend upon the ſpontaneous productions of the earth, fruits, plants, and roots of various kinds. In the rainy ſeaſon, when the country is ſubject to ſudden floods by the torrents from the mountains, deſtitute of the ſhelter of houſes, they gather bundles of reeds, or ſtrong graſs, and binding them together at one end, they open them at the other, and fitting them to their heads, they are covered as with a large cap, which, like a penthouſe, throws off the rain, and will keep them dry for ſeveral hours. During the warm ſeaſon, they form a ſhed with the branches of trees, which protects them from the ſultry rays of the ſun. When expoſed to the cold, which is extreme in December and January, (the weather, during the reſt of the year, being very warm,) they make large fires, around which they ſleep in the open air. In the mine Yecorato of this province there was found a grain of gold of 22 carats, which weighed 16 marks, 4 ounces, 4 ochavas; this was ſent to Spain as a preſent fit for the king, and is now depoſited in the royal cabinet at Madrid. The chief mining ſtation is Sivirijoa.

Cinaloa, a town of Mexico in the above-mentioned province, ſeated on a river of the ſame name, which diſcharges itſelf into the gulph of California. N. lat. 26°. W. long. 106° 10′.

CINARA, in *Botany*. See Cynara.

CINAROCEPHALÆ, the ſecond natural order in the tenth claſs of Juſſieu, with the following general character and diviſions. Flowers all floſculous; florets ſometimes all hermaphrodite; ſometimes neutral in the ray; rarely feminine intermixed with hermaphrodites. *Calyx* common, many-leaved, imbricated; ſcales with or without ſpines. *Receptacle* common, beſet with hairs, or more frequently with chaff-like ſcales; neutral florets often irregular; hermaphrodite ones five-cleft, regular, pentandrous; ſtigma of the latter ſimple or bifid, often without any marked diſtinction from the ſtyle. *Seed* downy; down capillary or plumoſe. *Stem* herbaceous, rarely fruteſcent. *Leaves* alternate, with or without ſpines. *Flowers* various in colour, terminal, or rarely axillary.

I. True cinarocephalæ. Scales of the calyx ſpinous. *Atractylis, cnicus, carthamus, carlina, arctium, cinara, onopordum, carduus, lappa, crocodilium, calcitrapa, ſeridia.* II. True cinarocephalæ. Scales of the calyx without ſpines. *Jacca, cyanus, zoegea, rhaponticum, centaurea, pacourina, ſerratula, pteronia, ſtæhelina.* III. Anomalous cinarocephalæ. Calyxes one or few-flowered, aggregate. *Jungia, naſſauria, gundelia, echinops, corymbium, ſphæranthus.* Juſſieu obſerves that the genera of the laſt diviſion do not properly belong either to this natural order, or to the ſucceeding one corymbiferæ, but are a link connecting both.

Ventenat has adopted the above diviſions, adding in the firſt, berardia and cirſium; diſcarding pacourina, pteronia, and ſtæhelina from the ſecond; and retaining only gundelia, echinops, and ſphæranthus in the third.

CINARUS, in *Ancient Geography*, an iſland ſituated in the vicinity of that of Leros. It is mentioned by Athenæus, Plutarch, and Pliny, the latter of whom calls it "Cinara."

CINCARITANUS, an epiſcopal ſee of Africa in Bizacium. Some have thought that this ſee was in the town of Cercina, in an iſland of the ſame name.

CINCENSES, a people of Spain, placed by Pliny in the Tarragonenſis; they are probably the Cinnenſes, ſo called from the name of the town Cinna.

CINCHONA, in *Botany*, (ſo called from the Counteſs del Cinchon, lady of a Spaniſh viceroy, whoſe cure is ſaid firſt to have brought the Peruvian bark into reputation). Linn. Gen. 228. Schreb. 301. Juſſieu 201. Vent. 2. p. 573. Gært. 204. Willd. 346. Quinquina; Lam. Encyc. Claſs and order, *pentandria monogynia*. Nat. Ord. *Contortæ*, Linn. *Rubiaceæ*, Juſſ.

Gen. Ch. *Cal.* Superior, one-leafed, five-toothed, permanent. *Cor.* monopetalous, tubular, funnel-ſhaped, deeply five-cleft; tube long, obſcurely angular; ſegments lanceolate, or linear. *Stam.* Filaments five, in the middle of the tube; anthers elongated, either ſhorter than the tube, or projecting beyond it. *Piſt.* Germ inferior, top-ſhaped, obſcurely angular; ſtyle the length of the ſtamens; ſtigma thick, either bifid or entire. *Peric.* Capſule crowned with the calyx, two-valved, two-celled; valves opening at their inner ſide, turned in at their edges, and ſeparating, when ripe, ſo as to have the appearance of two capſules. *Seeds* numerous in each cell, oblong, compreſſed, bordered, attached to a central oblong receptacle.

Eſſ. Ch. Calyx top-ſhaped, five-toothed. Corolla tubular, five-cleft. Stamens five, inſerted into the middle of the tube. Capſule oblong, two-valved, two-celled, many-ſeeded.

* *Flowers tomentous; ſtamens included.*

Sp. 1. C. *officinalis*, Linn. Sp. Pl. 1. Mant. 1. Lam. 16. Willd. 1. Lam. Ill. Pl. 164. fig. 1. Gært. tab. 33. fig. 4. Woodv. Med. Bot. tab. 200. (Arbor peruviana febrifuga; Rai. hiſt.) Common Jeſuits' bark, or officinal Cinchona. "Leaves ovate-lanceolate, ſmooth; capſules oblong." Vahl. A tall tree rather thicker than a man's thigh. *Branches* oppoſite, covered with a reddiſh brown bark, frequently rugged with obliquely tranſverſe chinks, and marked with the ſcars of fallen leaves; upper ones a little compreſſed. *Leaves* from two to three inches long, and one broad, remote on the flowering-branches, but approximating on the others, oppoſite, petioled, acute, ſmooth on both ſides, green above, paler underneath, marked with lateral ſimple parallel nerves, a little curved at the ſummit; petioles channelled above, convex underneath: ſtipules ſmall, acute, caducous. *Flowers* in a terminal, trichotomous panicle; peduncles ſlightly pubeſcent, furniſhed with ſmall acute oppoſite bractes, at the baſe and about the middle; calyx-teeth ſhort, acute; corolla ſlightly tomentous without, woolly within; ſegments acute, ſhorter than the tube; anthers the length of the tube; germ tomentous; ſtigma thick, ſlightly bifid. *Capſules* half an inch long, oblong, ſmooth, marked with obſcure raiſed lines. A native of Peru, growing abundantly on a long chain of mountains, extending between two and five degrees of latitude to the north and ſouth of Loxa. The proper time for cutting the bark is from September to November, the only ſeaſon when, in that country, there is ſome intermiſſion from rain. Care muſt be taken not to cut the bark wet; and if it ſhould happen to be ſo, it is carried directly to the low country to be dried.

This tree has been ſuppoſed to be the Quina-quina of the Peruvians, and has accordingly been given by many authors as one of its ſynonyms. But the contrary has been proved by a ſpecimen of the true Quina-quina ſent by Monſ. Condamine to Cromwell Mortimer, eſq. ſecretary of the Royal Society, about the year 1749, of which an engraved figure was then publiſhed. Anthony Juſſieu, who examined a dried ſpecimen preſerved in the herbarium of Joſ. Juſſieu, has pronounced it in his natural orders of plants, to be not a Cinchona, and to have no natural affinity with that genus; but to be a decandrous leguminous plant, which he has referred to Myroſpermum of Jacquin, a genus which has been united by Willdenow with the Myroxylon of Schreber. As the ſpecimen ſent by Condamine, is without fructification, this point cannot be abſolutely determined; but, from the deſcription, the opinion of Juſſieu ſeems highly probable, though it does not appear to be taken up by any other author as a diſtinct ſpecies. It has a triangular furrowed, pithy ſtem, with alternate branches; and a thick, leafy, curiouſly veined wing running along every angle, like a three-edged ſword-blade, terminating here and there in a rounded form. A fragrant reſin diſtils from the trunk by means of an inciſion. The ſeeds, called by the Spaniards Pepitas de Quinaquina, are of a brown colour, and woody ſubſtance, having the form of beans or flat almonds, and are encloſed in a kind of doubled leaf, (Qu. valves of the legume?) between which and the ſeed is found a little of the ſame reſin that diſtils from the tree. Their chief uſe is to make fumigations, which are reputed cordial and wholeſome, but their reputation is now on the decline. This tree grows abundantly in ſeveral provinces of Peru, as in the neighbourhood of Chucuiſaca or La Plata, Tarija, &c. The natives make rolls or maſſes of the reſin, which are uſed for ſeveral other purpoſes in phyſic, ſometimes under the form of a plaſter, ſometimes under that of a compound oil made from the reſin, and are ſuppoſed to promote perſpiration, ſtrengthen the nerves, and reſtore the motion of the joints of gouty people. In addition to theſe real or imaginary medical virtues, its bark is eſteemed an excellent febrifuge, and before the diſcovery of the tree of Loxa, was in great repute for curing tertian agues, &c. The Jeſuits of La Paz or Chicuiapa gathered its bark which is intenſely bitter, and uſed to ſend it to Rome, where it was diſtributed under the true name of Quina-quina, and employed for the cure of intermittent fevers. The bark of Loxa, or Cinchona officinalis, having been brought into Europe, and particularly to Rome, by the ſame means, the new febrifuge became confounded with the old one, and that of Loxa having been moſt uſed, took the name of the firſt, which is now almoſt entirely forgotten, though the name Caſcarilla, or ſmall bark, given to that of Loxa, ſeems to have been invented to diſtinguiſh it from ſome other, undoubtedly the ancient Quina-quina. See Linnean Tranſactions, vol. iii. p. 59. with a figure copied from the original one.

Two ſorts of the Loxa bark are in uſe, the pale and the red, poſſeſſed of ſimilar properties, but in a different degree, the latter being found by experience to be the moſt powerful. It has been doubted whether they are the produce of different ſpecies or of the ſame plant from different parts of its ſurface, or, which is the ſame thing, in different ſtages of the growth of the bark itſelf. But the queſtion ſeems to be nearly, if not altogether decided, by a drawing of the plant which produces the red kind, ſent from Peru to Linnæus, and which appears to be a diſtinct ſpecies, though its ſpecific difference has not been botanically determined. This drawing has been found in the Herbarium of Linnæus by Dr. James Edward Smith, and the uſe of it liberally granted to Dr. Woodville, who has publiſhed in his Medical Botany a figure taken from it. See Medical Botany, vol. iii. p. 555. 2. C. *pubeſcens*. Mart. 2. Willd. 2. Poiret Encyc. 17. Vahl. Act. Soc. Hiſt. Nat. Haf. 1. p. 19. tab. 2. "Leaves egg-ſhaped, elongated at the baſe, pubeſcent underneath; capſule cylindrical." *Root* perennial. *Bark* whitiſh, whence it has been called white bark. *Branches* pubeſcent on their upper part. *Leaves* from eight to ten inches long, and from five to ſix inches broad, petioled, egg-ſhaped, obtuſe, narrowed at the baſe, and decurrent a little way along the petiole, pubeſcent and tomentous underneath, hairy on the principal nerves, almoſt ſmooth above; nerves ſtrongly marked, ſimple, parallel, dividing into ſmall ſimple lateral veins; petioles about two inches long. *Flowers* numerous, in large terminal panicles; bractes ſmall at the baſe of the diviſions of the peduncles; calyx ſmall, with five ſharp teeth; corolla ſcarcely an inch long, furniſhed with whitiſh hairs along its edge, and on its inſide five-cleft; ſegments egg-ſhaped, ſhorter than the tube. *Capſules* an inch long, ſmooth, cylindrical, leſſening a little at both ends. A native of Peru. Poiret ſuſpects that the Cinchona hirſuta, purpurea & ovata, of Ruiz and Pavon in the Flora Peruviana, are nothing more than varieties of this ſpecies. They are thus ſeverally characterized by thoſe authors. C. *hirſuta.* "Leaves oval, thick, reflexed at the edges; the terminal ones ſomewhat heart-ſhaped: corolla with a purpliſh down; border hairy." C. *purpurea.* "Leaves oblong-oval and egg-ſhaped, purpliſh; panicle brachiate, large; flowers ſomewhat in corymbs; corollæ light purple; border hairy, white. C. *ovata.* "Leaves egg ſhaped, downy underneath; panicle brachiate; flowers ſomewhat in corymbs; corollæ purple; border hairy." 3. C. *macrocarpa*, Mart. 3. Poiret 18. Willd. 3. Vahl. Act. Soc. Hiſ. Nat. Hafn. 1. tab. 3. Lambert. Gen. Cinch. tab. 3. (C. officinalis; Linn. Syſt. Ed. 12. as far as relates to the deſcription. C. officinalis; Linn. Jun. Sup. 144) "Leaves oblong, pubeſcent underneath, ribbed." *Root* perennial. *Branches* villous-tomentous. *Leaves* petioled, oblong, more than three inches long; ſomewhat coriaceous, ſmooth and ſhining above, pubeſcent underneath, with villous tomentous ribs; younger ones elliptical, hairy above, eſpecially along the nerves; petioles an inch long; ſtipules two, lanceolate, caducous, connate at their baſe, ſmooth on the inſide, often longer than the petioles. *Flowers* in a terminal, trichotomous, pubeſcent, panicle; peduncles of the ramifications an inch and a half long, compreſſed, with three nearly ſeſſile flowers; bractes an inch long, linear-lanceolate; with others much ſmaller, awl-ſhaped ones at the baſe of each flower; calyx bell-ſhaped, pubeſcent, ſilky within; with five, ſometimes ſix ſmall ſharp teeth; corolla an inch and half long, coriaceous, villous, almoſt tomentous; ſegments of the border lanceolate, obtuſe, the length of the tube; filaments very ſhort; anthers linear, longer than the tube; germ five-ſided, obtuſe; ſtigma bifid. *Capſule* two inches long, cylindrical, ſmooth, narrowed at the baſe; the two valves, as the fruit ripens, widely ſeparating both at their baſe and ſummit. A native of Santa Fé. Vahl received it from Ortega.

** *Corollæ ſmooth; ſtamens projecting.*

4. C. *caribæa*, Linn. Sp. Pl. 2. Mart. 4. Poir. 1. Willd. 4. Jacq. Amer. tab. 179. fig. 95. Obſerv. Bot. 2. p. 47. Amer. pict. tab. 63. Gært. tab. 33. fig. 4. (C. Jamaicenſis; Wright Act. Angl. Vol. 67. p. 504. tab. 10.) "Peduncles axillary, one-flowered." A tree from ten to twenty feet high. *Branches* dark brown, ſmooth, ſtriated; often marked with brilliant oval, white or yellowiſh ſpots. *Leaves* two inches long or more, and about one broad, oval, lanceolate, narrowed at both ends, entire at their edges, thin, ſmooth on both ſides; petioles ſhort; ſtipules very ſmall, broader than long, ciliated, acuminate. *Flowers* numerous; duſky yellow; peduncles not longer than the petioles, ſmooth; calyx ſmooth, ſhort, ſomewhat cylindrical, with five ſhort, acute teeth; tube of the corolla cylindrical; ſegments of the border long, linear, rather obtuſe, ſmooth, longer than the tube; ſtamens a little projecting; anthers pale yellow, very long, narrow. *Capſule* opening from the top, black, with an even ſurface, very ſmooth, ſhining. *Seeds* oval, compreſſed, ſurrounded with a ſalient border. A native of Jamaica and Guadaloupe. It is called in Jamaica, Sea-ſide Beech. The bark in general is ſmooth and grey on the outſide, though in ſome ſpecimens rough and ſcabrous. Its flavour is ſweet, with a mixture of the taſte of horſe radiſh, and the aromatics of the Eaſt, but when ſwallowed has the bitterneſs and aſtringency of the Peruvian bark. 5. C. *longiflora*, Poir. 2. Lamb. Gen. cinchon. p. 12. "Peduncles axillary, one-flowered; leaves linear-lanceolate, ſmooth; corolla very long." Nearly allied to the preceding, but diſtinguiſhed from it by the remarkable length of the flowers, and by its longer narrower leaves. A tree. *Leaves* oppoſite, near together, with oblique lateral nerves, on moderately long petioles; ſtipules ſmall, acute; ſegments of the border of the corolla linear, three or four times ſhorter than the tube. 6. C. *corymbifera*, Mart. 5. Poir. 3. Willd. 5. Linn. Jun. Sup. 144. Forſt. Act. Nov. Up. 3. p. 176. Flor. Auſt. Prod. 88. "Leaves oblong-lanceolate; corymbs axillary." *Trunk* ſix feet or more in height, upright, round, ſmoothiſh, the thickneſs of the human arm. *Branches* round, ſpreading, oppoſite; upper ones herbaceous, compreſſed at the joints. *Leaves* three inches long, oppoſite, with an even ſurface, ſmooth, acuminate, quite entire, deep green, mid-rib purple underneath; petioles ſcarcely an inch long, round, ſpreading; ſtipules membranous, acute. *Flowers* white, red on the outſide, duſky purple before they open; corymbs large, dichotomous; peduncles ſolitary, compreſſed at the tip, the length of the leaves; partial peduncles three, an inch long, angular, trifid; pedicels one-flowered; two, three, four, or more together, half an inch long, round, ſlender, erect; bractes very ſmall, membranous, ſolitary, acute, at the baſe of each pedicel; corolla tubular; ſegments of the border ſhorter than the tube, narrow, obtuſe, curved inwards; anthers erect, a little projecting; ſtigma thick, ſimple. A native of the iſlands of Tongatabu and Eaoowe in the South Seas, where it is cultivated for the odour and elegance of its flowers. Its bark is extremely bitter, and ſomewhat aſtringent, much reſembling the common Jeſuits' bark. 7. C. *lineata*, Mart. 6. Poir. 4. Willd. 6. Vahl. Act. Soc. Hiſt. Hafn. 1. tab. 4. Lambert. Gen. Cinch. tab. 6. "Panicle terminal; leaves egg-ſhaped, acuminate, ſmooth; capſules five-ſided." A tree. *Branches* cylindrical, eſpecially at the baſe, greyiſh, purple, and compreſſed near the top. *Leaves* two inches or more long, and one broad, on ſhort petioles, not at all ſhining, bluntiſh, thin, ſmooth; nerves ſimple, lateral; ſtipules egg-ſhaped, acute. *Flowers* in large trichotomous panicles; peduncles compreſſed, three-flowered; bractes briſtle-ſhaped; calyx-teeth long, awl-ſhaped; corolla two inches long or more; tube cylindrical; ſegments of the border linear, obtuſe; germ five-ſided, obtuſe; ſtigma globular. *Capſules*, ſhort, ſmall, brown, ſmooth, oval, crowned with the teeth of the calyx. Nearly allied to C. floribunda and C. anguſtifolia; but differs from the latter in having much broader leaves, and from both in having its leaves rounded at the baſe with nerves viſible on both ſides. A native of the Weſt Indies. 8. C. *floribunda*, Mart. 7. Poir. 5. Willd. 7. Vahl. Act. Soc. Hiſt. Nat. Hafn. 1. p. 123. Lam. Ill. Pl. 164. fig 2. Lamb. Gen. Cinch. tab. 7. (Cinchona floribus paniculatis, glabris, &c. Swartz Prod. 41; flor. Ind. Occid. 1. p. 375. Nov. Act. Acad. Nat. Curios. 9. p. 1. fig. 1. C. montana; Badier Journ. de Phyſ. feb. 1. 789. p. 129. fig. 1. Auſt. Bot. Mag. p. 96. tab. 3. C. Sanctæ Luciæ; Philoſ. Tranſ. vol. 74. p. 452. tab. 19. Trachelium arboreſcens & fluviatile; Deſport. Hiſt. Morb. S. Doming. 2. p. 231. Quinquina piton; Journ. de Phyſ. 1781. p. 169—179.) "Panicle terminal; capſules top-ſhaped, with an even ſurface; leaves elliptical, acuminate." A tree, thirty or forty feet high. *Trunk* ſtraight, about a foot in diameter. *Branches* cylindrical at the bottom, obſcurely tetragonal and purpliſh near the top. *Leaves* from eight to ten inches long, three or four broad, petioled, oppoſite, lanceolate-elliptic, acuminate, quite

ſmooth, even and ſhining on the upper ſurface, paler underneath, veined; nerves lateral, projecting, parallel, a little branched and confluent at their extremity; petioles an inch and half long; ſtipules oppoſite, ſheathing, oblong, obtuſe, caducous. *Flowers* at firſt white, afterwards purpliſh, numerous; panicle large; ramifications oppoſite, compreſſed, quite ſmooth; calyx-teeth very ſhort, awl ſhaped; tube of the corolla cylindrical, an inch long; ſegments of the border long, ſmooth, linear; ſtigma oval, entire. *Capſules* oblong, black, narrowed at the baſe. The bark of this ſpecies is more bitter and more aſtringent than that of C. officinalis. A native of St. Lucia, Martinico, Guadaloupe, and Hiſpaniola, where it bears the name of Pitton, becauſe it is found on the tops of mountains, which bear that name in the Weſt Indies, the mountains themſelves being called Morne. 9. C. *brachycarpa*, Mart. 8. Poir. 6. Willd. 8. Vahl. Soc. Hiſt. Nat. Hafn. 1. p. 24. Lamb. Gen. Cinch. tab. 8. Swartz. Prod. 42. Ind. Occid. vol. i. p. 378. "Panicle terminal; capſules inverſely egg-ſhaped, ribbed, leaves elliptical, obtuſe." *Leaves* large, ſmooth on both ſides; nerves alternate, lateral, a little branched at the ſummit; petioles ſhort; ſtipules ſhort, egg-ſhaped, acute. *Panicle* trichotomous, furniſhed with ſmall bractes at the diviſion of the peduncles; calyx-teeth ſhort, a little obtuſe; tube of the corolla rather long, cylindrical, ſlender; ſegments of the border linear, reflexed; ſtigma ſimple, globular. *Capſule* with ten ſtrong projecting ribs, connivent at their baſe. A native of Jamaica. The deſcription formed by Poiret from Lambert's figure. 10. C. *anguſtifolia*, Mart. 9. Poir. 7. Willd. 9. Swartz. Act. Stockh. Ann. 1787. p. 117. tab. 3. Prod. 42. Flor. Ind. Occid. 1. p. 380. Lam. Illuſt. Pl. 164. fig. 3. Lamb. Gen. Cinch. tab. 9. "Flowers panicled, ſmooth; capſules oblong, five-ſided; leaves linear-lanceolate, pubeſcent." A ſmall tree, from ten to fifteen feet high. *Trunk* upright, ſmooth, with a wrinkled aſh-coloured bark, which becomes brown and ſtriated near the root. *Branches*, ſlender, filiform, ſmooth. *Leaves* two or three inches long, ſcarcely half an inch broad, oppoſite, petioled, ſoft to the touch; ſtipules ſmall, egg-ſhaped, acute. *Flowers* white, odorous; panicle terminal, frequently with trifid ramifications; bractes ſmall, ſhort; calyxes ſhort, tubular, pubeſcent, with five upright awl-ſhaped teeth; tube of the corolla an inch long, ſmooth, ſlender; ſegments of the border the length of the tube, linear, narrow, obtuſe, reflexed. *Capſules* ſhort. *Seeds* very ſmall, ſmooth, rounded. A native of Hiſpaniola on the borders of rivers in a rocky ſoil. 11. C. *coriacea*, Poir. 8. (Cinchona nitida; Flor. Peruv.?) "Leaves ovate-oblong, ſhining on both ſides, coriaceous; panicles ſhort, ſmooth; anthers projecting, filiform. "*Branches* with an even ſurface ſtriated; bark cinereous. *Leaves* oppoſite, petioled, narrowed at their baſe, obtuſe at their ſummit; nerves lateral, alternate, a little branched at the ſummit, projecting on the under ſurface of the leaf. *Flowers* in terminal panicles, with nearly dichotomous ramifications, on ſtiff ſmooth peduncles; calyx oblong, with upright acute teeth; corolla two inches long; tube ſtraight, cylindrical; diviſions of the border narrow, obtuſe, the length of the tube, ſmooth, reflexed; anthers upright, filiform. *Capſules* an inch long, blackiſh, cylindrical. A native of St. Domingo. The C. nitida of Ruiz and Pavon, Flor. Peruv. vol. ii. tab. 191. has inverſely egg-ſhaped, ſhining leaves; a brachiate panicle; light purple corollæ with a ſomewhat hairy border. Poiret judges it to be near a-kin to this ſpecies; but its panicle is larger, the tube of the corolla only half the length, and its capſule elongated; diminiſhing a little at its ſummit. 12. C. *grandifolia*, Poir. 9. Ruiz and Pavon Flor. Peruv. vol. ii. tab. 196. "*Leaves* oblong and oval, ſmooth; panicle brachiate; flowers ſomewhat in corymbs: corollas white, with a ſlightly villous border." A large tree with a denſely tufted head. *Bark* cinereous brown, reddiſh within, of an even ſurface, bitter and acidulous, without being unpleaſant. *Younger Branches* quadrangular, reddiſh. *Leaves* from one to two feet long, quite entire; ſhining on the upper ſurface, paler underneath, traverſed by purple veins; the principal ones furniſhed at their baſe with whitiſh ſilky hairs. *Stipules* oval, acuminate, caducous. *Flowers* white; corymb-like panicle about a foot long, and much branched, leafy; bractes ſmall, oval, acute; calyx purple, five-toothed; corolla an inch long; border a little villous within; ſtamens incloſed within the tube; anthers oblong, bifid at their baſe. *Capſule* large, ſcarcely ſtriated. *Seeds* oval, membranous at their borders. A native of Peru in the foreſts of the Andes in the neighbourhood of torrents. 13. C. *parvifolia*, Poir. 10. "Leaves egg-ſhaped, obtuſe, ſmooth; flowers panicled, twice-trichotomous, villous; corolla very ſmall. C. micrantha; Flor. Peruv. v. ii. tab. 194.? "Leaves oval, obtuſe; panicle large; flowers numerous, ſmall, white, with a woolly border." *Branches* ſmooth, upright, cylindrical. *Leaves* three inches long or more, one and a half broad, thin, entire membranous, petioled, with lateral nerves, narrowed at their baſe. *Stipules* oppoſite, ſheathing, awl-ſhaped, enlarged at the baſe. *Flowers* in a moderate panicle; peduncles axillary, oppoſite towards the extremities of the branches, upright, forked at the ſummit, each fork trichotomous, villous, compreſſed, with about three pedicelled flowers; bractes ſmall, at the baſe of the diviſions; calyx ſhort, tubular, villous; teeth ſcarcely viſible; corolla three or four lines long, pubeſcent on the outſide; ſegments of the border obtuſe. Stamens not projecting. *Capſule* unknown. A native of Jamaica. The Peruvian plant of Ruiz and Pavon has larger panicles; a corolla white on the inſide, reddiſh without, pubeſcent; and an oblong, acute, brown, capſule, with ten obſolete ſtriæ. 14. C. *lanceolata*, Poir. 11. Flor. Peruv. vol. ii. p. 51. "Leaves lanceolate-oblong; panicle brachiate, large; flowers ſomewhat in corymbs; corollas purple, inclining to roſe-colour; border hairy." A tall tree. *Bark* brown, a little ſpotted, yellowiſh within, very bitter, a little acid, but not unpleaſant. *Leaves* oppoſite, petioled, quite entire, ſmooth on both ſides, with purpliſh veins: petioles half an inch long; ſtipules flat, egg-ſhaped, obtuſe, connate at the baſe. *Panicle* terminal, wide-ſpreading; bractes ſmall, awl-ſhaped, caducous; calyx ſhort, purple; border of the corolla open, villous; ſtamens villous at the baſe. *Capſule* an inch long, oblong, narrow, ſlightly ſtriated, reddiſh brown, opening from the baſe to the ſummit. *Seeds* egg-ſhaped, with a membranous border, often much torn. A native of Peru on the mountains of Muyna. 15. C. *grandiflora*, Poir. 12. Flor. Peruv. vol. ii. tab. 198. "Leaves oval and inverſely egg-ſhaped, very ſlightly veined, coriaceous, white underneath; corymbs terminal; corollæ, large, ſmooth, white." A tree about twenty feet high. *Bark* cinereous brown, yellowiſh within, rather leſs bitter than the other ſpecies. *Branches* ſpreading; younger ones ſlightly tetragonal. *Leaves* ſpreading, rather near together, quite entire, ſhining green above, ſtipules obtuſe, ſlightly ſtriated. *Flowers* about thirty in a corymb, of a pleaſant ſmell, peduncled; bractes awl-ſhaped; calyx funnel-ſhaped, tubular, teeth upright, ſharp; corolla ſmooth; ſegments of the border reflexed; ſligma two-lobed, oblong. *Capſule* narrowed at the baſe, marked with two furrows, opening from the ſummit to the baſe. *Seeds* numerous, very ſmall, with a linear membrane, on a large receptacle. A native of Peru in the foreſts of the Andes. 16. C. *roſea*, Poir. 13. Flor. Per. vol. ii. tab. 199. "Leaves oblong, obtuſely acuminate; panicle brachiate;

brachiate ; flowers in corymbs ; corollæ roſe-coloured ; border tomentous at the edge." A tree, fifteen feet high. *Bark* brown, even, with cinereous ſpots, very aſtringent, ſlightly bitter. *Leaves* oppoſite, petioled, very large, quite entire, ſmooth, ſhining, veined underneath ; ſtipules egg-ſhaped, obtuſe, purple, pubeſcent on the outſide, connate at the baſe. *Flowers* in a terminal corymb ; peduncles ſpreading, pubeſcent, compreſſed ; bractes egg-ſhaped, acute; calyx ſhort, purple ; tube of the corolla ſhort, ſlightly curved, cylindrical, ſmooth at its edge, dilated into a tomentous border; ſegments of the border ſhort ; ſtamens villous at the baſe, ſhorter than the border. *Capſule* a little recurved. A native of Peru in the foreſts of the Andes. 17. C. *dichotoma*, Poir. 14. Fl. Peruv. vol. i. tab. 197. " Leaves oblong-lanceolate ; peduncles terminal, dichotomous, few-flowered ; capſules narrow, linear, long." A low tree. *Bark* brown, a little rugged, marked with whitiſh ſpots. *Branches* cylindrical, a little compreſſed between the joints. *Leaves* flat; principal nerves oppoſite ; ſmaller ones almoſt reticulated ; ſtipules egg-ſhaped, oblong, obtuſe. *Flowers* in a looſe panicle; ramifications oppoſite, with an expanded bifurcation. *Flowers* unilateral, nearly ſeſſile. *Capſules* about two inches long, ſlightly ſtriated; valves boat-ſhaped. *Seeds* numerous, browniſh, with a narrow membranous wing. A native of Peru. 18. C. *caroliniana*, Poir. 15. (Pinkneya pubens; Michaux Flor. boreal. Amer. vol. i. tab. 13.) " Pubeſcent; leaves egg-ſhaped ; flowers in a faſciculated panicle, axillary." Poiret. A middle-ſized tree. *Branches* oppoſite, villous, cylindrical, a little compreſſed near the end. *Leaves* ſix inches long, or more, three broad, petioled, narrowed at the baſe, pubeſcent underneath, eſpecially along the principal nerves, green and ſmooth above ; petiole ſhort, pubeſcent ; ſtipules two, lanceolate, acute, caducous. *Flowers* almoſt ſeſſile ; calyx oblong, top-ſhaped, divided at its orifice into five oblong, acute, nearly equal, caducous ſegments, one of which often lengthens into the appearance of a leaf, or oval bracte, about an inch long, of a yellowiſh white colour, as in muſſerda frondoſa; corolla tubular, cylindrical, pubeſcent, an inch long or more ; ſegments of the border oblong, obtuſe, reflexed, two-thirds ſhorter than the tube ; filaments attached to the corolla a little above the baſe, briſtle-ſhaped, upright ; anthers projecting, almoſt verſatile, obtuſe, ſhorter than in the other ſpecies ; germ encloſed in the tube of the calyx : ſtyle the length of the ſtamens; ſtigma thick, almoſt dichotomous. *Capſule* large, rounded, a little compreſſed, marked with two oppoſite furrows, obtuſe, flattened and naked at its ſummit, coriaceous, two-celled ; partition reaching only to the middle. *Seeds* numerous, almoſt round, with a ſhort membranous ring. A native of Carolina and Georgia. Michaux on account of ſome peculiarities found for it a new genus : but on account of its near affinity to Cinchona, Poiret has been induced to place it here.

Obſ. Poiret obſerves that Cinchona ſpinoſa of Lambert is evidently a ſpecies of Cateſbœa, near a-kin to cateſbœa ſpinoſa of Linnæus.

CINCHONA, in the *Materia Medica; Peruvian Bark.* This moſt valuable medicine was firſt introduced into Europe by the Jeſuits as a cure for intermittent and other fevers, the uſe of which had long been known to the inhabitants of Peru and other parts of the American continent. It long remained a lucrative article of commerce to the order, whence it obtained the name of *Jeſuits' Bark* or *Jeſuits' Powder ;* and it gradually (though not without conſiderable oppoſition at firſt from the regular phyſicians) roſe in reputation, and its uſe has extended over all the civilized world, ſo that it has for many years been juſtly eſteemed as the moſt ſafe and powerful febrifuge which we poſſeſs.

There are three principal ſorts of Peruvian Bark in common uſe, and known in the European markets; beſides which, there are many other varieties which are generally confounded with one or other of the above three ſorts, and which differ from them only by ſome ſlight circumſtances, ſo as hardly to require a diſtinct notice in a general deſcription like the preſent. The three common ſorts now in uſe, are the *pale*, the *red*, and the *yellow* bark, and of theſe the two laſt are comparatively of very recent date, and the red is now become very ſcarce and is hardly ever imported, ſo that in fact the pale and the yellow are the only barks now ſeen.

The chemical analyſis and ſenſible properties of each, are on the whole extremely ſimilar, but there is found an infinite variety in the proportion of conſtituent parts.

The pale bark is brought over from the Spaniſh main, in large bundles cloſely packed up in goat and other ſkins, and in pieces of different ſizes, ſome rolled up into ſhort thick quills, and others flat. The outſide is browniſh and ſcabrous, and generally covered with moſs ; the inſide is of a dull red or ruſty iron colour. The beſt ſort breaks cloſe and ſmooth, and often minute ſhining grains of a blackiſh reſin may be diſcovered by cloſe examination. It is very friable when chewed, and readily breaks down into a powder of a light cinnamon colour. The inferior ſorts are more tough and fibrous.

The yellow bark is in much larger pieces than the pale, and flatter and thicker. The outer part is ſmoother, and the colour of the inner part is of a light red. It weighs lighter than the pale, and when reduced to powder, its colour is paler.

The red bark is alſo in larger and thicker pieces than the pale, and more convoluted than the yellow, though not actually forming quills or cylinders. It alſo breaks ſhort, and the inner part is very red.

All the ſpecies of cinchona have ſo many properties in common, that the ſame deſcription is here meant to apply to all, except the contrary be particularly ſpecified. The cinchona has a ſlight and ſomewhat muſty ſmell, though this may, perhaps, ariſe from the ſkin in which it is packed. It requires to be chewed for a little while before the taſte comes out fully, which then is bitter and aſtringent, with a ſlight aroma, but not ſufficient to prevent its being diſagreeable to moſt palates.

The chemical analyſis of the cinchona has been attempted by ſome able chemiſts ; and the effect of water, alcohol, and other reagents, as far as is neceſſary for pharmaceutical purpoſes, has been examined, with conſiderable care. Enough has been learnt by them to decide on the beſt mode of exhibition of this valuable remedy, but to the ſcientific chemiſt much doubt ſtill remains as to the true nature of many of the conſtituent parts of this, as probably of all other reſinous barks.

We ſhall firſt mention the ſimpler experiments that relate more eſpecially to pharmacy, and then deſcribe ſome more elaborate chemical proceſſes.

The firſt menſtruum to be mentioned, is water. This fluid, whether hot or cold, acts ſpeedily and powerfully on the cinchona. If this bark, thoroughly bruiſed and reduced to coarſe powder, be boiled for a few minutes in water, it makes a clear decoction, which, when hot, is clear and reddiſh, but on cooling it becomes very turbid and of a pale yellowiſh or wheyiſh hue, and a dark brown ſediment is depoſited. This decoction is intenſely bitter, gives a deep black with ſolutions of iron, and a very ſmall quantity of precipitate with a ſolution of iſinglaſs or glue. The latter circumſtance ſhews that it contains a little tannin ; the blackening with iron indicates gallic acid, and the bitterneſs is occaſioned by the preſence of an extractive matter, the peculiar quality of which will be preſently mentioned more at large. On keeping for ſome days the ſupernatant liquor of the decoction becomes almoſt colourleſs and tranſparent, and the precipitate more copious. In time, though not very ſpeedily, it grows mouldy and ſour, and acquires rather an offenſive ſmell. A few drops of the ſtrong acids added to the freſh decoction cauſe a copious precipitate in a few minutes, and the clear liquor is left nearly without colour, but its taſte is ſtill intenſely bitter.

If the ſame portion of bark be boiled ſucceſſively with different portions of water, employing only a few minutes in each boiling, the contents of the ſeveral decoctions ſhew, in ſome meaſure, the different degrees of ſolubility of the conſtituent parts. The quantity of bitter extract given by theſe decoctions is by much the greateſt in the firſt, and goes on uniformly diminiſhing till the whole is exhauſted. The gallic acid is more difficult of extraction, ſo that the decoction will blacken the ſolutions of iron after it has ceaſed to poſſeſs any other ſenſible property. It has been mentioned, that the decoctions of bark grow turbid on cooling, and depoſit a ſediment in which much of the medicinal virtue is ſuppoſed to reſide. This applies peculiarly to the firſt decoction, which is loaded with ſoluble matter. If the turbid liquor be again heated, a part of the ſediment is re-diſſolved, but not the whole, and the proportion of inſoluble matter is much increaſed by the length of time employed in the boiling, and the ſurface expoſed to the air. Hence it is inferred, and this is ſupported by other chemical reaſons which will be afterwards mentioned, that part of the ſoluble matter of the bark becomes permanently inſoluble by abſorbing oxygen from the air; and when thus rendered inſoluble, it is alſo inferred, that it has loſt moſt of its medicinal properties, ſo that the practical direction ſeems to be indicated in preparing this decoction, to boil the water on the bark only a ſhort time, and in a covered veſſel.

Cold water alſo diſſolves very readily a conſiderable portion of the ſoluble matter of the bark, and ſaturates itſelf with it in a digeſtion of a few hours. This infuſion is of a light brown red, and quite tranſparent. Its taſte is very bitter and leſs nauſeous than the decoction. But by keeping it grows turbid, and are dinſoluble powder is precipitated. This infuſion has been adopted in medicine in the proportion of about one part of powdered bark to eight of cold water, infuſed for about ſix hours, with occaſional ſtirring. It appears, however, from Dr. Lewis's experiments, that a ſingle hour produces as ſtrong a ſolution.

Alcohol digeſted on bark acquires a deep brown colour, and a ſtrong bitter and aſtringent taſte. This ſolution, when evaporated to dryneſs, leaves a black, ſhining, brittle reſin.

Dilute ſpirit of wine alſo acquires a deep colour and ſtrong impregnation with the active principle of the cinchona, by digeſtion for a few days in a moderate heat. On increaſing the heat, the colour deepens, and the ſpirit becomes turbid, and a ſediment is depoſited which will not again entirely re diſſolve. The tincture of bark is made with dilute alcohol. The bark, after the utmoſt effect of the alcohol, ſtill yields ſome ſoluble matter to water, and the decoction thus made is both bitter and aſtringent. A part of this matter, which alcohol will not diſſolve, and which water will, is the mucilage which the cinchona is found to contain in a notable quantity, and which, as in other caſes where mucilage is preſent, though inſipid itſelf, ſtrongly unites to a portion of the bitter extract and gallic acid, and appears to defend it from the action of the alcohol.

When a ſtrong decoction of cinchona is evaporated at a boiling-water heat, it gradually becomes more and more turbid, deepens in colour almoſt to a browniſh black; and at laſt a dark pitchy-looking *extract* is left behind, which may be inſpiſſated to perfect dryneſs if required, but in pharmacy is generally left of the conſiſtence of thick paſte. This extract has a ſtrong, ſomewhat ſaccharine, and agreeable ſmell; to the taſte it is intenſely bitter and aſtringent; it readily diffuſes in water, but a part only is diſſolved. The extract, of courſe, contains all the ſoluble parts of the bark blended together, partly in chemical union and partly in ſimple mixture; and is, in fact, an extremely compound maſs. Its analyſis will be mentioned at the concluſion of this article. The directions given for preparing this extract in the pharmacopœias are extremely ſimple and very ſimilar. The cinchona is boiled with ten or twelve times its weight of water for an hour or two, and when the firſt decoction is poured off, the bark may be again boiled with a freſh portion of water. The united decoctions are then evaporated at a boiling heat till they begin to be thick, and the drying to a due conſiſtence is then to be performed over a water-bath or in a ſtoved room. The water-bath, however, is, in fact, ſeldom uſed, being very tedious; but the whole is performed by moſt of the druggiſts in this town in a ſingle pan over a naked fire, which is kept very ſlack towards the end, and the extract conſtantly ſtirred to avoid burning.

The extract of bark is made in London only from the pale bark. The yellow bark does, indeed, furniſh a conſiderable portion of extract, but the parts are apt to ſeparate ſpontaneouſly, and it has not that uniform pitchy conſiſtence which the common extract has. The quantity yielded by different barks varies extremely, nor does there appear any other criterion to judge of the goodneſs of any ſample of cinchona for this purpoſe, except that nice and minute obſervation of colour, fracture, and the like, which is acquired by long and extenſive practice. It is reckoned a very good bark that yields a fourth of its weight of extract.

The cinchona is exhibited in medicine in a variety of forms. The ſimple powder is by far the moſt efficacious, and, in fact, is the only form that can be depended on for the cure of intermittents, and many other diſeaſes that require the vigorous uſe of this medicine. In London, the bark is powdered in large quantities in mills, where it is reduced to a moſt impalpable duſt. Some difficulty is found in bringing it entirely to this ſtate, on account of the different degrees of brittleneſs of the ſeveral parts of the bark, ſo that much of it would be loſt in fine duſt before the whole was powdered unleſs ſome addition be made in the mill. To prevent this, ſome add a ſmall quantity of oil of almonds. This operation alſo gives the opportunity of practiſing many frauds and adulterations; one of the commoneſt of which is to mix in with the freſh bark that which has already ſerved for the purpoſes of decoction and tincture, and therefore has loſt moſt of its virtue, though not the whole.

The doſe of the powder, when good and genuine, is from twenty to ſixty grains. The great inconvenience attending the powder is, the extreme diſguſt which it is apt to give to ſick perſons, partly from the taſte, which is nauſeous, and partly from the mere bulk and quantity of impalpable powder which muſt be got down. This diſguſt too does not always go off, but as often increaſes by uſe. Beſides this inconvenience, the cinchona in any form is liable to produce coſtiveneſs, and as the powder of bark itſelf is little ſoluble in the ſtomach, the whole alimentary canal is apt to be loaded and oppreſſed with the accumulated doſes of the powder, ſo that after a long courſe of this medicine, it is often diſcharged from the bowels unaltered, and may be clearly detected in the ſtools. An occaſional purgative, therefore, is particularly neceſſary in a long courſe of this medicine.

The diſagreeable taſte and feel of bark in the mouth may be conſiderably checked and corrected by various ways. A cup of coffee with cream and ſugar will bear the addition of a doſe of the powder, with very little alteration in the taſte, if taken immediately on mixture. Red wine is often uſed as a vehicle, or water with a ſmall quantity of brandy or warm tincture. Liquorice is generally thought to cover the taſte moſt effectually; or elſe the powder may be made into a ſtiff electuary with a little ſyrup, and a lump of this, equal to the required doſe, may be wrapped up in wafer paper and ſwallowed.

In the liquid form the decoction is the moſt commonly uſed, and by far the beſt. The London College direct that one ounce of coarſely powdered bark be boiled with a pint and three ounces of water for ten minutes only, in a covered veſſel. The decoction, which is clear when hot, ſhould be ſlightly ſtrained before it cools; and whenever it is uſed, it ſhould be ſhaken, that the ſediment, which ſubſides when cold, be again mixed with the clear liquor. The decoction is undoubtedly the beſt ſubſtitute for the entire powder, if it is taken in large quantity. The uſual doſe is about two or three ounces, repeated a few times in the day, but it may be taken much more liberally without inconvenience. To increaſe its ſtrength, many practitioners add ſome of the powder to it, which by ſhaking will remain ſuſpended in it long enough for the purpoſe.

The cold infuſion of bark, made by macerating, in a moderate heat, one part of the bark with eight or ten of water for five or ſix hours, is alſo of conſiderable ſervice.

We find in different pharmacopœias an abundance of formulæ for the tincture of bark, all of which have nearly the ſame intention. Though proof ſpirit extracts much of the virtue of the cinchona, no quantity of tincture that could be borne without intoxication, could be depended on in diſeaſes where the cinchona itſelf was the proper remedy. The tincture therefore is only an auxiliary medicine, and is principally employed as a ſtomachic or mixed with the decoction. Two tinctures are in common uſe: the ſimple tincture, made merely with the bark and proof ſpirit; and the compound tincture (firſt brought into uſe by Dr. Huxham), in which the cinchona is combined with ſerpentaria and orange-peel.

When the extract of cinchona was firſt introduced, very ſanguine expectations were entertained of its ſuperior utility. As the inconveniences attending the entire powder were its bulk and the quantity of woody and apparently inert matter which it contained, it was expected that by exhauſting the bark of its ſoluble part, and exhibiting that portion in the condenſed form of extract, every poſſible advantage would be combined. But experience has not confirmed theſe expectations, at leaſt by no means to the full extent; for, whatever may be the cauſe, it is not found that doſes of ten grains of the extract are generally equivalent to forty or fifty of the powder, nor is it often that patients who reject the powder can bear the other in ſufficient quantity. Still, however, the extract is a valuable medicine, but it is chiefly employed in the form of pills as a ſtomachic, and in chronic diſorders, and ſeldom as a ſubſtitute for the powder in the more important caſes.

A very pure extract has long been known in pharmacy, and invented by the count la Garaye, and called after his name, or ſometimes *eſſential ſalt of bark*. The inventor firſt conceived the idea of preparing the ſuppoſed *eſſential* or finer part of the ſoluble matter of the cinchona as well as of other ſubſtances by infuſion in cold water, aſſiſted by violent and long continued agitation. This was peformed by La Garaye in ſmall mills, and with a complicated apparatus, which, however, is not neceſſary. This kind of extract is ſimply prepared by adding cold water to powdered bark, macerating them for two days with frequent ſtirring, and then evaporating very ſlowly the infuſion, which is ſtrongly impregnated with the active and ſenſible properties of the cinchona. The extract thus prepared, if the evaporation be well managed, has a fine granular appearance, ſtrongly reſembling a ſalt, and was taken for one by the inventor. It is ſcarcely ſoluble again in cold water, probably owing to the action of the air during the long evaporation, but it has not been examined in a ſatisfactory way. This preparation is tedious and expenſive, and though it is extolled by ſome writers, it by no means deſerves the high character given to it by the inventor, nor does it appear at all preferable as a medicine to the common extract.

A very valuable analyſis has been made by Fourcroy of one ſpecies of the cinchona from St. Domingo, (publiſhed in the 8th and 9th vol. of the Annales de Chimie,) which contains ſeveral new facts on the nature of the extract of cinchona, and which, therefore, may be with propriety introduced here. Some of the obſervations will, doubtleſs, apply to all the vegetable barks and to vegetable extract in general. The operations of this excellent chemiſt on the cinchona, as far as relate to extract, are the following: A pound (16oz.) of the cinchona reduced to powder was boiled twelve times ſucceſſively for a quarter of an hour, in about 26lbs. of water each time. The firſt decoction was a deep brown red, very bitter, and ſtrongly frothed in boiling. It yielded by evaporation in a gentle heat five ounces ſeven grains of a brown dry extract. The ſecond decoction was much leſs coloured, and gave only nine gros (of 72 grs. each) of extract. The third gave only two grains of extract. The taſte and other ſenſible qualities of the ſeveral decoctions alſo gradually diminiſhed to the twelfth, which was little elſe than pure water. The entire quantity of extract obtained was 9 oz. 56 grains. A ſecond ſeries of decoctions was then made with the ſame quantities, and preciſely in the ſame way, except that each decoction was allowed to cool before evaporation, during which the ſix firſt liquors depoſited in decreaſing quantities a quantity of black tenacious extract, apparently inſoluble in cold water. The ſupernatant liquors were then united, and the whole was evaporated to 2 lbs., and the depoſit on cooling was added to the other extracts, which altogether amounted to two ounces leſs than the quantity obtained in the former way, which two ounces, therefore, were eſtimated to be the quantity of extract retained in the 2 lbs. of clear decoction after cooling. This laſt, on mixture with alcohol, depoſited about an ounce of a whitiſh coheſive maſs, evidently different from the black extract, and which was proved to be a pretty pure mucilage. The black extract was then treated with boiling alcohol, by which all was diſſolved, except about $\frac{1}{20}$th, that remained behind in the form of a *red powder*. This laſt was digeſted in cold water, which diſſolved out of it a third of its weight of mucilage, ſimilar to that precipitated on adding alcohol to the decoction, and the remainder was, as before, a fine red powder inſoluble in cold water, and in alchol hot or cold. The alcoholic ſolution was then let to ſtand in the air for ſome days, when it depoſited a ſmall quantity of brilliant cryſtalline grains. It was then mixed with water, and in ſome hours a number of white flocculi ſeparated. Laſtly, the alcohol and water were totally evaporated, and there remained a large quantity of extract. By repeating this mode of analyſis with the entire extract obtained by the firſt proceſs, a pound of cinchona was found to yield the following ſoluble matter:

	oz.	gros.	grains.
Of mucilage - - -	1	1	0
Cryſtalline grains ſeparated from the ſolution - - -	0	1	0
Flocculi ſeparated by adding water to the ſolution - - -	0	1	12
Red powder inſoluble in alcohol -	0	2	0
Extract left at the laſt operation -	7	0	44
Loſs - - - -	0	3	0
Total of extract obtained - -	9	0	56

Of theſe five conſtituent parts of the entire extract, or ſoluble part of the cinchona, the author principally attends to the two latter, namely, the red powder, and the extract left behind after all the other ſubſtances have been ſeparated from it. With regard to the three firſt, the mucilage very cloſely reſembled the common gum-mucilages; the cryſtalline grains were inſoluble in alcohol, and in cold water, but yielded to a large quantity of boiling water, were diſſolved in alkalies, and gave ſome ammonia by diſtillation; and the flocculi reſembled the gluten of wheat.

The red powder the author clearly ſhews to be different from reſin or any of the ſuppoſed immediate principles of vegetables. It is inſoluble both in water and alcohol, but it unites with alkalies immediately and inſeparably, and, therefore, eſſentially differs from the reſins. Its colour is extremely durable, and little affected by oxymuriatic acid. The true nature of this reſin was attempted to be explained by experiments on the extract.

This extract is, obviouſly from its quantity and its ſenſible properties, the moſt important part of the ſoluble portion of the cinchona. When quite dry, it is hard, ſhining, and brittle, black, or deep brown, and intenſely bitter. It is totally and permanently ſoluble in hot alcohol, inſoluble in cold water, but ſoluble in boiling water; from which, however, the greater part ſeparates on cooling, unleſs very largely diluted.

A ſmall portion of the extract was diſſolved in a large quantity of water and oxymuriatic acid gas paſſed through. The firſt effect of the acid was to give the ſolution a clear red colour, and to ſeparate a red flocculent powder. More of the gas deprived the liquor of colour, and much lightened that of the powder. After ſeparating all the red powder, which amounted to $\frac{3}{7}$th of the extract originally employed, the liquor (now ſaturated with the acid gas), was evaporated and left a black acerb-acid maſs.

The extract, therefore, appears, by this experiment, to be compoſed of two parts; the one, capable of being converted by the oxymuriatic acid into this red powder, and the other not. The red powder thus produced artificially was found to reſemble exactly that naturally contained in the entire extract, and which appears to be a conſtituent part of the cinchona. Hence the author concludes, that the red powder conſiſts of extract altered by oxygenation, the oxygen in the one caſe of its production being abſorbed from the atmoſphere by the decoction, during its long evaporation, and in the other, furniſhed by the oxymuriatic acid. In conſequence of this hypotheſis, he adds, that the quantity of this red powder is in direct proportion to the time of expoſure to the atmoſphere; and as it may be inferred to be very inert as a medicine, from its ſparing ſolubility, hence the practical direction of preparing the decoction of bark by a haſty boiling, and in a covered veſſel.

Theſe experiments, however, by no means warrant the inference that the red powder is nothing but ſuper-oxygenated extract, even admitting that the ſubſtance formed by the oxymuriatic acid is eſſentially the ſame as that ſeparated ſpontaneouſly by expoſure to air. The inquiries of other chemiſts have ſhewn that this ſubſtance contains lime in one form or other, ſince, when calcined, it leaves chiefly carbonat of lime; and alſo, if it is nothing but oxygenated extract, it is not eaſy to aſſign a valid reaſon why only a part of any given portion of extract ſhould be able to be thus changed.

Theſe are the chief experiments relating to the ſubject of extract contained in this elaborate inquiry; and though they are ingenious, and apparently accurate, they certainly ſhew that very much remains to be done in this part of chemical analyſis, and that the common diſtinction of theſe ſubſtances into reſin, gum, gum-reſin, &c. is extremely imperfect and unſatisfactory; though the deficiency of real information on the nature of many of the moſt important articles of the vegetable Materia Medica leaves little to the compiler but to repeat the ſcanty matter of fact ſuch as he finds it.

The cinchona has been, and is conſtantly employed in a great variety of diſeaſes, which we ſhall not attempt to enumerate in this place. The general operation of this admirable drug is, to reſtore and increaſe the general health and ſtrength, to improve the appetite, and promote all the functions of the body. This it effects in a gradual way, and moſtly without any ſenſible operation, except that of ſtrengthening the pulſe. Some inconveniences occaſionally occur, which either forbid its uſe, or require ſome additions to counteract them. Sometimes it increaſes the ſymptoms of general fever, heat, thirſt, reſtleſſneſs, &c. and in this caſe too, it often is rejected by the ſtomach, after having been taken for ſome hours. Hence it can ſeldom be borne, and often does miſchief in acute fever; ſo that in curing intermittents by its means it muſt be employed only in the perfect intervals between the paroxyſms. Its effects on the bowels are various and oppoſite. Often it purges, and as often it brings on a coſtive ſtate, each of which requires the proper correctives.

Beſides the original uſe of the bark in intermittent and remittent fevers, it is ſcarcely leſs extenſively or certainly uſeful as an auxiliary to ſurgery, in ſupporting and improving the vis vitæ under extenſive bodily injuries, large ulcerations, compound fractures, and caſes where gangrene is threatened, or actually eſtabliſhed. In ſcrophulous caſes alſo, and indurated and ulcerated glands, it has often a moſt happy effect in bringing on healthy ſuppuration and granulation of the ſore.

The cinchona is ſcarcely ever employed externally, except as a uſeful aſtringent gargle.

CINCINATO, Romulo, in *Biography*, a Florentine painter, who was born early in the 16th century, and is believed to have been the diſciple of F. Salviati. He was one of the principal artiſts employed by Philip II. in the Eſcurial, where, in the great cloiſter, he painted many excellent freſcos; in the church likewiſe are ſeveral of his pictures, "particularly one of San Geronimo reading, and another of the ſame ſaint dictating to his diſciples; and in the choir two freſco paintings, taken from paſſages in the life of San Lorenzo." Many works of his exiſt at Guadalaxara, in the palace of the Duque del Infantado, a grandee of high family. The moſt celebrated of his pictures is a Circumciſion, in the church of the Jeſuits at Cuenca, where he ſucceeded ſo admirably in the fore-ſhortening of one of the figures, which is repreſented with its back turned towards the ſpectator, that he is reported to have declared that he prized one limb of this figure more than all his works in the Eſcurial. He died at an advanced age, univerſally lamented, in the year 1600. Cumberland. Lanzi, Storia Pittorica. Orlandi.

Cincinato, Diego de Romulo, was the ſon and ſcholar of the preceding; he entered into the ſervice of Don Fernando Enriquez de Ribera, third duke of Alcala, and went with him to Rome, upon his being appointed ambaſſador for the purpoſe of doing homage from Philip IV. to pope Urban VIII. He painted the portrait of his holineſs three ſeveral times, with ſuch ſucceſs, that, beſides many handſome preſents heaped upon him, he received the honour of knighthood from the hand of cardinal Trexo Parriagua, a Spaniard. This happened in the year 1625, and in the year following he died, and was buried in the church of San Lorenzo, at Rome. He left a brother named Franceſco, upon whom, at the requeſt of Philip IV. the pope conferred the honour of knighthood, after the death of his brother. Franceſco died at Rome, in the year 1636. Cumberland. Lanzi, Storia Pittorica.

CINCINNATI, in *Geography*, a pleaſant and flouriſhing town in the United States of America, in the ſtate of Ohio, and county of Hamilton, ſeated on the Ohio river, and commanding a pictureſque view of the ſurrounding country. It is oppoſite to the mouth of Licking river, and the little town of Newport, which is built at the point formed by the junction of that river with the Ohio. The ſettlement commenced in 1789, and the town was incorporated in 1802. It contains upwards of 300 houſes, and has a printing-preſs which iſſues a weekly paper. Cincinnati was for ſeveral years the ſeat of government for the north-weſtern territory, and it is in the line of communication with the chain of forts that extend from fort Waſhington, near the upper end of the town, towards the weſt. It lies ſix miles below Columbia, and this as well as the other place are ſituated between Great and Little Miami rivers. N. lat. 39°. 5′ 54″. W. long. 85° 44′.

Cincinnati, *Society of*, a ſociety formed in the United States of America towards the cloſe of the year 1783, by the officers of the army, juſt before the diſbanding of it; ſo called after the Roman dictator, Cincinnatus, and intended to perpetuate the memory of the revolution, the mutual friendſhip, and the union of the ſtates; and alſo to raiſe a fund for the relief of poor widows and orphans whoſe huſbands and fathers had fallen during the war, and for their deſcendants. In October 1783 general Waſhington ſubſcribed himſelf preſident of this order. The general ſociety, which was to meet at leaſt once in three years, was divided into ſtate-ſocieties, which were to meet annually on the 4th of July, the anniverſary of American independence. In order to raiſe a fund for the benevolent purpoſes of the ſociety, each member was to ſubſcribe one month's pay to the general treaſury, and the fund was to be augmented by private donations. The intereſt only of the money thus raiſed was to be expended in acts of charity. The members of the inſtitution were to be diſtinguiſhed by wearing a medal, emblematical of the deſign of the ſociety. The device was a bald eagle of gold, and it was ſuſpended by a deep blue ribband edged with white, deſcriptive of the union of America and France. The emblems borne on the breaſt of the eagle were the following: the principal figure Cincinnatus, and three ſenators preſenting him with a ſword and other military enſigns; on a field in the back ground his wife ſtanding at the door of the cottage, and near it a plough and other implements of huſbandry; round the whole, "Omnia reliquit ſervare rempublicam." On the reverſe, the ſun riſing, a city with open gates, and veſſels entering the port; fame crowning Cincinnatus with a wreath, inſcribed "virtutis premium;" below, hands joining, ſupporting a heart, with a motto "eſto perpetua;" round the whole, "Societas Cincinnatorum inſtituta, A.D. 1783." The honours and advantages of this ſociety were to be hereditary in the line of the eldeſt male heirs, and in default of male iſſue, in that of the collateral male heirs. Honorary members were to be admitted, but without the hereditary advantages of the ſociety, and provided their number ſhould never exceed the ratio of one to four of the officers or their deſcendants. The oſtenſible views of this ſociety, however honourable and praiſe-worthy, could not ſcreen it from popular jealouſy; and it was alleged by an able writer, that the principles on which the ſociety was formed would, in proceſs of time, introduce and eſtabliſh an order of nobility in the country, which would be repugnant to the genius of the republican governments of America, and dangerous to liberty. Early in the year 1784 the provinces of Pennſylvania and Maſſachuſetts declared the inſtitution unjuſtifiable, and their reſolution to diſcountenance it. The province of Rhode Iſland proceeded ſo far as to annul the privileges of all the ſubjects of its ſtate who ſhould be members of this ſociety, and to declare them incapable of any office under government. In conſequence of this alarm, the Cincinnati, in their firſt general meeting convened at Philadelphia, May 3, 1784, thought proper to new model the inſtitution of their ſociety. They profeſſed to withdraw the claim of hereditary honour, to diſclaim all interference with political ſubjects, and to place their funds under the immediate cognizance of the ſeveral legiſlatures, through the medium of a general charter. Indeed they relinquiſhed without heſitation every thing in their new conſtitution, except their perſonal friendſhips, of which they could not be diveſted, and the acts of beneficence which it was their intention ſhould flow from them. With theſe profeſſions, however, they retained their funds, their general meetings, and their ribbands.

Cincinnatus, Lucius Quintius, in *Biography*, an illuſtrious Roman, who flouriſhed towards the cloſe of the 3d century from the building of the city. Though his means were ſo ſmall as to induce him to cultivate a ſmall farm with his own hands, yet he was of a patrician family. In the year 292, when the city was in a very diſturbed ſtate on account of the diſſenſions between the tribunes and the ſenate, Cincinnatus was created conſul. He had for ſome time relinquiſhed all views of ambition, and would gladly have been excuſed entering upon public life. He was naturally attached to the patrician party, and owing to the baniſhment of his ſon Cæſo for ſupporting the cauſe of the ſenate, he was ſtill leſs inclined to keep terms with the plebeians. He reproached the ſenators for their puſillanimity, and the tribunes of the people for their inſolence, and prevented the bringing forward any motion for the Terentian law in favour of the people. He had been elected to his office to complete the year only of the conſul Valerius Poplicola, who had been ſlain in recovering the capitol from Herdonius, an ambitious Sabine, that had rendered himſelf popular by oppoſing the laws, and by promiſing freedom to the ſlaves, and an ample participation of the ſpoils of the rich to thoſe in the lower ranks of life. When his time of ſerving the office of conſul was nearly expired, the ſenators propoſed to re-elect him for another year, which he peremptorily refuſed, as being contrary to their own reſolution againſt the continuation of magiſtracies to the ſame perſon. He had not, however, long retired from public concerns when the city became threatened with imminent dangers from an invading army of the Æqui: Cincinnatus was unanimouſly created dictator. At that time he was diligently cultivating a ſmall farm acroſs the Tiber. He was found by the perſons deputed from the ſenate engaged in ruſtic labour; and, after mutual ſalutations, he was deſired to put on his *toga* to hear the commands of the ſenate. His wife Racilia quickly brought the garment from their cottage, and as ſoon as he was dreſſed in it, they ſaluted him dictator, and at the ſame time explained to him the nature of the public danger. A veſſel was already prepared for his paſſage, and he was received on the oppoſite bank with every token of reſpect and deference. Cincinnatus headed the Roman army, and, after a deſperate engagement, the Æqui were obliged to ſubmit to a treaty propoſed by the conqueror, and to give up their principal officers, arms, and baggage. Cincinnatus divided the ſpoils among his ſoldiers, and returned triumphant to Rome, where he was received as the ſaviour of the ſtate. The ſenate would gladly have enriched him, but he declined their offers: he retained his dictatorial authority only till the principal witneſs againſt his ſon had been convicted of falſe teſtimony, and Cæſo recalled, and then abdicated on the ſixteenth day the ſupreme dignity to which he had been appointed for ſix months, having in that ſhort time reſcued a Roman army from deſtruction, and defeated a powerful enemy. "He returned," ſays a good hiſtorian, "a triumphal huſbandman, having finiſhed a war within fifteen days, as if he had been in haſte to reſume his interrupted labours." Twenty years after this Cincinnatus was again made dictator, and though then eighty years of age, this veteran poſſeſſed all the intrepidity and courage of youth. He was now called upon to ſuppreſs a conſpiracy, at the head of which was Spurius Mælius, a rich knight, who had monopolized the corn of Tuſcany, and by his liberality to the idle and the poor had ſeduced a number of partizans to his cauſe ſufficient to endanger the ſafety of the republic. As ſoon as Cincinnatus had been appointed dictator, he ordered Mælius to appear before him in the forum: the knight, conſcious of his guilt, and foreſeeing the danger to which he was now expoſed, attempted to make his eſcape, when he was purſued by Ahala the maſter of the horſe, and killed on the ſpot. The dictator applauded the deed, and commanded the conſpirator's goods to be ſold, his houſe to be demoliſhed, and his wealth to be diſtributed among the people. Cincinnatus did not long ſurvive the glory of this action: he died highly reſpected by his fellow-citizens, and with the conſciouſneſs of having been eminently uſeful to the ſtate of which he had ſo long been a member.

Cincinnatus, in *Geography*, the moſt ſouth-eaſterly of the military townſhips in the ſtate of New York, in America. It has on the weſt Virgil, and Salem in Herkamer county on the eaſt, and lies on two branches of Tioughnioga river, a north-weſtern branch of the Chenango. The center of the town lies 53 miles S.W. by W. of Cooperſtown, and 39 S.E. by S. of the S.E. end of Salt Lake. N. lat. 42° 30′.

CINCIUS Alimentus, Lucius, in *Biography*, an early Roman hiſtorian and antiquary, who flouriſhed during the ſecond Punic war. He is now known only from references to his works by other celebrated writers. Cincius is quoted by Livy as of great authority; and from the works of Dionyſius Halicarnaſſus, it appears that he wrote a hiſtory of the wars of Hannibal in the Greek language. Aulus Gellius has referred to his treatiſe on military affairs. Macrobius refers to a work which he wrote on the Faſti; and Feſtus ſpeaks of ſeveral books of his on ſubjects connected with Roman antiquities. From theſe references, there can be no doubt that Cincius was an author, whoſe works, had they come down to us, would have done honour to the age in which he lived, and have been a valuable addition to our preſent literary treaſures.

CINCLUS, in *Ornithology*, a ſpecies of Tringa, which ſee; the ſtint or ox-eye of Ray and Willughby, the leaſt ſnipe of Ray and Sloane, the wag-tail of Brown, the ſanderling of Albinus, and the purre of Pennant and Latham.

Cinclus is alſo a ſpecies of Sturnus, (which ſee), black with a white breaſt; the water-ouzel or water-crake of Ray, Willughby, Pennant, and Latham.

Cinclus *tertius.* See Giarolo.

CINCTURE, in *Architecture*, the orlo or ring at the top and bottom of a column, which ſeparates the ſhaft at one end from the baſe, and at the other from the capital. The upper cincture is likewiſe called *collarino*; (ſee *Plate* XVI. of *Architecture*). Cincture is alſo uſed to denote the aſtragals or other mouldings, which are in ſome inſtances applied to conceal the joints in the ſhaft of a column, as in the baldaquin of St. Peter's, and at the Val-de Grace at Paris.

CINCTUS, in *Ancient Military Language.* This appellation was given to a Roman ſoldier rated or ceſſed as bound to carry arms and fight for his country. At the ſame time, the *cingulum* (girdle or belt) was given to him. And the taking of it from him was regarded as a load of ignominy and diſgrace.

CINDIA, in *Ancient Geography*, a town of India, placed by Ptolemy on this ſide the Ganges.

Cindia, a town of Caria, in the vicinity of Jaſſus and Bargilia.

CINDRAMORUM, an epiſcopal town of Aſia Minor, in Caria.

CINEFACTION. See Cineration.

CINEGUILLA, in *Geography*, a town of North America in New Mexico, in the province of Sonora; N. lat. 29° 48′, W. long. 111° 30′. Whilſt the Spaniards were penetrating theſe countries during a war of three years, which terminated in 1771, by the final ſubmiſſion of the natives, they entered a plain at this place, 14 leagues in extent, in which they found gold in grains, at the depth of only 16 inches, of ſuch a ſize, that ſome of them weighed 9 marks, and in ſuch quantities, that in a ſhort time, with a few labourers, they collected 1000 marks of gold in grains, even without taking time to waſh the earth that had been dug, which appeared to be ſo rich, that perſons of ſkill computed that it might yield what would be equal in value to a million of peſos. Before the end of the year 1771, more than 2000 perſons were ſettled at Cineguilla, under the government of proper magiſtrates, and the inſpection of ſeveral eccleſiaſtics.

CINERARIA, in *Botany*, (ſo called from the cinereous or aſh-coloured appearance of many of its ſpecies), Linn. gen. 957. Schreb. 1294. Juſſ. 181. Vent. 2541. Gært. 1021. Claſs and order, *Syngeneſia polygamia ſuperflua*. Nat. ord. *Compoſitæ diſcoideæ*, Linn. *Corymbiferæ*, Juſſ.

Gen. Ch. *Cal.* common ſimple, many-leaved; leaves nearly of equal length. *Cor.* compound; hermaphrodite, florets in the diſk, tubular, five-cleft, regular; ſemi-florets female, ligulate, forming the ray when preſent. *Stam.* in the hermaphrodite; filaments filiform, ſhort; anthers united in a hollow cylinder, five-cleft at the top. *Piſt.* in the hermaphrodite, germ oblong; ſtyle filiform, the length of the ſtamens; ſtigmas two, almoſt erect; females, germ oblong; ſtyle filiform, ſhort; ſtigmas two, oblong, bluntiſh, revolute. *Peric.* the permanent calyx. *Seeds* linear, quadrangular; down generally capillary, copious. *Rec.* naked, flattiſh.

Eſſ. Ch. Calyx ſimple, many-leaved, equal; down generally ſimple, receptacle naked.

In a few ſpecies there are two or three ſmall ſcales at the baſe of the calyx, by which they ſhew an approximation to ſenecio, and ſeem to intimate that there is no natural line of diſtinction between the genera. Gærtner aſſerts, that the ſphacelated tips of the calyx-ſcales in ſenecio do not form a ſufficient generic difference. He has therefore founded the diſtinction between that genus and cineraria on the form of the leaves, retaining in his genus cineraria only thoſe that have undivided leaves, and removing all that have pinnatifid ones to his jacobæa, part of the ſenecio of Linnæus. But we preſume that no ſound botaniſt will ever agree with him in admitting any thing relative to the leaves into the eſſential character of a genus.

* *Flowers without a ray.*

Sp. 1. C. *nivea*, Willd. 1. (Doria nivea, Thunb. Prod. 155. nov. gen. p. 163.) "Leaves linear, tomentous; flower generally ſolitary, terminal; ſtem ſhrubby." *Root* perennial. *Flowers* peduncled. A native of the Cape of Good Hope. 2. C. *undulata*, Willd. 2. (Doria undulata, Thunberg. C. ſpathulata, Lam.?) "Root-leaves elliptical, petioled, undulated, ſmooth; flower ſolitary, terminal." *Root* annual, fibrous. *Root leaves* numerous, curled, revolute at the edges, erect, a finger's length; petioles longer than the leaf, linear, ſtriated, ſomewhat villous. *Stem* a foot and a half high, ſolitary, ſometimes two, cylindrical, ſcabrous, ſimple, erect. 3. C. *alata*, Linn. jun. Suppl. 374. Mart. 19. (Doria alata, Thunb.) "Root perennial; ſtem herbaceous; leaves inverſely egg-ſhaped; flowers in corymbs." *Stem* two feet high, upright, a little branched, angular, with an even ſurface. *Leaves* quite entire, with an even ſurface. *Corymbs* at the top of the ſtem, leafleſs; calyx ſix cleft, egg-ſhaped, with an even ſurface; florets about ſixteen; ſome of them in the margin female, naked. A native of the Cape of Good Hope. 4. C. *ſpinuloſa*, Lam. 19. "Leaves embracing the ſtem, ſomewhat ſpatule-ſhaped, ſpinous-toothed at the edges, ſmooth; corymb panicled." Whole plant ſmooth, of a ſlightly glaucous green colour. *Stem* a foot high or more, herbaceous, full of pith, cylindrical, ſtriated, a little branched. *Leaves* alternate, ending in a ſhort point; upper ones ſmall, almoſt lanceolate, entire. *Flowers* yellow, ſmall, numerous. A native of Africa, communicated by Sonnerat. 5. C. *perfoliata*, Linn. jun. Suppl. 375. Mart. 23. (Doria perfoliata, Thunb.) "Leaves egg-ſhaped, embracing the ſtem; peduncles one-flowered, elongated." Whole plant glaucous, inclining to fleſh coloured. A native of the Cape of Good Hope. 6. C. *denticulata*, Linn. jun. Sup. 375. Mart. 22. (Doria denticulata, Thunb.) "Leaves lanceolate, ſmooth, toothed; flowers panicled." *Leaves* almoſt all radical, long; ſtem-ones ſmall, chiefly at the ramifications. A native of the Cape. 7. C. *ſerrata*, Willd. 6. (Doria ſerrata, Thunb.) "Leaves inverſely egg-ſhaped, oblong, ſerrated, tomentous underneath; ſtem branched near the top; branches one-flowered." A native of the Cape. 8. C. *elongata*, Mart. 20. Willd. 7. (Doria elongata, Thunb.) "Leaves ſomewhat heart-ſhaped, bitten; peduncles very long, ſubulate-ſcaly." *Stem* a foot and a half high; erect, branched, reddiſh, tomentous at the ramifications. *Leaves* an inch long, petioled, diſtant, unequally crenate, ſmooth, rather obtuſe; petioles the length of the leaves, a little decurrent at the baſe. *Flowers* yellow, peduncles terminal, one-flowered; calyx quite ſimple; leaves from twelve to fourteen, lanceolate, the length of the flower. A native of the Cape. 9. C. *eroſa*, Willd. 8. (Doria eroſa, Thunb.) "Stem herbaceous, decumbent; leaves lyre-ſhaped, toothed, flowers panicled." *Leaves* ſcabrous, pubeſcent underneath, with minute prominent papillæ; lateral lobes unequal, ſimple; terminating one larger, kidney-ſhaped, three-lobed. A native of the Cape, near Ribek castel and Paardeburg. 10. C. *ſonchifolia*, Linn. Sp. Pl. 5. Lam. 6. Mart. 5. Willd. 9. (Doria ſonchiſolia, Thunb. Jacobæa ſonchi folio, Breyn. Prod. 3. tab. 21. fig. 1.) "Leaves embracing the ſtem, differing in ſhape." Linn. *Stem* ſmooth, leafy. *Flowers* terminal, large. *Lower leaves* petioled, irregularly lobed; upper ones embracing the ſtem, heart-ſhaped, acute, entire. A native of the Cape. 11. C. *inciſa*, Willd. 10. (Doria inciſa, Thunb.) "Leaves oblong, ſmooth; lower ones gaſh-toothed; upper ones quite entire; flowers terminal." A native of the Cape. 12. C. *pinnatifida*, Willd. 11. (Doria pinnatifida, Thunb.) "Leaves pinnatifid, toothed, ſmooth, petioled; flower ſolitary, terminal." *Stem* a foot high, herbaceous, cylindrical, a little zig-zag, branched. *Branches* alternate, filiform, elongated, leafleſs at the top. *Leaves* three inches long, ſcattered, erect; lobes nearly oppoſite, egg-ſhaped, ſcarcely a line long. A native of the Cape. 13. C. *bipinnata*, Willd. 12. (Doria bipinnata, Thunb.) "Leaves twice pinnated, linear, ſmooth; flowers panicled." A native of the Cape.

** *Flowers with a ray.*

14. C. *filiformia*, Willd. 13. Thunb. Prod. 154. "Leaves linear, ſmooth; flowers panicled." A native of the Cape. 15. C. *cacaloides*, Linn. jun. ſup. 174. Mart. 21. Willd. 14. Thunb. Prod. 154. "Leaves cylindrical, oblong, fleſhy; panicle terminal, elongated, few-flowered; peduncles alternate." A native of the Cape. 16. C. *lineata*, Linn. jun. ſup. 375. Mart. 24. Willd. 15. Thunb. Prod. 154. "Leaves lanceolate, tomentous underneath, ſerrated at the tip, toothed at the baſe." *Stem* a foot high and more, herbaceous, erect, ſtriated, hoary. *Leaves* alternate, nearly ſeſſile, three-nerved underneath. *Flowers* with a yellow ray; panicle twice compound, ſtiff, much longer than the leaves, ſomewhat faſtigiate, hoary; calyx ſmall; down twice the length of the calyx. A native of the Cape. 17. C. *americana*, Linn. jun. ſup. 373. Mart. 18. Willd. 16. "Stem ſhrubby; panicles axillary; leaves alternate, petioled, broad-lanceolate, ſerrated, ſmooth on the upper ſurface, hoary underneath." Whole plant clothed with a woolly epidermis, which has the appearance of a thin membrane, and is eaſily abraded. The branches, petioles, peduncles, and under ſurface of the leaves, all whitiſh. *Stems* woody. *Leaves* veined, with the conſiſtence of evergreens. *Flowers* with a ray, apparently yellow; peduncles with ſcaly bractes, rarely two-flowered; calyx and leaves ſo equal as to ſeem only one, with a few irregular ſcales at the baſe. *Leaves* oblong, rather obtuſe, ſlightly heart-ſhaped at the baſe, coriaceous. A native of North America, obſerved by Mutis. 18. C. *repanda*, Mart. 28. Willd. 17. Forſt. Prod. n 295. (Brachyglottis; Forſ. ch. gen. tab. 46.) "Panicle twice compound, divaricated, terminal; leaves oblong, repand-ſinuate, tomentous underneath; ſtem arboreous." *Root* perennial. A native of New Zealand. 19. C. *rotundifolia*, Mart. 27. Willd. 18. Forſt. Prod. n. 294. "Panicles few-flowered; leaves petioled, roundiſh, egg-ſhaped, quite entire, tomentous underneath; ſtem arboreous. *Root* perennial. A native of New Zealand. 20. C. *geifolia*, Linn. Sp. Pl. 1. Mart. 1. Lam. 1. Willd. 19. (Othonna glifolia, Kniph. Ant. 5. n. 62. Jacobæa Comm. Hort. 2. tab. 73. Seb. Muſ. 1. tab. 22. fig. 3.) "Peduncles branched; leaves kidney-ſhaped, rather orbicular, ſomewhat lobed, toothed, petioled, Linn. Sp. "Peduncles branched; leaves kidney-ſhaped, narrowed, ſomewhat lobed, pubeſcent; petioles eared at the top. *β*. "Petioles unequally appendicled, Lam. Jacobæa, Pluk. Mart. tab. 421. fig. 4. *Root* perennial. *Stem* a foot high, or more, much branched, cylindrical, cloth-

ed with a cottony down. *Leaves* green on the upper ſurface, hoary underneath. *Flowers* yellow. The variety β is larger, and its petioles furniſhed with more remarkable appendicles. A native of Africa. 21. C. *aurita,* Willd. 20. L'Herit. ſert. ang. "Flowers in corymbs; leaves heart ſhaped, ſomewhat angular, tomentous underneath; petioles with two ears at the baſe." *Root* perennial. *Flowers* purple. 22. C. *cruenta,* Mart. 35. Willd. 21. L'Herit. ſert. ang. 26. Hort. Kew. 3. p. 221. Bot. Mag. 406. "Flowers in corymbs; leaves heart-ſhaped, angularly toothed, purpliſh underneath; petioles winged, eared at the baſe." *Root* perennial. *Stem* herbaceous, two or three feet high. *Flowers* purple. A native of the Canary Iſlands, introduced in 1777 by Maſſon. 23. C. *cymbalarifolia,* Linn. Amœn. Acad. 6. p. 106. Mart. 2. Lam. 2. "Leaves lyre-ſhaped; the end one kidney-ſhaped, ſlightly toothed; upper ſtem ones embracing the ſtem, lobed, quite entire." *Root* a ſolid bulb. *Stem* herbaceous, ſimple, with an even ſurface. *Flowers* with a purple ray, peduncled, numerous. There is a variety with ſimple trifid leaves, and the lobes trifid. A native of the Cape of Good Hope. 24. C. *anguloſa,* Lam. 2. (Aſter Africanus minimus monanthus luteus, Rai. Supp. 16.) "Peduncles ſimple; leaves roundiſh-angular, petioled; upper ones ſomewhat lyrate." *Root* half an inch long, ſlender, furniſhed with fibres. *Stem* from four to ſix inches high, herbaceous, ſlender, ſmooth, branched. *Leaves* ſmall, ſmooth; petioles almoſt capillary, more than an inch long. *Flowers* yellow; peduncles long, ſimple, one-flowered; calyx a little pubeſcent. A native of the Cape, communicated by Sonnerat to La Marck, who aſſerts, that it is very diſtinct from C. cymbalarifolia, as deſcribed by Linnæus in Amœnitates Academicæ. 25. C. *lobata,* Mart. 36. Willd. 23. L'Herit. ſert. ang. 26. "Flowers ſomewhat in corymbs; leaves roundiſh, with many lobes, ſmooth; petioles eared at the baſe; calyxes with a few ſcales at the baſe." *Root* perennial. A native of the Cape, obſerved by Maſſon. 26. C. *multiflora,* Willd. 24. L'Herit. ſert. ang. 26. "Flowers in cymes; leaves cordate-ovate, tomentous underneath; petioles half-eared. A native of hills in the Canary iſlands." *Root* perennial. 27. C. *tuſſilaginis,* Willd. 25. L'Herit. ſert. ang. 26. "Flowers looſely panicled; leaves kidney-heart-ſhaped, with many angles, tomentous underneath; petioles eared at the baſe." *Root* annual. A native of Teneriffe. 28. C. *præcox,* Willd. 26. Cav. Ic. 3. tab. 244. "Flowers in corymbs; leaves heart-ſhaped, lobe-toothed, acuminate, ſmooth; petioles naked; ſtem fleſhy." *Root* perennial. *Stem* three or four feet high, about the thickneſs of the human finger. *Leaves* with five or ſix deep teeth on each ſide, ſmooth on both ſides. *Flowers* yellow; ray with five florets. A native of Mexico. 29. C. *malvæfolia,* Mart. 34. Willd. 27. L'Herit. ſert. ang. 26. "Flowers in cymes; leaves heart-ſhaped, angular, a little tomentous underneath; petioles ſimple." A native of the Canary iſlands, and St. Michael, one of the Azores, introduced by Maſſon in 1777. 30. C. *glabra,* Mart. 39. Willd. 28. Swartz. Prod. 113. "Flowers in corymbs; calyxes cylindrical; leaves oblong, acute, a little toothed, nerveleſs, ſmooth on both ſides, ſomewhat ſucculent; ſtem ſhrubby." *Root* perennial. A native of Jamaica. 31. C. *diſcolor,* Mart. 40. Willd. 28. Swartz. Prod. 113. "Flowers in corymbs; leaves oblong-lanceolate, acuminate, with a few ſmall teeth, ſmooth, ſnowy-tomentous underneath; ſtem ſhrubby." *Root* perennial. A native of Jamaica. 32. C. *coronata,* Willd. 30. Thunb. Prod. 154. "Leaves inverſely egg-ſhaped, crenate, ſmooth; flowers terminal; ſtem a little ſhrubby." *Root* perennial. A native of the Cape of Good Hope. 33. C. *ſibirica,* Linn. Sp. Pl. 3. Mart. 3. Lam. 3. Willd. 31. (Jacobæa orientalis, cacaliæ folio; Tourn. Cor. 57. Jacobæaſtrum Amm. ruth. tab. 24. Jacobæides uni-crenato folio; Vaill. Act. 1720. p. 300. Solidago n. 139. Gmel. Sib. 2. p. 169.) "Raceme ſimple; leaves heart-ſhaped, obtuſe, finely toothed, with an even ſurface; ſtem quite ſimple, one-leafed." Linn. "Flowers in racemes; leaves heart-halbert-ſhaped, toothed, ſmooth; petioles dilated at the baſe, ſheathing." Lam. *Root* perennial. *Stem* a foot and half high, or more, ſmooth. *Leaves* with a very ſhort point. *Flowers* yellow, in an upright raceme; bractes two at the baſe of the calyx, oblong, the length of the calyx, withering. A native of Siberia, the Levant, and the Pyrenees. 34. C. *glauca,* Linn. Sp. Pl. 4. Mart. 4. Lam. 5. Willd. 32. (Solidago, Gmel. Sib. 2. tab. 74.) "Raceme ſimple; leaves ſpatulate-heart-ſhaped, quite entire, with an even ſurface; ſtem quite ſimple." *Root* perennial. *Stem* from three to five feet high, hollow, ſtriated. *Leaves* a little fleſhy, glaucous; lower ones on enlarged bordered petioles, which embrace the ſtem at their baſe. A native of Siberia. 35. C. *paluſtris,* Linn. 6. Mart. 10. Lam. 7. Willd. 33. Flor. dan. tab. 573. Eng. bot. 151. (Conyza aquatia laciniata, Bauh. Pin. 266. Aſter paluſtris, laciniatus, luteus; Tourn. 483. Othonna paluſtris; Linn. it. ſcan. fl. ſuecica. Solidago, Gmel. Sib. 2. tab. 72.) Marſh. Fleawort. "Flowers in corymbs; leaves broad-lanceolate, tooth-ſinuated; ſtem villous." *Root* perennial, fibrous. *Stems* three feet high, erect, ſimple, thick, angular, abundantly leafy. *Leaves* alternate, embracing the ſtem, nerved, pale, hairy, often pinnatifid-laciniated, and undulated. *Flowers* bright yellow, with a lemon-coloured ray, numerous; corymbs terminal; peduncles hairy; calyx cylindrical, hairy, yellowiſh, not ſwelling at the baſe; leaves membranous at the edge; florets of the ray about the ſame number as the leaves of the calyx, and a little longer, ſomewhat elliptical, toothed at the tip, ſpreading; of the diſk numerous. *Seeds* furrowed, ſmooth; down ſcabrous, (ſilky, Lam.) *Receptacle* pitted. All the hairs of the plant are tranſparent, and finely jointed like a conferva. A native of marſhy ground in England and other parts of Europe, but rare in England. 36. C. *cordifolia,* Linn. jun. Sup. 375. Mart. 6. Lam. 4. Willd. 39. Jacq. Auſt. tab. 176, 177. (C. alpina, α, Linn. Sp. Pl. 7. Senecio, Hall. Helv. 63. Jacobæa alpina foliis ſubrotundis ſerratis, Bauh. Pin. 131. Prod. 70. tab. 69.) "Flowers in panicled corymbs; leaves heart-ſhaped, unequally toothed, petioled, pubeſcent underneath." Lam. "Panicle few-flowered; ſtem ſimple; all the leaves petioled, heart-ſhaped, doubly toothed; petioles ſomewhat toothed at the baſe." Willd. *Root* perennial. *Stem* about a foot high, ſtriated, leafy, ſimple, or a little branched near the top. *Flowers* yellow; peduncles branched, woolly, furniſhed with ſmall ſcales; calyx ſhort, many-leaved, villous, open. A native of Swiſſerland and Auſtria. Senecio alpinus of the younger Linnæus, (C. alpina, Willd. 40.) has been ſuppoſed to be C. alpina α of his father: but we think without foundation. The ſphacelated tips of the calyx-leaves would ſurely have prevented Linnæus from making it a cineraria. 37. C. *integrifolia,* Murray, Syſt. Veg. 765. Mart. 8. Willd. 37. Jacq. Fl. Auſt. tab. 180. Eng. Bot. 152. (C. alpina, γ. Linn. Sp. Pl. 7. C. alpina, Lam. 9. C. campeſtris, Willd. 34. Retz. Prod. Flor. Scand. Ed. 2. n. 1027. Hoſt. Synop. 464. Jacobæa montana lanuginoſa anguſtifolia non laciniata, Bauh. Pin. 131. Tourn. 486. Jacobæa pannonica, folio non laciniato, Rai. Syn. 178. Bauh. Hiſt. vol. ii. 1056.) β. C. alpina, Allion. Ped. vol. i. tab. 38. fig. 2. (C. aurantiaca, Willd. 35. Hoppe Ant. pl. 4.) "Leaves oblong,

long, obſoletely toothed, villous; umbel ſimple, involucred.” Dr. Smith. “Peduncles ſimple, umbellate; ſtem-leaves oblong. entire, ſeſſile; root ones egg-ſhaped, ſomewhat toothed, leſſening into the petiole; ſtem ſimple.” Lam. “Flowers umbellate; ſtem ſimple; leaves tomentous; root-ones egg-ſhaped, ſomewhat crenulate; ſtem-ones lanceolate, quite entire.” Willd. *Root* perennial, fibrous. Whole herb cloathed with a white deciduous down. *Stem* about two feet high, furrowed. *Leaves* ſomewhat revolute; root-ones depreſſed, larger, and more obtuſe; ſtem-ones alternate, erect, narrower. *Flowers* of a bright gold-colour, in a terminal umbel with few flowers; each peduncle furniſhed with a ſhort lanceolate bracte at its baſe; calyx cylindric-hemiſpherical, ſmooth; leaves woolly at the baſe, with a membranous margin; florets of the ray numerous, twice the length of the calyx, elliptic oblong, three-toothed at the tip, ſpreading. *Seeds* with ſilky hairs; down ſcabrous. Stem in β a foot high; all the leaves, eſpecially the ſtem-ones, larger, more naked on the upper ſurface; root-ones ſometimes with broad teeth. A native of England, Sweden, Auſtria, France, and Siberia. 38. C. *longifolia*, Murray, Syſt. Veg. p. 765. Mart. 9. Willd. 33. Jacq. Flor. Auſt. tab. 181. (C. alpina, δ. helenites, Linn. Sp. Pl. 7. Othona, Sp. Pl. Ed. 1. Jacobæa montana polyanthos, Barr. Ic. 226.) “Leaves with five obſolete teeth; all oblong,” Mur. “Flowers umbellate-corymbous; ſtem ſimple; leaves ſomewhat toothed; root-ones ſpatula-ſhaped; ſtem-ones oblong-lanceolate. Willd. *Root* biennial. It varies in having the leaves either quite entire, or toothed, ſmooth or villous. A native of ſubalpine woods in Thuringia, Auſtria, Italy, and France. The integrifolia of Murray and Willdenow, to which, however, the latter attributes a perennial root, Jacquin's tab. 179, ſeems to be only a variety of this ſpecies, with the lower ſtem-leaves, as well as the root-one ſpatula-ſhaped; whereas, in C. longifolia, all the ſtem-leaves are oblong lanceolate. 39. C. *criſpa*, Linn. Supp. 376. Mart. 7. Willd. 38. Jacq. Auſt. tab. 178. “Flowers umbellate-corymbous; ſtem ſimple; leaves toothed; lower ones ſpatulate-heart-ſhaped; with winged, finely toothed petioles; upper ones ſeſſile, lanceolate.” Willd. *Root* perennial. *Stem* two feet high, erect, furrowed. *Leaves* curled, and waved about the edge; root-ones heart-ſhaped; ſtem-ones a little embracing the ſtem; peduncles and calyxes villous. A native of Auſtria. 40. C. *aurea*, Linn. Sp. Pl. 8. Mart. 11. Lam. 8. Willd. 41. “Flowers in corymbs; leaves lanceolate, ſerrated, tomentous underneath.” Linn. *Root* perennial. *Stem* villous. *Leaves* ſlight, villous on the upper ſurface. *Flowers* yellow, large, with an ample ray; pedicels with a few linear bractes. A native of Siberia. 41. C. *Japonica*, Murray, Syſt. Veg. 766. Mart. 26. 41. Willd. 42, Thunb. jap. 317. “Leaves ſword-ſhaped, toothed, tomentous; flowers terminal.” *Stem* cylindrical, ſimple, erect, tomentoſe. *Leaves* alternate, acute, leſſened at both ends, woolly, erect. *Flowers* yellow, ſolitary, or by threes; calyx woolly. A native of Japan. 42. C. *maritima*, Linn. Sp. Pl. 9. Mart. 12. Lam. 10. Willd. 43. (Jacobæa maritima, Bauh. Pin. 431. Tour. 486.) “Flowers panicled; leaves pinnatifid, tomentous; ſegments ſinuated; ſtem ſhrubby.” Linn. *Root* perennial. The whole plant remarkable for a very white cottony down, which covers the ſtem, peduncles, calyxes, petioles, and the under ſide of the leaves. *Stems* ſeveral, two or three feet high, hard, and ſometimes continuing through the winter, but not properly woody, cylindrical, leafy, branched. *Leaves* ſoft; lower ones petioled, egg-ſhaped, ſlightly pinnatifid, greeniſh on the upper ſurface. *Flowers* yellow, in terminal panicles, on the ſtem and branches; florets of the ray revolute. A native of ~~the~~ ſea-coaſt of Languedoc and Provence, Italy, and the Levant. It is one of the moſt ſpecious of the genus, and merits cultivation on account of its beauty. 43. C. *bicolor*, Willd. 44. “Flowers in corymbs; calyxes greyiſh, pubeſcent; leaves oblong, pinnatifid at the baſe, ſhining, and ſmooth above, downy underneath; ſegments ſomewhat toothed; ſtem ſhrubby.” It ſeems only a variety of the preceding ſpecies, differing from it in being leſs woolly. Deſcribed by Willdenow from a living plant, but probably the effect of cultivation, as its native country is unknown. 44. C. *canadenſis*, Linn. Sp. Pl. 10. Mart. 13. Willd. 45. (Jacobæa maritima, ſ. cinerea latifolia, Bauh. Pin. 131.) “Flowers panicled; leaves pinnatifid, ſomewhat villous; ſegments ſinuated; ſtem herbaceous.” Linnæus ſtates this to be the daughter of C. *maritima*; but differing in the leaves not being tomentous, but only ſomewhat villous, eſpecially underneath; in the ray of the corolla being ſpreading, not revolute; in the ſtem being annual, not perennial; and in the calyx being ſlightly ſphacelated at the tip, which it is not in C. *maritima*. A native of Canada. 45. C. *balſamita*, Lam. 11. (Jacobæa orientalis, foliis oblongis non laciniatis incanis, Tourn. Cor. 36.) “Leaves petioled, egg-ſhaped, crenate-ſerrated, tomentous; corymb ſmall, compound.” *Stem* a foot high, angular, woolly, quite ſimple, leafy. *Leaves* narrowed into the petiole at the baſe, cottony, and whitiſh. A native of the Levant. Specimen preſerved in the herbarium of Juſſieu. 46. C. *aſpera*, Willd. 46. Thunb. Prod. 153. “Leaves linear, pinnated, toothed, tomentous underneath; flowers panicled.” A native of the Cape of Good Hope. 47. C. *capillacea*, Linn. jun. Supp. 375. Mart. 14. Willd. 47. “Leaves pinnated; pinnæ capillary, entire.” Very like *othonna tagetes*, but its leaves are deeply divided and more ſlender. 48. C. *minuta*, Mart. 38. Willd. 48. Cav. Icon. i. tab. 33. fig. 3. (Bellis minima, Barr. Ic. 1153. fig. 1.) “Peduncles one-flowered; root-leaves ſmooth, wedge-ſhaped, with about five teeth; ſtem ones pinnated, linear-filiform, hairy; ſtem hairy.” *Root* annual. *Stems* ſometimes two or three, two or three inches high, ſimple, one-flowered beſet with long ſlender hairs. *Root leaves* petioled; ſtem-ones ſeſſile. *Flower* white. A native of mountainous ground in Spain. 49. C. *linifolia*, Linn. Sp. Pl. 11. Mart. 15. Lam. 14. Willd. 49. Jacq. Hort. Schoen. 3. tab. 308. “Peduncles one-flowered; leaves ſcattered; ſtem ſhrubby.” Linn. “Peduncles one-flowered; axillary; leaves linear-awl-ſhaped, ſmooth; ſtem ſhrubby.” Willd. It differs from *ſenecio linifolia*, in having all the flowers ſolitary. *Stem* compound, rough. *Flowers* yellow ſmall; peduncles longer than the leaves. A native of the Cape of Good Hope. 50. C. *humifuſa*, Mart. 30. Willd. 50. L'Herit. Sert. Ang. 25. (C. pumila, Thunb. Prod. 155.) “Peduncles one-flowered; leaves kidney-ſhaped, ſomewhat angular; petioles ſometimes eared, ſometimes naked at the baſe.” *Root* perennial. A native of the Cape. 51. C. *viſcoſa*, Mart. 31. Willd. 51. L'Herit. Sert. Ang. 25. Jacq. Frag. 12. tab. 7. fig. 2. (C. pandurata, Thunb.?) “Peduncles one-flowered; leaves pinnatifid-lobed, acute, viſcid, ſomewhat fleſhy. *Root* biennial. A native of the Cape. 52. C. *purpurata*, Linn. Mant. 285. Mart. 16. Lam. 16. Willd. 52. “Stem with about two flowers; leaves inverſely egg-ſhaped, ſomewhat tomentous.” *Root* perennial. *Stem* a foot high, herbaceous, ſimple, furrowed near the bottom. *Leaves* alternate, petioled, obtuſe, pubeſcent above, cottony underneath. *Flowers* with a purple ray; peduncles terminal, as long as the ſtem, filiform, cottony, erect, one-flowered; calyx-leaves lanceolate, nearly equal, ſhort, pubeſcent; down feathered. *Receptacle* naked. A native of the Cape. 53. C. *amelloides,* Linn. Sp. Pl. 13. Mart. 17. Lam. 17. Willd. 52. Bot. Mag. 249. (Solidago africana fruteſcens cærulea, hyperici foliis plerumque conjugatis. Aſter africanus fruteſcens, Rai. Supp. 158.) "Peduncles one-flowered; leaves oppoſite, egg-ſhaped, naked; ſtem ſomewhat ſhrubby." *Root* perennial. *Stem* two feet high, purpliſh, rough, dividing into many branches near the root, ſo as to form a low buſhy plant. *Leaves* about an inch long, and a third of an inch broad, thick, ſucculent, ſeſſile, generally two, but ſometimes three or four at a joint. *Flowers* with a yellow diſk and ſky-blue ray. Nearly allied to *amellus lychnitis*, but differing in its naked receptacle. A native of the Cape; and a common inhabitant of our green-houſes, where it flowers moſt of the year. The ſeeds were ſent to Miller in 1753. 54. C. *lanata,* Mart. 29. Lam. 12. Willd. 54. L'Herit. Sert. Ang. 25. Jacq. Collect. iii. tab. 19. fig. 3. Bot. Mag. 53. "Peduncles one-flowered; leaves roundiſh-heart-ſhaped, with ſeven angles, downy underneath." L'Herit. "Leaves roundiſh-angular, on long petioles, white, with down underneath; flowers ſolitary, terminal." Lam. *Root* perennial. *Stems* from twelve to ſix inches high, woody at their baſe, feeble, a little branched, cottony, and whitiſh near the top. *Leaves* alternate, green on their upper ſurface, white and cottony underneath. *Florets* of the ray of a viſcid purple upwards, white near the bottom; calyx cylindrical, ſmooth. A native of the Canary iſlands; introduced by Maſſon in 1780. 55. C. *ſcapiflora,* Willd. 53. L'Herit. Sert. Ang. 25. "Peduncles very long, one-flowered; leaves egg-ſhaped, ſmooth, doubly-toothed." A native of the Cape of Good Hope. 56. C. *laricifolia,* Lam. 15. (Jacobæa Breyn. Cent. tab. 64. Moriſ. Hiſt. 3. tab. 18. fig. 31.) "Flowers erect, lateral and terminal; little branches ſhort, one-flowered; leaves ſcattered, crowded, linear-awl-ſhaped, keeled; ſtem ſhrubby." A ſhrub, ſcarcely a foot high, ſmooth in all its parts. *Stem* cylindrical, with ſlender branches, leafy on its upper part, naked and marked with the ſcars of fallen leaves near the bottom. *Leaves* channelled on their upper ſurface, ſcarcely an inch long. *Flowers* yellow, ſeſſile; florets of the ray few, diſtant from each other; calyx ſimple, but apparently compoſed of two ranks, occaſioned by the preſſure of the upper leaves of the branches. A native of the Cape of Good Hope, communicated by Sonnerat. 57. C. *chamædrifolia,* Lam. 20. "Stem herbaceous, angular, naked near the top; leaves petioled, heart-ſhaped, crenate, hoary underneath." *Stem* from ſix to eight inches high, zig zag near the baſe; branches two or three near the top, one-flowered, furniſhed with ſmall acute ſcales. *Leaves* ſmall, ſmooth on both ſides, but greyiſh underneath. *Flowers* terminal; calyx ſimple, ſmooth, many-leaved. A native of the Cape. 58. C. *anthemoides.* Lam. 21. "Leaves ſeſſile, deeply pinnatifid; lobes lanceolate-toothed, ſlender; ſtem herbaceous." *Stem* eight or nine inches high, ſtriated, branched, leafy. *Leaves* greeniſh, beſet with a few hairs. *Flowers* yellow; peduncles one-flowered, ſmooth, furniſhed with very ſhort acute ſcales; calyx ſmooth, quite ſimple. 59. C. *haſtifolia,* Lam. 24. Mart. 25. Linn. jun. Suppl. 376. "Leaves halberd-ſhaped; ſegments lateral, bifid, divaricated." *Stem* ſeven inches high, erect. *Leaves* alternate, petioled. *Flowers* yellow; peduncles elongated, furniſhed with awl-ſhaped ſcales; calyx with about ten leaves.

Obſ. According to Juſſieu, C. amelloides recedes from the reſt of the genus, on account of its purple flowers and oppoſite leaves, but neither of theſe can be allowed to form part of a generic character, and if they did, ſeveral other ſpecies muſt be removed. Gærtner has ſeparated C. glauca and C. purpurata, on account of their feathered down, and placed them in a new genus which he calls ſenecillis, but it may alſo be doubted whether this be of itſelf a ſufficient generic difference. Thoſe ſpecies which have a few ſcales at the baſe of the calyx ſeem more allied to ſenecio, wanting only the ſphacelated tips of the calyx-leaves, and ſhewing, as La Marck obſerves, that there is no ſolid diſtinction between the two genera. As the ſpecies of ſenecio are very numerous, it might facilitate the ſtudies of the young botaniſt, if theſe were formed into a new genus, of which the preſence of the ſcales and the abſence of the ſphacelated tips ſhould form the eſſential character. Or it would anſwer the ſame purpoſe if the whole were thrown into one genus, divided into three ſections. The chief objection is the difficulty of finding trivial names.

C. *othonnites,* Linn. See OTHONNA *fruteſcens.*

— *abrotanifolia,* Berg. See OTHONNA *abrotanifolia.*

Propagation and Culture. Many of the ſpecies are well-known ornaments to our green-houſes, and others are worthy of being introduced. Moſt of them may be increaſed by cuttings, planted in a ſhady border, during the ſummer months, and duly watered. In a month or five weeks they ſhould be tranſplanted into pots, to prevent their roots from ſpreading. But they are too tender to endure the open air in the winter of our climate. C. maritima is hardier, and if the ſlips be planted in a dry rubbiſhy ſoil, they will live out of doors all the winter, and thrive many years; but in rich ground the plants are ſo luxuriant in ſummer as to be killed by the froſt in winter. C. amelloides, and ſome of the others, may alſo be propagated by ſeeds, ſown on a bed of light earth in the beginning of April. When the plants are fit to remove, part of them ſhould be planted in pots, to be ſheltered in winter under a hot-bed frame, and the remainder under a wall in poor ground, where, if the winter prove favourable, they will live. Miller. C. lunata, lately introduced into this country, which far exeeds all others cultivated here, in the beauty of its flower, is a valuable acquiſition to the green-houſe, alſo on account of its hardineſs, its readineſs to flower, and the facility with which it may be propagated. It flowers early in the ſpring, and may be made to continue nearly the whole year. It is particularly liable to be infeſted with aphides, or in the language of gardeners, to become louſy. The only method to have healthy plants is, to procure a conſtant ſucceſſion by cuttings. Theſe ſhould be placed in a pot, and plunged into a bed of tan. Curtis Bot. Mag.

CINERARIUS, in *Antiquity,* an officer retained by the women, whoſe buſineſs it was to provide aſhes proper for tinging the hair with a deep yellow colour. He was otherwiſe called *ciniflo.*

CINERARIUS is alſo uſed to ſignify one who paid a veneration to the relics of martyrs and ſaints.

CINERATION, in *Chemiſtry,* the reduction of wood, or any other combuſtible matter, into aſhes, by means of fire. This, others call *cinefaction.*

CINERES. See ASHES.

CINERES *clavellati,* in *Chemiſtry,* or *Pearlaſh,* is a conſiderably pure ſub-carbonat of Potaſh, which ſee.

CINERES *Ætnæ,* a name given by authors to a duſty and ſaline ſubſtance thrown out of mount Ætna, in form of powder, and reſembling aſhes. After an eruption of this mountain, theſe ſaline aſhes are found ſcattered about the opening itſelf, down the ſides of the mountain, and over the country for ten miles or more round. Thoſe aſhes, which are found thrown to the diſtance of eight or ten miles, are generally taken up in form of a very dry duſt, almoſt inſipid to the taſte: but what lie upon, and round about the ſkirts of the mountain, are very different; they are never dry, though they lie many months expoſed to the ſun's heat, which is very great there, but always feel damp and wet, and are compoſed of larger or ſmaller lumps, and not of a fine powder, as the more diſtant are. They are of a very ſtrongly vitriolic taſte, reſembling that of our common green copperas. From this taſte, and from the great quantities of matter reſembling a ſort of crocus Martis, and with theſe a great abundance of ſulphur, which is burnt away, and the vaſt quantities which alſo are ſublimed about the mouths, and left unburnt, it appears, that the common pyrites is contained in vaſt abundance in the bowels of the mountain, ſince green vitriol and ſulphur are its produce, and nothing is ſo eaſy as to calcine it with the purple powder reſembling crocus Martis, which is the third ſubſtance ſo frequent there. This gives great weight to the opinion of thoſe who believe all the eruptions of the burning mountains in the ſeveral parts of the world to be owing to this mineral. See PYRITES and VOLCANO.

CINERITIOUS, a term applied to things reſembling aſhes; particularly in point of colour and conſiſtence.

Thus, the cortical part of the brain is alſo called the *cineritious* part.

CINETTRI or CINITTRI, in *Ancient Geography*, a people of Africa, according to Ptolemy, who inhabited the deſert, S.E. of the river Bagradas.

CINEY, in *Geography*. See CHINY.

CINGA, *Cinca*, a river of Hither Spain, which has its ſource in the Pyrenées, and running to the ſouth, paſſed by the territories of the Illergates, in order to diſcharge itſelf into the ocean. The inundation of this river, and that of the Sicoris in the plain near Ilerda, proved very injurious to Cæſar, becauſe, by the removal of the bridges, he could not keep up a communication with the town that had joined him. But, in order to effect this purpoſe, he engaged all the barks, which he could find along the Iberus.

CINGILIA, a town of Italy, in the country of the Veſtini, which was taken by the conſul Brutus.

CINGULUM, in *Conchology*, a ſpecies of *Conus*, found in the Friendly Iſlands.

CINGULUM, in *Geography*, a town of Italy in the Picenum. Cæſar ſays that it was built at the expence of Labienus. It is mentioned by Pliny, Cicero, Silius Italicus, and Frontinus. It is now known by the name of *Cingoli* or *Cingolo*.

CINGULUM. See CINCTUS.

CINGULUM *Mundi*, mountains which the ancients alſo called the "Hyperborean mountains." Theſe mountains are probably thoſe which the Ruſſians call *Ziemnoipoias*.

CINGULUM *Sapientiæ*. See GIRDLE.

CINIFLO, in *Antiquity*, the ſame with CINERARIUS.

CINIUM, in *Ancient Geography*, a name given by Pliny to the greater of the Balearic Iſlands: the inhabitants of which enjoyed the ſame rights with thoſe of Latium.

CINNA, LUCIUS CORNELIUS, in *Biography*, an aſpiring Roman, who raiſed himſelf to the higheſt honours of the ſtate, by attaching himſelf, during the civil contentions, to the popular faction. In the year of Rome 667, Cinna was elected conſul, during the tyranny of Sylla, though he had been the avowed friend of Marius. He had no ſooner entered upon his newly acquired office, than he drove Sylla from Rome to his army in Aſia. He then attempted to ſtrengthen his party by incorporating a number of new citizens into the ancient tribes from the allies. This was oppoſed by his colleague Octavius, and the ſenators, who yet held the honour of citizenſhip in high eſtimation; a bloody battle was fought in the forum between the two parties. Cinna was defeated; he and ſix tribunes who had ſided with him were expelled the city. They proceeded to depoſe him from the conſulſhip, and choſe Cornelius Merula in his ſtead. Cinna applied for ſuccour to the allies, by whom he was furniſhed with money and troops, and, having by his various arts, gained over a large body of Roman ſoldiers encamped at Capua, he was joined by ſuch numbers, that he formed an army of thirty legions. He then inveſted Rome, and forced Metellus, in whom the care of defending the capital was lodged, to retire: Merula the new conſul reſigned his authority, and Cinna was again acknowledged as conſul. Not contented with a ſimple reſtoration to all his honours, he entered Rome with Marius, and the other leaders of his party. At firſt, they ſeemed contented with the deſtruction of Octavius, but they afterwards proſcribed all thoſe who had attained to ſenatorial rank, and a great multitude of the nobleſt and moſt honourable of the Romans were ſacrificed at the ſhrine of their mad ambition. At the expiration of the conſular year, Cinna nominated himſelf and Marius conſuls for another year. The latter dying ſoon after the nomination to office, Cinna ſhared the authority with the younger Marius, who was no leſs cruel than his father. He made himſelf conſul a third time, with Papirius Carbo, and, to ſtrengthen his hands, he married his daughter to Julius Cæſar, a man hereafter deſtined to act a great part in his country. Intelligence arrived, that Sylla was preparing to return to Rome at the head of a formidable army. Cinna, unwilling that the war ſhould be carried on in Italy, determined to meet his rival in Dalmatia; while, however, he was on the point of embarking his troops, a mutiny was excited among them, in which he was ſlain by his own ſoldiers, at the port of Ancona, in the year 670. Cinna has been deſcribed as one who, having attempted what no good man would have dared, performed what none but a very brave man could have effected.

CINNA, in *Botany*. See AGROSTIS *Cinna*. It is a native of Canada, whence ſeeds were ſent by Kalm.

CINNA, in *Ancient Geography*, a town of Italy, taken, according to Diodorus Siculus, by the Romans from the Samnites.—Alſo, a place of Dalmatia, marked by the Itinerary of Antonine, on the route from Salone to Durazzo, between Birziminium and Scodra.—Alſo, a town of Spain, placed by Ptolemy in Juetania, a country of the Tarragonenſis.—Alſo, a town of Aſia, in Perſia Propria, according to Ptolemy.

CINNABAR. See MERCURY.

CINNAMOLOGUS, in *Natural Hiſtory*, among the ancients, the name given to a bird which built its neſt either in the cinnamon-tree, or upon rocks and precipices, with the broken branches of that tree. The ancients have a great many idle traditions concerning this bird: ſome ſay it is the phœnix; and others, that it is a peculiar ſpecies of fowl. The common opinion of the phœnix building its neſt of ſpices ſeems to have given birth to all the idle ſtories that we hear of this bird in Pliny, and other credulous authors.

CINNAMOMIFERA REGIO, in *Ancient Geography*, the name of a country of Ethiopia, near Egypt, according to Ptolemy and Strabo. The latter places this country at the commencement of the Torrid Zone, and ſays, that Seſoſtris, king of Egypt, penetrated ſo far.

CINNAMON, in *Botany*. See LAURUS *Cinnamomum*.

CINNAMON. *Cinnamomum*, in the *Materia Medica*. The bark of the cinnamon tree (*Laurus cinnamomum*, Linn.), is the part uſed in medicine. It is of a brown red colour, light and thin, and rolled up in long brittle quills. The ſmell is delightfully fragrant, and the taſte is highly pungent and aromatic, with a conſiderable ſweetneſs, and ſome aſtringency. The thinneſt pieces are by much the moſt aromatic. Cinnamon, infuſed in boiling water, in a covered veſſel, gives out much of its grateful aromatic flavour, and forms an agreeable reddiſh-brown infuſion. Alcohol, ſtrong or diluted, extracts the aromatic part more completely, and without artificial heat. The aroma of the cinnamon reſides in an eſſential oil, which is extracted by diſtillation with water, though with ſome difficulty. Oil of cinnamon has a clear golden yellow colour, and a moſt powerfully fragrant ſmell. The taſte is exceſſively fiery, and abſolutely cauſtic, corroding the ſkin very ſpeedily. This oil is heavier than water. It is altogether prepared in Ceylon, and imported. When cinnamon is diſtilled with water juſt ſufficient to cover it in the ſtill, the diſtilled water that comes over is milky and turbid, and has a mild and agreeable flavour of the ſpice. If a large quantity is prepared at once, a few drops of oil collect at the bottom of the water. From a pound of cinnamon about a gallon of ſtrong diſtilled water may be prepared. The watery decoction remaining in the ſtill, yields, on evaporation, a red extract, of a mucilaginous and gently aſtringent taſte, but without any thing aromatic.

Pure alcohol, diſtilled from cinnamon, brings over very little of its flavour; ſo that if an extract is made with this menſtruum, it retains moſt of the rich aroma and pungency of the cinnamon. Proof ſpirit, on the other hand, when diſtilled from this bark, gives a clear, ſtrong, aromatic, ſpirituous water. This, as well as the ſimple water, is much uſed in medicine.

Cinnamon is one of the moſt grateful aromatics that we poſſeſs, and is employed as a cordial, reſtorative, and for all the purpoſes for which aromatics are uſeful. It is ſeldom, if ever, given alone; for the aromatics, though their ſenſible qualities are ſo decided, have but a temporary and uncertain effect on the conſtitution, and contribute but little to the cure of important diſeaſes. But, as an auxiliary in a variety of ways, and to cover the flavour of nauſeous medicines, cinnamon is eminently uſeful, and enters into the compoſition of a vaſt variety of tinctures, confections, cordial mixtures, and the like. A drop of the oil, dropped on a lump of ſugar, is one of the readieſt and moſt powerful ſtimulants in faintings and ſudden debility.

On account of the high price of the cinnamon, the *caſſia* bark, which much reſembles it, is very generally ſubſtituted. The general appearance, ſmell, and flavour, of the two are the ſame, only the aromatic property is much weaker, and it wants much of the grateful ſweetneſs of the real cinnamon. The caſſia may be diſtinguiſhed by the ſmooth ſurface which it exhibits when broken, and by its ſlimy taſte.

This ſubſtitution, though a real inconvenience, in many caſes is of little conſequence in preparing the diſtilled water; for water diſſolves ſo little of the eſſential oil, that, in the uſual proportions, it appears to ſaturate itſelf from the caſſia as completely as from the real cinnamon.

CINNAMON, *clove*, is alſo the bark of a tree growing in Braſil and Madagaſcar; where it is known under the name of *ravendſara*. The Portugueſe call it *cravo de marenham*.

This bark, pulveriſed, is ſometimes ſubſtituted for real cloves, though far ſhort of them in reſpect of flavour.

Saſſafras is ſometimes alſo called *cinnamon-wood*. See SASSAFRAS.

CINNAMON, *white*, which ſome call *coſtus corticus*, or *corticoſus*, or erroneouſly *cortex Winteri*, *Winter's bark*, from the perſon's name who firſt brought it into England, is the bark of a tree, reſembling the olive-tree, frequent in the iſlands of St. Domingo, Guadaloupe, and Madagaſcar; called by the natives *ſimpli*.

This bark, which dries like that of cinnamon, is at firſt browniſh, of a ſharp biting taſte, like pepper, and a ſmell like muſk; as it dries it whitens. Some uſe it in lieu of nutmeg; and in medicine it is uſed as a ſtomachic, and ſometimes as an antiſcorbutic.

The ſame tree alſo yields a gum called *alouch*, ſometimes *bdellium*, which is no diſagreeable perfume. See *Winteranus* CORTEX and WINTERANIA.

CINNAMUM, the name given by many of the old writers on the materia medica to cinnamon. The Arabian writers, when they treat of cinnamon, have three words by which they expreſs it; theſe are *ſelicha*, *daſini*, and *kanſe*.

CINNAMUS, JOHN, in *Biography*, a Greek, who flouriſhed in the 12th century. In his youth he followed the profeſſion of arms, and was preſent at various expeditions in Europe and the Eaſt. After the death of Manuel, he compoſed hiſtories of John Comnenus, and Manuel, his ſon, comprehending their actions from 1118 to 1176. He is characterized by Leo Allatius as an elegant author, who frequently uſes foreign forms of expreſſion, and figures from the ſchools, whence he ſometimes falls into obſcurity. According to Voſſius, his diction is more pure and terſe than that of the modern Greeks in general; and he is an imitator of Xenophon. His hiſtory was firſt printed in Greek and Latin, with notes, at Utrecht, 1652, in 4to. Another edition has been ſince publiſhed in folio by Du Cange, at Paris, with hiſtorical and philological obſervations.

CINNERETH, or KINNERETH, *ſea and lake of*, in *Ancient Geography*, otherwiſe called the lake or water of Geneſareth. See *Sea* of GALILEE.

CINNIANA, or CIRANIA, now *Sitania*, a town of Spain, in Luſitania. Valerius Maximus informs us, that when D. Brutus expreſſed his deſire that the inhabitants ſhould ranſom their city, they returned him anſwer, that they had iron to defend it, but no gold to ranſom it.

CINNORUM *Civitas*, an epiſcopal town of Aſia, in Galatia prima.

CINNUS, in *Ancient Medicine*, a drink made of the decoction of wheat, to which was added ſome flour of barley, honey, and wine.

CINO DU PISTOIA, in *Biography*, ſo called from his native place, but by his family name De 'Sigibuldi, an eminent lawyer and poet, flouriſhed in the beginning of the 14th century. He ſtudied law at Padua and Bologna, but with ſo little application or ſucceſs that he was at firſt refuſed the degree. This circumſtance had its proper effect in rouſing his diligence, and he ſoon attained to great profeſſional reputation. He was made principal aſſeſſor to Lewis of Savoy, when ſenator of Rome, to which office he was choſen in 1310. In 1314 he finiſhed a voluminous commentary on the code, and obtained a doctor's degree at Bologna. He was profeſſor at various univerſities, and was intimate with many diſtinguiſhed characters, among whom was Petrarch, who lamented his death in a ſonnet. Beſides the commentary on the code, printed at Frankfort in 1578, Cino commented on ſome parts of the Digeſt. But he derived the greater part of his reputation from his poetical works. By general ſuffrage he is placed among the moſt cultivated Italian poets of the age in which he flouriſhed; and of thoſe who preceded Petrarch, not one is to be compared to him for elegance and ſweetneſs. The moſt complete edition of his works is that of Venice in 1589.

CINOLIS, in *Ancient Geography*, or *Cimolis* of Strabo, a town of Aſia, in Galatia. Arrian ſays that it was a commercial and maritime town, at the diſtance of 60 ſtadia from Egineta, and 180 from Stephana. Others repreſent it as a village having a river and harbour.

CINQUAIN, in *Ancient Military Language*, an order of battle compoſed of five battalions or five ſquadrons. To form the cinquain, place the five battalions or five ſquadrons in one line, then make the ſecond and fourth advance to form the van, or *avant garde;* leave the firſt and fifth on the original line or ground as the main body, or *corps de bataille;* and make the third or middle one fall back to form the rear or *arriere-garde.* When the number of regiments or ſquadrons is equal to a multiple of five by any whole number n, or is equal to $5n$, they may be formed into the ſame order of battle.

CINQUEFOIL, in *Botany*. See POTENTILLA.

CINQUEFOIL, *baſtard*. See SIBBALDIA *procumbens*.

CINQUEFOIL, *marſh*. See COMARUM *paluſtre*.

CINQUEFOIL is a term in *Heraldry*, to repreſent a leaf of graſs of five points.

CINQUEFOIL *root*, in the *Materia Medica*, the name of a root which uſed to be an ingredient in ſeveral of the officinal compoſitions. The plant which produces it is the common cinquefoil, which grows every where by way-ſides. The root conſiſts of a cortical and ligneous or ſticky part, but the cortical only is uſed. It is eſteemed drying, and aſtringent, and antifebrific. Some have given it in agues in as large doſes as the cortex, and have cured with it. It ſtops fluxes of the bowels, and is good in diſorders of the lungs, and in the *fluor albus* and gonorrhœas, either in men or women. It is, however, very little regarded in the preſent practice. See Phil. Tranſ. vol. xiix. part ii. p. 835.

CINQUEL, in *Geography*, a town of the iſland of Sumatra, on the weſtern coaſt of a river of the ſame name.

CINQUE-MARS, in *Geography*, a town of France, in the department of the Indre and Loire, 10 miles N.W. of Tours.

CINQUE-PORTS, *Quinque portus*, five havens that lie on the eaſt part of England, towards France, thus called by way of eminence, on account of their ſuperior importance, as having been thought by our kings to merit a particular regard, for their preſervation againſt invaſions.

Hence they have a particular policy, and are governed by a keeper, with the title of lord warden of the cinque-ports, which office belongs to the conſtable of Dover; and their repreſentatives are called barons of the Cinque-ports.

They have various franchiſes ſimilar in many reſpects to thoſe of the Counties Palatine, and particularly an excluſive juriſdiction before the mayor and jurats of the ports; their warden having the authority of an admiral among them, and ſending out writs in his own name; and the king's writs do not run there. However, on a judgment in any of the king's courts, if the defendant hath no goods, &c. except in the ports, the plaintiff may get the records certified into chancery, and from thence ſent by *mittimus* to the lord-warden to make execution. 4 Inſt. 223. 3 Leon. 3.

Camden tells us, that William the Conqueror firſt appointed a warden of the Cinque-ports; but king John firſt granted them their privileges; and that upon condition that they ſhould provide eighty ſhips at their own charge for forty days, as often as the king ſhould have occaſion in the wars; he being then ſtreightened for a navy to recover Normandy.

There are alſo ſeveral towns adjoining, to which the privileges of the Cinque-ports extend.

There are ſeveral courts belonging to theſe ports; one before the lord-warden; others within the ports themſelves before the mayor and jurats; another, which is called *curia quinque portuum apud Shepway;* a writ of error lies from the mayor and jurats of each port to the lord-warden in his court of Shepway; and in theſe caſes the mayor and jurats may be fined, and the mayor removed, &c. (4 Inſt. 334. Crompt. Juriſd. 138.) and alſo from this court to the king's bench: and a writ of error lies from all the other juriſdictions to the ſame ſupreme court of judicature, in token of the ſuperiority of the crown when theſe franchiſes were created. All prerogative writs, as thoſe of *habeas corpus*, prohibition, *certiorari*, and *mandamus*, may likewiſe iſſue to all theſe juriſdictions; becauſe the privilege, that the king's writ runs not, muſt be intended between party and party, for there can be no ſuch privilege againſt the king. They have likewiſe a court of chancery, to decide matters of equity; but no original writ iſſues thence.

The Cinque-ports, it has been obſerved, are not "*jura æqualia*," like counties palatine, but are parcel of the county of Kent; ſo that if a writ be brought againſt one for land within the Cinque-ports, and he appears, and pleads to it, and judgment is given againſt him in the common pleas, this judgment ſhall bind him; for the land is not exempted out of the county, and the tenant may waive the benefit of his privilege. Wood's Inſt. 519.

Theſe five ports are Dover, Haſtings, Romney, Hythe, and Sandwich; to which Winchelſea and Rye have been ſince added. Thorn tells us, that Haſtings provided twenty one veſſels, and in each veſſel twenty-one men. To this port belong Seaford, Pevenſey, Hedney, Winchelſea, Rye, Hamine, Wakeſbourn, Creneth, and Forthclipe.—Romney provided five ſhips, and in each twenty-four men. To this belong Bromhal, Lyde, Oſwarſtone, Dangemares, and Romenhal.—Hythe furniſhed five ſhips, and in each twenty-one ſeamen. To this belongs Weſtmeath.—Dover, the ſame number as Haſtings. To this belong Folkſtone, Feverſham, and Marge.—Laſtly, Sandwich furniſhed the ſame with Hythe. To this belong Fordiwic, Reculver, Serre, and Deal.

CINQUE-PORT *net*. See NET.

CINQUE-VILLAS, in *Geography*, a town of Portugal, in the province of Beira; 2 leagues N.E. of Almeida.

CINQ-MARS, HENRY COIFFIER, *Marquis of*, in *Biography*, born in 1620, was introduced by Richlieu to Louis XIII. for the purpoſe of becoming his favourite, a poſt for which he was well qualified, having an agreeable perſon, and being endowed with ready talents for converſation. He was ſoon promoted to high honours, and the cardinal hoped to have reaped advantage from him whoſe fortune he had made; but in this he was completely diſappointed. Cinq-Mars was ambitious only of his own elevation, and deſtitute of every principle of gratitude; he even thwarted the views of Richlieu, and gladly complied with the king's deſire of being preſent at all the private conferences with the cardinal. This was not agreeable to the miniſter, and he gave his eléve a ſevere lecture on his preſumption for interfering in ſtate affairs, and forbade him from attending at any future councils. He alſo mortified his pride and vanity by queſtioning his pretenſions to a marriage with the princeſs Mary de Gonzaga, afterwards the wife of the king of Poland. On theſe accounts Cinq-Mars reſolved to revenge himſelf on his benefactor, and excited the king's brother, Gaſton, duke of Orleans, to a revolt, in which the duke de Bouillon participated. A treaty was made with Spain in Gaſton's name, by which it was agreed to lay open France to her enemies. In the mean time Cinq-Mars did not fail, at every opportunity, to declaim againſt the cardinal, and urged the king to baniſh him from his court, and to get him aſſaſſinated. The king appeared to reliſh the propoſals. Richlieu, though confined by illneſs, was too penetrating not to diſcover his approaching diſgrace. Fortunately, at this juncture, he made the diſcovery of the treaſonable negotiation carried on by the faction with Spain, and immediately informed the king of it. Cinq-Mars was arreſted, and carried to Lyons for trial. Gaſton, to make his own peace, furniſhed abundant evidence for the conviction of the late favourite. Cinq-Mars was capitally condemned, together with his friend De Thou, ſon of the celebrated hiſtorian and preſident, and was beheaded in September 1642, in the 22d year of his age. Gen. Biog.

CINTEGABELLE, in *Geography*, a town of France, in the department of the Upper Garonne, and chief place of a canton, in the diſtrict of Muret, ſeated on the Arriege; 16 miles S. of Toulouſe. The place contains 2984, and the canton 8695 inhabitants: the territory includes 195 kiliometres and 8 communes.

CINTRA, a town of Portugal in Eſtramadura, ſeated between the mountains of Cintra, near the mouth of the Tagus, and diſtant 4 leagues from Liſbon. The houſes lie diſperſed in a pictureſque manner over the declivity of the mountain; it has a royal caſtle, formerly the reſidence of ſeveral kings; it is ſaid to have been built by the Moors, and after having been deſtroyed by an earthquake in 1655, re-built in the ſame ſtyle by king Joſeph. The town has four pariſh churches, and the number of inhabitants is eſtimated at 1900. Cintra is the ſummer reſidence of the opulent inhabitants of Liſbon, and eſpecially of the foreign merchants, and of perſons in high rank under government. The months of Auguſt and September, when every thing is parched round Liſbon, are paſſed here on mountains that afford plenty of water, verdure, and ſhade. In the midſt of ſummer the nights are cool, and the houſes, which are diſperſed among rocks, gardens, and wood, preſent an agreeable retirement. The mountains of Cintra, called by the ancients "Montes Lunæ," lie N.E. and S.E. and terminate in the Cabo de Rocca. They conſiſt of granite compoſed of clear-white quartz, a ſomewhat reddiſh felſpar, and black mica, againſt which leans a white or foliaceous limeſtone, or a proper ſtink-ſtone. The ſouth ſide toward Liſbon is arid, naked, parched up, conſiſting of bare heaped-up rocks, and affords a wild, deſert, dreary proſpect. But on the north ſide, at the entrance of Cintra, every thing ſeems to be changed. The whole declivity to a certain height is covered with country-houſes and charming quintas, forming a ſhady wood of the fineſt trees, ſuch as oaks of various kinds, pines, lemons, and other fruit-trees. Streams iſſue every where from the rocks, and form cool moſſy ſpots. Towards the ſummit of the mountain naked rocks are accumulated together. On one of the high points, floating, as it were, in the air, is ſeen a monaſtery, and on another the ruins of a Mooriſh caſtle. Where the quintas ceaſe, begins a thick but low coppice of ſtrawberry-tree, mock-privet, buck-thorn, and gale or ſweet-willow, together with other vegetable inhabitants of the iſland of Madeira. A fine proſpect of the well-cultivated valley of Colares, of the great monaſtery of Mafra, and of the ſea, complete the beauties of the ſcene. To the weſt of Cintra is a market-town, called *Colares*, (which ſee); and on the mountain, towards the weſt, is a ſmall monaſtery of Capuchins, built between rocks, and called "Cork Monaſtery," the rocks being caſed with cork. The elevation and vicinity to the ſea cauſe a great accumulation of clouds and moiſture, which render it expedient to have a coating of cork upon the walls. Snow is not uncommon here in winter, although it never lies. Toward Cabo de Rocca the mountains become lower and lower, terminating in a flat, deſert, naked, lonely ridge, which forms the cape. The height toward the ſea is from 50 to 80 feet, being broken ſtraight off, and conſiſting of granite. Near the extremity is a light-houſe, and not far from it a ſmall chapel. On this naked plain the ſtorms rage with great violence, the ſea burſts with vehemence againſt the rocks, and is very deep in their vicinity. From hence are ſeen the mountains of Mafra, and oppoſite is the correſponding cape, Cabo de Eſpichel. Farther to the northward is another chain of mountains, parallel to thoſe of Cintra, with which it unites by high and detached mountains, the Cabeça de Montachique and others. From the ſea theſe mountains appear like a lofty amphitheatre. This chain of mountains conſiſts of thick and foliaceous limeſtone. On the part which runs toward the ſea is the caſtle of Mafra, built by John V. with its monaſtery. Of the ſize of this edifice, an idea may be formed from the quantity of metal uſed in every tower for bells, bars, &c. amounting to 14,500 arrobas (each arroba being 32 lb.) for each tower.

CINTRE, in *Building*, the mould on which an arch is turned; popularly called *centre*, ſometimes alſo *cradle*.

CINYPS, or CINYPHUS, in *Ancient Geography*, a river of Africa, in the Regio Syrtica, or northern part of the preſent kingdom of Tripoli, owing its name, according to Bochart, to the great number of porcupines produced in the adjacent country, derived its ſtream from a fountain, or a hill, called "Zachabari," or the hill of the Graces, (as the name imports in the Punic, Phœnician, or Libyan) in the country of the Macæ, and emptied itſelf into the Sinus Syrticus. Pliny and Herodotus intimate that in this region there was a fruitful diſtrict called "Cinyphe," which, as well as a city of ſome repute mentioned by Scylax, might have been ſo called from the river of the ſame name. The Macæ, from whoſe country the Cinyps flowed, were a pretty potent nation. They ſhaved their heads all over, except the middle, where they permitted a lock of hair to grow. When they made war upon any of their neighbours, they wore the ſkins of oſtriches inſtead of armour. In the winter they drove their flocks to the ſea-ſide, and in ſummer to the inland places near ſome fountain or river, for the ſake of water. They are denominated by the ancients Macæ Cinyphii and Macæ Syrtitæ, from their vicinity to the Cinyps and the Greater Syrtis.

CINYRA, in the *Jewiſh Antiquities*, a muſical inſtrument. This and the Hebrew *cinnor*, which is generally tranſlated *cithara*, *lyra*, or *pſalterium*, are the ſame. It was made of wood, and was played on in the temple of Jeruſalem. Joſephus ſays, that the cinyra of the temple had ten ſtrings, and that it was touched with a bow. In another place he ſays that Solomon made a great number of them with a precious kind of metal called *electrum*, wherein he contradicts the Scripture, which informs us that Solomon's *cinnors* were of wood.

CINYRAS, in *Fabulous Hiſtory*, the firſt king of the iſland of Cyprus, was the grandſon of Pygmalion, and father of Adonis. Paphus, his father, is ſuppoſed to have been the firſt that introduced into the iſland the worſhip of Venus, and is ſaid to have built the city which bears his name. He had, according to the fable, Adonis by his own daughter Myrrha. Paphus is feigned by the poets to have been the ſon of Pygmalion, by a woman, who had before been an ivory ſtatue. Pygmalion, they ſay, upon his arrival in the iſland of Cyprus, ſaw that the women lived very licentiouſly, and determined never to marry. Afterwards, as he was a famous ſtatuary, he made an ivory ſtatue of ſuch perfection, that, falling in love with it, he prayed the goddeſs Venus to procure for him a wife as beautiful as the ſtatue he had made. The goddeſs heard his prayer, and changed

changed the ſtatue into a fair damſel, by whom he had Paphus, the father of Cinyras. This Cinyras is ſaid to have poſſeſſed immenſe riches, inſomuch that "The wealth of Cinyras" became proverbial, for expreſſing an over-grown eſtate. As the worſhip of Venus was firſt eſtabliſhed in Cyprus by Paphus the father of Cinyras, both he and his deſcendants were buried in the temple of Venus at Paphos, an honour which was granted to no other family. The prieſthood of Venus was likewiſe entailed on their race, a dignity which they preſerved for many ages, after the throne was ſeized by others.

CINYRIA, in *Ancient Geography*, a town of the iſland of Cyprus, famous for the worſhip paid in it to Urania. It did not ſubſiſt in the time of Pliny.

CINYRUS, a mountain of Italy, placed in the Picenum.

CINZANO, in *Geography*, a town of Piedmont; 5 miles S.S.E. of Chivazzo.

CIOLI, Valerio, in *Biography*, a ſculptor of ſome eminence, who was born about the year 1530, at Settignano, a village near Florence, which, from its vicinity to ſome excellent quarries of ſtone, has at all times furniſhed a number of good ſculptors. Valerio was, in his infancy, inſtructed by his father, Simone Cioli, a ſculptor of ſome merit; but, at the age of 15, he was placed under Tribolo, an artiſt of conſiderable reputation, who at that time was employed in works of ſculpture and architecture by the duke Coſimo, at one of his villas near Florence.

Having ſtaid four years with Tribolo, he went to Rome, where he put himſelf under the tuition of Raffaello da Montelupo, one of the beſt imitators of the ſtyle of Michael Angelo; by whom he had indeed been employed in the execution of ſome of the ſtatues for the celebrated monument of Pope Julius II.

Having finiſhed his ſtudies, he was for ſome time employed to reſtore many of the ancient mutilated ſtatues; but he was afterwards choſen for a work which allowed greater ſcope to his abilities; it is the figure of Sculpture, who is repreſented in a diſconſolate attitude, weeping the loſs of the great Michael Angelo Buonaroti, and is one of three ſtatues which adorn his tomb in the church of St. Croce at Florence.

It is to be regretted, that a great part of the life of Cioli was ſacrificed in the execution of the ridiculous groteſque figures in the gardens of Boboli, which, though intended to ornament, are alone calculated to call forth ſentiments of pity or contempt, for the puerile and corrupt taſte which gave them birth. He died, aged upwards of 70, and left a ſon, Simone Cioli, who followed the profeſſion of his father, but who poſſeſſed ſmall talents. Gherardo Silvani was likewiſe his diſciple. Baldinuci, Dec. 1. della Par. 3. del. Sec. 4.

CION, in *Anatomy*, is ſometimes uſed for the uvula.

Cion, or Cyon, in *Gardening*, a young ſhoot, ſprout, or ſprig, put forth by a tree.

Grafting is performed by the application of the cion of one plant upon the ſtock of another.

To produce a ſtock of cions for grafting, planting, &c. the gardeners ſometimes cut off the bodies of trees, a little above the ground, and only leave a ſtump or root ſtanding; in this caſe the redundant ſap will not fail next ſpring to put forth a great number of ſhoots.

In dreſſing dwarf-trees, a great many cions are to be cut off. See Pruning.

CIONE, Orgagna (da) Andrea. See Orgagna.

CIONES, in *Antiquity*, a kind of idols very common, being only oblong ſtones, erected pillar-wiſe; whence alſo they had their name.

CIOS, Eskr, in *Ancient Geography*, a river of Thrace, the *Oeſeus* of Pliny, and thus denominated by M. D'Anville, had its ſource in the N.W. part of mount Rhodope, in the country of the Pæonians. It paſſed by mount Hæmus, near its middle, and, purſuing its courſe through the weſtern part of the Triballic plain, emptied itſelf into the Iſter, near one of the two towns which bore the name of Oeſeus.—Alſo, a river of Aſia Minor, in Bithynia, which watered a town of the ſame name, according to Pliny. The town called Cios, was ſituated, ſays Pliny, in the place called Aſcania of Phrygia. Pomponius Mela ſays, that it was ſeated at the bottom of a ſmall gulf, formed by the Propontis; it is called in Greek, "Glio," in Turkiſh, "Kemlik."

The town of Cios had been built, according to Ariſtotle, by Cios, who conducted thither a colony of Mileſians. Euſtathius ſays, that Cios was one of the companions of Hercules. The town was deſtroyed by Philip, father of Perſeus, and king of Macedonia, and its territory ſurrendered to Pruſias, king of Bithynia, who rebuilt it, and gave to it his own name, Pruſias.

CIOTAT, La, in *Geography*, a ſea-port town of France, in the department of the Mouths of the Rhone, and chief place of a canton, in the diſtrict of Marſeilles, ſeated at the bottom of a bay in the Mediterranean, in a country which produces delicious fruit, oil, and excellent wine. The harbour is in the form of a horſe-ſhoe, and defended with ſeveral forts; 4 leagues S.E. of Marſeilles, and 7½ S.S.E. of Aix. The place contains 5770, and the canton 8738 inhabitants; the territory includes 162½ kiliometres, and 4 communes. N. lat. 43° 10′. E. long. 5° 31′.

CIPHER, or Cypher, in *Arithmetic*, one of the numeral characters called figures, and formed thus 0. The word *cipher* is probably derived from the Hebrew ספר, *ſaphar*, *to number*. By the Italians it is written *Zifra*, by the French *Chiffre*, and by the Low Latins *Ciphra*. It is, therefore, more properly ſpelt cipher than cypher.

The arithmetical cipher by itſelf implies a privation of value, or nothing: but when diſpoſed with other figures, ſituated on its left, in common arithmetic, it ſerves to augment each of their values by tens; and in decimal arithmetic, it leſſens the value of each figure to the right thereof, in the ſame proportion. See the article Arithmetic.

A cipher alſo denotes a kind of enigmatical character, compoſed of ſeveral letters interwoven together, fancifully; which repreſent the initial letters of perſons' names, and are frequently uſed on ſeals, coaches, and articles of plate, or other moveables.

Formerly, when merchants and tradeſmen were not allowed to uſe armorial bearings, they had ciphers thus artificially compoſed in their ſtead; which moſtly conſiſted of the firſt letters of their names, curiouſly inter-twined about a croſs, &c. of which many inſtances remain on ancient tombs: but the cuſtom ſtill obtains among perſons of various ranks in life, as an ornamental device, eſpecially on ſeals, or carriages. This practice has, indeed, been increaſed of late, to avoid the annual tax of two guineas impoſed in Great Britain, on thoſe who paint their family arms upon carriages. See Heraldry.

Cipher, in *Diplomatic Affairs*, ſignifies an occult manner of writing, legible to thoſe only who poſſeſs the key or ſecret, and hence the term *Deciphering*, which ſignifies to explain what is written in *cipher*. We believe this art was ſo called from the early cuſtom of uſing arithmetical characters or figures, for the purpoſe of ſecret correſpondence; a practice ſtill very common in the courts of princes, and for the ſkilful management of which a decipherer is attached to the office of the ſecretary of ſtate for foreign affairs.

This art has been ſo much cultivated by the moderns, as to have acquired the importance of a diſtinct ſcience, and is called *cryptology*, *cryptography*, *polygraphy*, *ſteganography*, *&c.*

In the preſent article we ſhall touch upon all the parts of this ſcience, by whatever names they have been diſtinguiſhed, although it muſt be allowed that the term *cipher* is only applicable to private writing. When we conſider the noble and pre-eminent advantages of alphabetical writing, an art which ſo peculiarly diſtinguiſhes civilized ſociety from uncultivated barbarians, and the very gradual progreſs it is likely to have made towards a ſtate of perfection, we cannot reaſonably ſuppoſe the practice of writing in cipher was common in the remoteſt ages of antiquity. To communicate our thoughts at a diſtance, by means of arbitrary and viſible marks, was in its rudeſt form a vaſt effort of the human mind; and we muſt imagine that many centuries would elapſe, before writing was ſo perfect and univerſal as to render it neceſſary to adopt any more abſtruſe modes of concealment. See LETTERS, CHARACTER, and WRITING.

A general ſentiment has, indeed, prevailed among the literati, that the Egyptians invented hieroglyphics in order to hide and ſecrete their wiſdom from the vulgar; a miſtake, which the very learned biſhop Warburton, (Divine Legation, b. iv. § 4.) has ſufficiently confuted. Nay, we might with as good reaſon fancy the ancient picture-writing of the Mexicans, or the more refined hieroglyphical characters of the Chineſe, to have been contrived for the purpoſes of ſecrecy, and not for the diffuſion of knowledge! See the article HIEROGLYPHICS.

Letters were undoubtedly a much later invention than emblematical or ſymbolical writing; and, in their infancy, they muſt have been ſo puzzling as to appear endowed with an almoſt miraculous faculty. But, when this exquiſite contrivance had become familiar to the vulgar eye, and would no longer ſerve to conceal the myſteries of ſtateſmen, or the intrigues of deſigning ſubjects, the uſe of ciphers began to be foreſeen. The want of them was at firſt ſupplied by artifices of different kinds, but chiefly by newly conſtructed alphabets; which, being intended only for the uſe of princes, ambaſſadors, generals, and other public perſonages, were not diſcloſed to the world at large. Even ſo late as the time of lord chancellor Bacon, and in this free country, it was conſidered as an aggravation of earl Somerſet's crime to employ ſecret writing. "They made play," ſays lord Bacon, "of all the world beſides themſelves; ſo as they had ciphers and jargons for the king, queen, and all the great men, things ſeldom uſed but either by princes and their ambaſſadors and miniſters, or by ſuch as work and practiſe againſt, or at leaſt upon, princes." Bacon's Remains; Charge againſt the Earl of Somerſet.

It is too much to be lamented that, on ſome occaſions, diſaffected, treacherous, and ill-deſigning men have greatly abuſed this curious department of ſcience, by applying it to the baſeſt and moſt miſchievous purpoſes: but we aſk, Is this a reaſon againſt uſing or divulging it? Is it a ſufficient plea for ſuppreſſing all we know on the ſubject, and endeavouring to ſtifle our knowledge, leſt it ſhould chance to be perverted? Would not a ſimilar argument hold good for preventing the uſe of the preſs itſelf, and even for deſtroying books altogether? What uſeful thing has not been abuſed? And if this art ſhould be turned to any purpoſe ſubverſive of ſociety, we have laws and magiſtrates to puniſh the offenders. It has been well obſerved by biſhop Wilkins, (in his "Mercury, or The Secret and Swift Meſſenger,") that "nothing hath occaſioned more troubles and contention than the art of writing, which is the reaſon why the inventor of it is fabled to have ſown ſerpent's teeth; and yet it was but a barbarous act of Thamus, the Egyptian king, therefore, to forbid the learning of letters. We may as well cut out our tongues, becauſe that member is *a world of wickedneſs!* If all thoſe uſeful inventions that are liable to abuſe, ſhould, on that account, be concealed, there is not any art or ſcience which might lawfully be profeſſed."

The authors who have written either formally or incidentally on the ſubject of ſecret-writing, are by no means few in number; but they are not often conſulted, nor always very eaſy to be met with; and it is ſurpriſing to find how ſeldom they are quoted by writers on bibliography and general literature. In the laſt edition of the Encyclopædia Britannica, and in the article *Chiffres* of the large French Encyclopédie (Departm. Diplomat. tom. i. part ii. p. 538.) mention is made of only three or four (and theſe not the principal) authors; ſo that we conceive it may be intereſting to point out thoſe who have moſt diſtinguiſhed themſelves in this ſcience, at different periods, and in various nations. We ſhall, however, attempt to compreſs our hiſtorical remarks into as narrow a compaſs as poſſible.

The art of correſponding by viſible ſigns may be ſuppoſed to have exiſted before the introduction of writing, and might have been practiſed by geſtures or motions of the body; ſince infants are able to expreſs themſelves in this way, before they have acquired the faculty of ſpeaking: but, whether or not the practice of holding ſecret information by ſigns of this nature, was carried to any great extent by the ancients, we are unable to ſay. Ovid takes notice of the art of diſcourſing thus, in the lines following:

> "Verba ſuperciliis ſine voce loquentia dicam.
> Verba leges digitis, verbaque vultus habet."

And again:

> "Sæpe tacens vocem, verbaque vultus habet."

Schottus, in his "Steganographia," exhibits an arthrological alphabet in Latin and German; alſo Mr. Falconer, in his "Cryptomenyſis Patefacta," and Bp. Wilkins in his "Mercury" chap. xiv. have given us a ſimilar one in Engliſh.

As to the art of diſcourſing with the fingers, named dactylogy and cheirology, it has been often commended for its antiquity: ſince the ancients uſed to expreſs any number under 100 by the fingers of the left hand; and above 100, and under 1000, by thoſe of the right hand. Moreover, Pierius has particularly deſcribed their methods of reckoning from 1 to 9000: and hence Juvenal ſays,

> "Rex Pylius, magno ſi quicquam credis Homero,
> Exemplum vitæ fuit à cornice ſecundæ,
> Fælix nimirum, qui tot per ſæcula vitam
> Diſtulit, atque ſuos jam dextra computat annos."

To employ this manœuvre for the purpoſes of ſecrecy, Schottus has afforded us another alphabet; and ſo likewiſe has the celebrated George Dalgarno, in his "Didaſcalocophus," p. 74, who diſtinguiſhed himſelf in the reign of Charles II., by an endeavour to introduce an univerſal character and philoſophical language.

Among the ſigns for nightly information at a diſtance, thoſe by fire are extremely common, and have been uſed by the Chineſe, Perſians, and other nations, in the remoteſt times. This ſpecies of communication is affirmed by Diodorus Siculus to have been practiſed by Medea in her conſpiracy with Jaſon, which carries us back three thouſand and ſeventy years; and although there muſt be ſome uncertainty on this queſtion, Pliny, in his "Hiſtory," lib. vii. cap. 56, ſays it originated with Sinon. "Specularem ſignificationem Trojano bello Sinon invenit." This was the ſignal upon which Sinon agreed to unlock the wooden horſe, in the ſiege of Troy, about 1184 years before Chriſt:

> " ——— Flammas cum regia puppis
> Extulerat ————————."
> Virgil, Æn. lib. ii. 256.

And, after the taking of Troy, Æſchylus relates, that Agamemnon immediately apprized his queen, Clytemneſtra, of that event by a ſimilar method; which, we ſuppoſe, muſt have been done either by men placed at certain diſtances with lighted torches, which they held up in ſucceſſion, or by a conſiderable number of fires on the tops of hills, denoting the ſimple fact previouſly agreed on between the parties. See Onoſander's Strategicus, cap. 25, where this practice is deſcribed.

The fire-ſignals of the Greeks and Romans are alſo ſlightly mentioned by Quintus Curtius, Livy, Cæſar, Herodotus, Homer, and Thucydides; likewiſe by Vegetius and Frontinus; but ſtill more in detail by Polybius, and Æneas Tacticus; the latter of whom was contemporary with Ariſtotle, and has left a valuable fragment on the duties of a general, (tranſlated into Latin by Caſaubon,) wherein are many curious remarks on the ſubject of ſecret correſpondence. The Greek ſignals were much improved by Polybius, who, in his hiſtory (Lib. x. cap. 45. p. 296. tom. iii. Lipſ. 1790. edit. Joh. Schweighaeuſer) attributes the invention to Cleomenes and Democritus, or (more correctly) to Cleoxenus and Democlitus, in words thus rendered: " Poſtrema ratio, cujus auctores ſunt Cleoxenus & Democlitus, ſed quam nos correximus, certa definitaque eſt, adeo ut quidquid exortum fuerit negotii, id poſſis certo facere notum." Prior to that period, the information communicated by torches, flags, ſmoke, or otherwiſe, was very limited, and it was requiſite to ſettle beforehand, what each ſignal ſhould mean; whereas Polybius ſhewed, how to correſpond alphabetically, and to give or receive any ſpecies of intelligence, without this previous concert. The plans of Æneas Tacticus had never arrived at ſuch perfection, and were therefore of comparitively ſmall uſe; though, without doubt, he at leaſt equalled any of his predeceſſors in the facility of his telegraphic communications. Vid. Polyb. L. x. ſub finem.

Polybius has detailed the peculiar invention of Æneas; which conſiſted of a narrow earthen veſſel, filled with water, and having a tube or aperture to let off the fluid: a piece of ſtick is then to be thruſt through a cork, ſo as to float above the ſurface, when it is put into the water; and the upper part of this ſtick is to be marked by ſubdiviſions, of three inches each, upon which are to be written ſuch common events as happen in war. When the water is drawn off from any of theſe veſſels, which muſt agree exactly in ſize, &c. it is evident that the ſticks will ſink lower as the veſſels become empty; ſo that on obſerving the ſpace through which the ſticks deſcend, the correſpondents may (by the help of a ſimilar apparatus) tell which of the expected events has occurred. But Polybius, finding this contrivance adapted only for thoſe few occurrences which had been previouſly written on the ſticks, deſcribes his own method, which was far ſuperior.

We are told, however, that Æneas Tacticus collected together about twenty different modes of writing, which could only be underſtood by perſons who were in the ſecret; part whereof were his own, and part of them invented by others; ſo that this author ſeems to have been well verſed in the art of ſecret correſpondence, as it then exiſted among the ancients.

We ſhall hereafter have occaſion to notice ſome of the ſecret modes of writing recorded by Æneas; but, it will firſt be proper to explain and illuſtrate the telegraphic invention of Polybius himſelf, which is as follows:

Divide the letters of the Greek alphabet, into five parts, each of which will conſiſt of five letters, except the laſt diviſion, which will have only four. Let theſe be fixed on a board in five columns. The man who is to give the ſignals is then to begin by holding up two torches, which he is to keep aloft till the other party has alſo ſhown two. This is only to ſhow that both ſides are ready. Theſe firſt torches are then withdrawn. Both parties are provided with boards, on which the letters are diſpoſed as formerly deſcribed. The perſon then who gives the ſignal is to hold up torches on the left, to point out to the other party from what column he ſhall take the letters as they are pointed out to him. If it is to be from the firſt column, he holds up one torch; if from the ſecond, two; and ſo on for the others. He is next to hold up torches on the right to denote the particular letter of the column that is to be taken. All this muſt have been agreed on before-hand. The man who gives the ſignals muſt have a dioptrical inſtrument (διοπτρον), conſiſting of two tubes, and ſo placed as that, by looking through one of them, he can ſee only the right ſide, and through the other only the left, of him who is to anſwer. The board muſt be ſet up near this inſtrument; and the ſtation on the right and left muſt be ſurrounded with a wall (παραπεφραχθαι) ten feet broad, and about the height of a man, that the torches raiſed above it may give a clear and ſtrong light, and that when taken down they may be completely concealed. Let us now ſuppoſe that this information is to be communicated—*A number of the auxiliaries, about a hundred, have gone over to the enemy.* In the firſt place, words muſt be choſen that will convey the information in the feweſt letters poſſible; as, *A hundred Cretans have deſerted,* Κρῆτες εκατον αφ' ημων ηυτομολησαν. Having written down this ſentence, it is conveyed in this manner. The firſt letter is a κ, which is in the ſecond column; two torches are therefore to be raiſed on the left hand to inform the perſon who receives the ſignals to look into that particular column. Then five torches are to be held up on the right to mark the letter κ, which is the laſt in the column. Then four torches are to be held up on the left to point out the ρ (*r*), which is in the fourth column, and two on the right to ſhow that it is the ſecond letter of that column. The other letters are pointed out in the ſame manner. Such were the Φρύκτοι or Πυρσεια recommended by Polybius.

As this contrivance deſerves particular attention, and throws great light on a common mode of writing by cipher, we ſhall here attempt to give a further elucidation of it, by another example and a diagram.

Diſpoſe the letters into five rows or columns; place a figure over each of them, and another by the ſide of the five lines: but inſtead of q, let κ be its ſubſtitute: Thus,

1	2	3	4	5	
a	f	k	p	v	1
b	g	l	r	w	2
c	h	m	ſ	x	3
d	i	n	t	y	4
e	j	o	u	z	5

Provide ten torches, and let ſo many be held up towards the right hand as may denote the row in which the letter required is to be found; likewiſe ſo many on the left hand as ſhall point out the place of the ſame letter, reckoning from above. Proceed in this operation, till you have completed the word or ſentence to be communicated, as in the underwritten example; where the firſt figure in each pair ſhews the row, and the ſecond denotes the order of the letter. which being duly performed, the ſpectator will receive the following information:

52 . 15 . 41 . 15 . 42 . 24 . 43 . 23 . 12 . 54 . 21 . 11.
w e p e r i ſ h b y f a

33 . 24 . 34 . 15 . 11 . 34 . 14 . 14 . 24 . 43 . 15 . 11.
m i n e a n d d i ſ e a

43 . 15.
ſ e

An intelligent reader will perceive that five lights might do, for the purpoſe of repreſenting theſe five differences, as well as the ten; nay better, only taking care to pauſe ſufficiently after every ſeparate elevation of the torches, whether to the right or left hand. It is worthy of remark, that this very principle for diſtant communication has been recently adopted, in the conſtruction of a day-telegraph at the Admiralty! Although in the latter there are ſix ſigns for the purpoſe of repreſenting figures as well as letters. (See the articles Signals and Telegraph.) But we have advanced enough to ſhew that the ancients, 2000 years ago, knew how to maintain ſecret correſpondence by ſignals. We ſhall next prove that they were alſo acquainted with ſeveral means of *writing by cipher*; although it muſt be confeſſed, that the moderns have greatly improved upon their inventions of this kind.

Le Sieur Guillet de la Guilletiere, in his "Ancient and Modern Lacedemon," endeavours to ſhew that the Spartans were the inventors of writing in cipher; and that their Scytalæ were the firſt rudiments of this art. We ſuppoſe he has taken his account of the σκυτάλη from Plutarch: but as ſeveral modes of ſecret writing mentioned by Æneas Tacticus are entirely different from this, it by no means follows that thoſe of Æneas were ſuggeſted by the former; nay, we are diſpoſed to think, with Scaliger, that a little attention might have developed this cipher with eaſe.

The nature and uſe of the *Scytale*, according to Plutarch, in his life of Lyſander, was this: When the Grecian magiſtrates ſent out an admiral or a general, they prepared two cylindrical pieces of wood with ſo much exactneſs, that they were perfectly equal both in length and thickneſs. One of theſe they kept themſelves, and the other was given to the military officer then employed. When they had any ſecret and important orders to communicate to him, they took a long narrow ſlip of parchment, and rolled it round their own ſtaff, in a ſpiral form, one fold cloſe to another, and then wrote their communication upon the edges of the parchment. This done they took off the ſcroll, and ſent it to the commander; who, on receiving it applied it to his ſtaff, ſo that the broken and imperfect characters now became legible. The parchment as well as the ſtaff was called σκυτάλη. As this contrivance was had recourſe to by the Athenians and Lacedæmonians, in the time of Alcibiades, Pharnabazus, and Lyſander, we are certain it was invented at leaſt four centuries earlier than the Birth of Chriſt.

Although this confuſed ſort of writing, as it would appear upon the unrolled ſlip of parchment, is not a ſufficient ſecurity againſt detection in the preſent ſharp-ſighted age, there are other means of ſecret writing which even Scaliger's eyes (as biſhop Wilkins obſerves in his "Mercury") could not diſcover; "and therefore it was too inconſiderate and magiſterial a ſentence of him, thence to conclude all this kind of learning to be vain and uſeleſs. It is certain," adds the biſhop, "that ſome occaſions may require the exacteſt privacy; and it is as certain, that there may be ſome ways of ſecrecy, which it were madneſs for a man to think he could unfold;" in which opinion he is ſupported by Vegetius, Baptiſta Porta, and lord Bacon, as well as by ſeveral more recent judges; ſo that Scaliger ſhewed greater ſelf-confidence than ſkill, in pretending he could decipher any writing that might be invented. The author of the preſent article (who has only taken up this ſubject as an amuſement) challenges all the Scaligers in Europe to explain various kinds of cipher he has recently contrived, and which elude every rule laid down by his predeceſſors.

The learned Mr. Falconer, and ſome earlier writers on cryptography, have attributed the invention of the Lacedæmonian ſcytale to Archimedes the mathematician; but we have already afforded the reader evidence of its uſe in the days of Alcibiades, Pharnabazus, and Lyſander, who lived nearly two centuries prior to the time of Archimedes; and Plutarch does not ſpeak of this invention as *new*, or as being uſed by the Greeks alone, at that early period. See Plutarch, in his lives of Alcibiades and Lyſander.

We next deſcend to the age of Ariſtotle, about 350 years before Chriſt, when the art of ſecret writing ſeems to have aſſumed a more regular and ſyſtematic form; but the authors of that age and thoſe following, whoſe works have deſcended to poſterity, are ſo few and imperfect as to throw only a faint light on the object of our inquiry. We are ignorant of what was done by Julius Africanus, Laertius, and Philo-Mechanicus, three ancient Grecians, who treated on this ſubject. Æneas Tacticus, and Polybius, are our principal guides; the former of whom was contemporary with Ariſtotle: (vide "Æneæ Vetuſtiſſimi Tactici Commentarius, De tolerandâ Obſidione, Caſaubono interprete," 1610, 8vo.)

Æneas is ſaid by Polybius, to have collected and invented a great number of ſecret modes of correſponding; and among them, we imagine, are included thoſe few which he has briefly recited in the above named work. He ſeems to have approved eſpecially of affixing ſmall dots to the letters of any book or epiſtle, written upon a common ſubject, in ſuch a way as only to denote the characters expreſſive of the ſecret ſentiment, all the reſt being non-ſignificant. He alſo recommends the ſubſtitution of points inſtead of vowels, and gives the two following ſhort ſpecimens:

D :· :: N ::: S :·::· S P ::· L C H ·· R, which ſignifies Dionysius Pulcher.

H ·· R · C L :· D ·· S V ·· N :· T ::· which ſtands for the words Heraclides Venito.

This mode may be varied indefinitely; for it is of no importance what arrangement or number of points is ſubſtituted for the vowels; and, although we cannot ſay this is very difficult to decipher, it nevertheleſs demonſtrates the fact of ſecret writing being employed in thoſe remote ages. The ſame author likewiſe mentions the artifice of paſſing a thread through holes in a board or tablet, correſponding with the twenty-four Greek letters; which Guſtavus Selenus (an aſſumed name of the duke of Brunſwick and Luneburg), who publiſhed a folio book on cryptography, A.D. 1624, has therein deſcribed more at large. The order of the threads, expreſſing the alphabetical characters, previouſly ſettled by compact, will repreſent any words we pleaſe.

There is a great affinity between this method, and that of tying knots upon a ſtring at various diſtances from each other, ſo as to agree with a determinate meaſure, graduated for the purpoſe. Few people would ſuſpect any private news or treachery to lie hidden in a piece of knotted thread. Biſhop Wilkins has farther illuſtrated this device, in the 5th and 11th chapters of his "Secret and Swift Meſſenger;" and we have given a repreſentation upon *Plate* II. *fig.* 1. of the graduated meaſure alluded to, with knots tied upon the thread oppoſite to the letters F, L, Y, from which any perſon may learn how to put this plan into execution.

The ſame effect will be produced if, in lieu of the knots, the thread be marked with ink at the proper intervals oppoſite each letter; or, if the tablet, or the meaſure, be applied to paper, and dots are impreſſed upon it under the holes or ſubdiviſions which ſtand for the reſpective letters. The ancients have laid down the principle, which is thus eaſily varied in practice; but the merit of this invention belongs to them rather than to the moderns.

Æneas was acquainted with many other modes of occult writing beſides theſe, ſome of which are alluded to in his Poliorceticus, § xxxi. but the greater number are wholly loſt. And it is truly ſurpriſing, that theſe methods of correſpondence ſhould not have been more univerſally carried into effect by ſucceeding generations, ſo as to have prevented the loſs of them! Surely the telegraphic apparatus of Polybius, with five or ten flambeaux, might have been employed and improved upon, for the moſt important military or national purpoſes; and yet the moderns ſcarcely have dreamed of uſing any ſuch means of alphabetical communication till the preſent age! How obvious it ſeems, that this contrivance of Polybius, with ſome variation in the materials, ſhould be deemed at leaſt as applicable for daily uſe, as it was found to be for nightly obſervations! And, how numerous are the ſpecies of ciphers which a man of common ingenuity would extract from the principles ſuggeſted for ſecret writing in Æneas's little treatiſe!

He likewiſe deſcribes ſeveral ways of fraudulently conveying intelligence into a beſieged town, &c. For example, by the application of a manuſcript to a ſore leg, inſtead of a plaiſter or bandage;—by ſewing up an epiſtle within the ſole of a perſon's ſhoe, or hiding it under the arm-pit;—rolling thin leaves of lead into the form of ear-rings, &c. after having written thereon;—putting a bladder into a bottle of oil, firſt inſcribing upon it, and inflating it ſo as to fill the bottle completely;—or writing on a tablet, and afterwards covering it over with melted wax;—to which are added ſome other ſingular propoſals, ſhewing the fertility of invention exerciſed by the ancients on ſuch occaſions.

But the ſtrangeſt contrivance was that of Hyſtiæus, mentioned by Herodotus; who, while at the Perſian court, ſent to Ariſtagoras in Greece, a ſervant affected with bad eyes, pretending that his hair muſt firſt be ſhorn, and his head ſcarified; in performing which, Hyſtiæus imprinted his ſecret intention, in legible characters, upon the ſervant's head, and kept him in cloſe confinement till the hair grew; when he deſired him to travel to Ariſtagoras for a perfect cure, who, on the man's arrival, repeated the ſhaving, and thus obtained the ſecret information tranſmitted by means of the ignorant meſſenger.

As a meſſage may be concealed by adopting any arbitrary marks, (for inſtance the dots of Æneas) inſtead of letters, ſo likewiſe by changing their powers, and ſubſtituting one character for another; which is ſaid to have been practiſed in that kind of cabbaliſm which the Jewiſh rabbies call צירוף, or combination. Biſhop Wilkins has cited examples of this ſort among the Hebrews; and it was alſo practiſed among the Romans, as Suetonius relates of Julius Cæſar and Octavius Auguſtus; the former of whom wrote the fourth letter inſtead of the firſt, *i. e.* D for A, the fifth for the ſecond, the ſixth for the third, &c. &c.; and Auguſtus wrote after the ſame method, only by putting the ſecond for the firſt, and the third for the ſecond, *i. e.* B for A, C for B, D for C; which confounds the general appearance of the writing, but is not ſufficiently intricate to eſcape the ſcrutinizing eye of a modern decipherer. However imperfect and inadequate this ancient mode may be, it is quite as good as three-fourths of thoſe ciphers which the principal courts of Europe truſted to, until after the ſixteenth century! It is a matter of indifference, whether we change the powers of the letters, or invent a new-formed alphabet for ſecret writing; as the ſame rules for deciphering one of them will equally well apply to the other. And yet we find, for many centuries after the Auguſtan age, that kings and ambaſſadors contented themſelves with only changing the form of their alphabets, as if this were any ſecurity againſt detection! It demonſtrates how little men addicted themſelves to this ſubject as a SCIENCE, while they felt an indiſpenſable neceſſity for having recourſe to it as an ART.

We do not indeed affirm, that there is ſo much reaſon now to complain of the negligence of princes and ſtateſmen in this reſpect, as there was formerly; but we are in poſſeſſion of certain facts, which ſhew that the words of lord chancellor Bacon are not entirely inapplicable to our own times, viz. "If the ciphers in uſe were good and truſty, ſeveral of them would abſolutely elude the labour of the decipherer; and yet remain commodious enough, ſo as to be readily wrote and read; but through the ignorance and unſkilfulneſs of ſecretaries and clerks, in the courts of princes, the moſt important affairs are generally committed to weak and treacherous ciphers." We have much cauſe to doubt, whether any court in Europe, even at this time (1807), can lay claim to a cipher, having the three eſſential properties required by lord Bacon; "1ſt, That it be eaſy to write and read; 2d, That it be truſty and undecipherable; 3d, That it be clear of ſuſpicion." But we refrain from divulging all we believe on this delicate topic:—*Verbum ſapienti ſat eſt.* It may be ſaid, that no individual ought to diſcloſe an inſcrutable cipher, unleſs he is compelled by imperious circumſtances.

The practice of tranſpoſing the ordinary letters of the alphabet, to perplex the reader, was not only reſorted to by the Romans, but alſo by the Greeks, Syracuſans, Carthaginians, and perhaps by other enlightened nations. The ancient Gauls, Saxons, Normans, &c. uſed more commonly to employ new and uncouth alphabetical characters for ſecret writing; many examples of which were collected by Trithemius, and the other ſyſtematic authors on polygraphy, in the 15th and 16th centuries.

But the method of repreſenting whole words or ſyllables by arbitrary marks, ſaid to have been firſt introduced by the old poet Ennius, was much more perplexing, and was encouraged by Mæcenas, Cicero, Seneca the elder, Philargirus, Fannius, Aquila, and Tyro: thouſands of theſe ſyllabic characters may be ſeen in Valerius Probus, Paulus Diaconus, Goltzius, and (in 200 folio pages) at the end of Gruter's Inſcriptions.

Although thoſe Tyronian characters, as they are uſually named, were not alphabetical, we obſerve among them a great many bearing a conſiderable reſemblance to each other, when they denoted words beginning or ending with the ſame Latin particles; ſo that this kind of ταχυγραφια, or βραχυγραφια, was not compoſed entirely at random, but according to ſome preconceived ſyſtem.

The Tyronian *notæ*, we are told by literary perſons, were augmented in the time of Seneca to the number of thirteen thouſand! And ſo completely did they anſwer the purpoſe of ſecret writing during the monkiſh ages, that an old copy of a pſalter, found inſcribed with theſe characters, was ignorantly entitled "Pſalterium in Lingua Armenica." Nay, pope Julius II. employed learned men, without ſucceſs, to decipher them.

Herman Hugo, in his work "De Origine Scribendi," maintains an opinion of this writing having been uſed among the ancient Hebrews, and that it is alluded to in Pſalm xlv. 1, and Daniel v. 25; but this needs further evidence, and is no better ſupported than the opinion ſome men hold of Engliſh ſhort-hand, which is alphabetical, having originated from the Tyronian characters, which are not alphabetical.

Another ancient ſort of writing employed among the Romans more than any nation beſides, was that of abbreviating words or ſyllables, by omitting the final letters, and ſometimes placing points or daſhes in their ſtead. Theſe ſiglæ, as they were called, from the word ſigillæ, uſed to be chiefly inſcribed on ſtatues, arms, coins, public records, monuments, &c. for the ſake of brevity, rather than of ſecrecy; and, therefore, do not particularly come under our conſideration in the preſent article, although moſt authors upon Cryptography have taken notice of the SIGLÆ. (Vide Waltheri Lexicon Diplomaticum, 1752, and Gerrard's Siglarium Romanum, 1792.)

To bring theſe hiſtorical remarks towards a concluſion, we ſhall now refer to the chief modern writers on the ſubject of *ciphers,* whoſe names have come to our knowledge; ſome of whom, indeed, have treated more formally and copiouſly on the art of ſecret-writing than others, but all of them deſerve mention, and may be conſulted with advantage. We prefix an aſteriſm * to the names of a few authors who, in our judgment, have principally diſtinguiſhed themſelves, and merit an attentive examination.

The firſt writer among the moderns, and the man who may be ſaid to have led the way in ſecret writing, for we have no work of any importance before his time, was the * Abbé Trithemius, a Benedictine, whoſe erudition and acumen were ſuch, that he was ſuſpected of magical practices in the exerciſe of this art. He compoſed two extenſive treatiſes; one of which, entitled "Polygraphia," was publiſhed in the year 1499, but the other, called "Stenographia," was not printed during his life. He alſo made ſome progreſs towards the completion of a third work at the inſtigation of the emperor Maximilian. His "Polygraphia" was tranſlated into the French language by Gabriel de Collange, during the year 1561; but, prior to its appearance, three other authors had written on this topic; viz. Palatino, in 1540, Bellaſo, in 1553, and Glauburg, in 1560: and in the year 1563, the public were preſented with another original treatiſe, by * Baptiſta Porta, an author of conſiderable merit. Nearly about the ſame period, this ſubject was handled by Cardanus and Bibliander; afterwards by * Blaiſe de Vigenere, Walchius, Iſaac Caſaubon, * Schottus, * Guſtavus Selenus, Gerrard Voſſius, Herman Hugo, Schwenter *alias* * Hercules à Sunde, Wecker, Niceron, * Lord Bacon, Caſpi, Seeländer, * J. Balthaſar Friderici, Comiers, Baſaccioni, La Fin, Dalgarno, Becher, Hilier, * Biſhop Wilkins, J. Nicholaus, Buxtorff, Caramuel, Wolfgang, * Falconer, Horſley, P. Crinitus, Erneſt Eidel, J. Geſory, J. C. Amman, Ozanam, * Breithaupt, * Conradus, Dutton, Davys, Ware, Graveſande, Twiſs, De Vaines, Caſpi, Carpentier, Biſhop Warburton, Staniſlaus Mink, Lucatello, Kircher, Paſchius, Morhof, * Thickneſſe, Hutton, Hooper, Aſtle: to whom ſhould be added the mathematician * Dr. Wallis, whoſe valuable MSS. on this ſubject are depoſited in the Bodleian library; and the celebrated Marquis of Worceſter, whoſe unpubliſhed performance, written A. D. 1659, may be ſeen in the Harleian library, No. 2428. We have named the unedited works of theſe two Engliſhmen, becauſe Dr. Wallis's papers have been often quoted or referred to by authors, and ſome of them, indeed, have been printed ſince his death; and becauſe the Marquis of Worceſter's "Centurie of Inventions," § 3d and 4th, contain an evident alluſion to the ſubject of the above MS. which was not diſcovered to be his lordſhip's, until we lately recognized and verified it at the Britiſh Muſeum.

Several authors who have treated largely on diplomatic affairs, likewiſe give ſome account of writing by cipher; among whom we ought eſpecially to notice the editors of the "Nouveau Traité de Diplomatique," tome iii. p. ii. §. iv. ch. x. and the article CHIFFRES in the Encyclop. Method:—"Economie Politique et Diplomatique." But, we confeſs, that our expectations have been ſometimes diſappointed in works of that nature; for where we hoped to find the ſcience handled moſt learnedly and copiouſly, we have found only meagre and trifling obſervations.

This remark alſo applies to what is written, or rather ſtolen, upon the ſubject of cipher, in the ſucceſſive editions of the Encyclopædia Britannica; wherein we find merely a long extract from Dr. Hooper's "Recreations," without acknowledgment, or any attempt at improvement! That article might, perhaps, be well enough adapted for the purpoſe it was originally deſigned, viz. as a "recreation" for ſchoolboys; but cannot be regarded as an ornament to the great national work, into which it has been ſurreptitiouſly tranſplanted.

Lord Bacon refers the practice of writing by cipher to the art of grammar, noting it as a deficient branch of knowledge; and, in reference thereto, it is treated by moſt of thoſe authors who have written on grammar; "that art," ſays biſhop Wilkins, "in its true latitude, comprehending all the ways of diſcourſe, whether by ſpeech, or by writing, or by geſture, together with the ſeveral circumſtances pertaining to them. So that, beſides the uſefulneſs of this ſubject" (viz. ciphering) "for ſome ſpecial occaſions, it doth alſo belong unto one of the liberal arts." Now, among "the ways of diſcourſe" which have been greatly improved and new-modelled of late years, we ought to mention the art of correſponding by *ſignals at ſea;* an art which the moderns have carried to ſo great a pitch of excellence, that naval officers, in different ſhips, can diſcourſe with each other on almoſt any topic of importance relative to their military duties. We ſhall here add only a few words concerning naval ſignals, as this topic will be hereafter diſcuſſed at large in a ſeparate article. See SIGNALS.

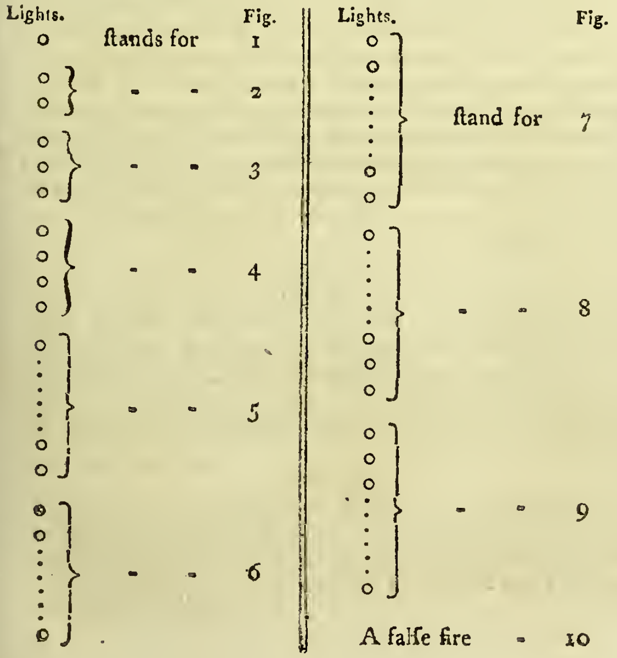
Whether the renowned ſea-officers of ancient Greece and Rome had a ſyſtem of ſignals analogous to that of Polybius by land, is a queſtion which we want evidence to reſolve; but we are not without proofs of their uſing ſome ſort of ſignals, however ſimple and inadequate we might now account them. Thus, we read when Ægeus ſent his ſon to Crete, that it was determined to diſplay a white flag if the ſhip conveyed back Theſeus in ſafety; and in the hiſtory of the Punic wars, mention is often made of certain rude methods of correſpondence; beſides which, Ammianus Marcellinus ſpeaks of the *vexillarii* and *ſpeculatores,* and ſome of the ancient coins repreſent both flags and ſtreamers. Again, there is a direct alluſion to ſignals on ſhip-board, by Virgil, Æn. iii. 519.—

> "Poſtquam cuncta videt cœlo conſtare ſereno,
> Dat clarum è puppi ſignum."

Alſo in Æneid ii. 255. before quoted; which implies that Agamemnon from his ſhip, and Sinon from the citadel, gave ſignals mutually to each other, whereby they were enabled to co-operate. But probably theſe methods were as different from the ſignals by which the operations of modern navies are regulated, as the Chineſe hieroglyphics are different from our alphabetical characters. It was eaſy to erect a flag, diſplay a torch, or blow a trumpet; but to multiply and combine theſe or ſuch like ſignals by ſea, ſo as to form letters, words, and ſentences (either immediately or through the intervention of numbers) was a ſcience to which the ancients ſeem not to have attained.

From the inceſſant changes of poſition in ſhips at ſea, it is impoſſible to put in execution the ſame means of conveying intelligence as we have adopted by land; and, beſides this difficulty, the ſpace which can be ſpared for the diſplay of flags by day, and lights in the dark, is exceedingly limited on ſhips under ſail. The principle, therefore, by which naval communications are chiefly governed, conſiſts in the repreſentation of arithmetical numbers; for which purpoſe ten or twelve different flags, &c. are ſufficient, and fewer than ten would be inconvenient. (See the "Telegraphic Signals, or Marine Vocabulary," printed by Sir Home Popham in 1804, for the uſe of the Eaſt India captains.) By the artful combination of a few pendants or flags, naval officers can thus deſignate ſeveral thouſand figures, words, and ſentences, which are entered in oppoſite columns for the ſake of eaſy reference; and by night they can exhibit lanthorns, blue-lights, falſe-fires, or rockets, with the occaſional report of guns, in ſuch a way as to keep up a regular correſpondence. The lights diſplayed for ſignals in the dark, muſt always be arranged perpendicularly, to avoid any apparent change of their relative poſition, when viewed from ſeveral ſhips at a time.

For example: a ſingle light will repreſent 1; two, three, and four lights, placed vertically, may repreſent 2, 3, and 4; three lights over each other, two of which are placed at a certain diſtance below, and the upper one thrice as far above them, will denote figure 5; three perpendicular lights, reverſing the laſt order, may ſtand for 6; four lights, the two at each extreme being at a common diſtance, and a triple ſpace between the middle two, will repreſent 7; four lights, the three lowermoſt ones at a common diſtance, and the upper thrice as far, will ſignify 8; four lights, the three uppermoſt at a common diſtance, and the lower one at a triple diſtance, may denote 9; a falſe-fire, or a blue light, will ſtand for 0 or 10; and by the ſucceſſive exhibition of theſe, as they are wanted, any number of figures, denoting particular inſtructions or communications, can be made with the utmoſt certainty and preciſion. To render this example more clear, we ſubjoin the reſpective ſituations of the lights as deſcribed above: viz.



The greateſt impediment in executing this plan, will be the proper adjuſtment of the lights, ſo that they may be diſtinctly perceived. They ſhould be placed at leaſt fifteen or twenty feet apart; and the beſt ſituation for the ſignals repreſenting 5, 6, 7, 8, 9, will uſually be to hoiſt the upper lamp or lamps at the mizen-peak, and the lowermoſt at the enſign ſtaff: but if thoſe ſituations ſhould not be viſible from the other ſhips, let the upper lamps be hoiſted to one of the maſts'-head, and the lower ones to the ſhrouds of the ſame maſt.

By this method, then, it appears that only four lamps are ſufficient for nightly communications at ſea; and upon ſhore, or when a ſhip lies quiet at anchor, a ſtill ſmaller number of ſignals would be adequate to every exigency, as we ſhall evince preſently. Some laudable endeavours have been made to diſtinguiſh the lamps by different coloured glaſſes: but, at a great diſtance, theſe colours could not be diſcriminated with certainty, or the lights have been too feeble when ſeen through denſe glaſſes; in conſequence of which this project has wholly failed of ſucceſs, and can never be revived, except by mere ſpeculators.

Another mode of correſponding by *cipher*, (for all theſe modes come under this general denomination,) is by ſtriking on two or three bells of various ſizes; or by as many different kinds of audible ſounds of any other ſort, ſuch as, 1, a drum; 2, a fife; and, 3, a trumpet. We prefer to uſe three, for alphabetical purpoſes, which may be combined as follows, ſo as to repreſent each letter.

A	is repreſented by	111	N	is repreſented by	222
B	- -	112	O	- -	223
C	- -	113	P	- -	231
D	- -	121	Q	- -	232
E	- -	122	R	- -	233
F	- -	123	S	- -	311
G	- -	131	T	- -	312
H	- -	132	U	- -	313
I	- -	133	V	- -	321
J	- -	211	W	- -	322
K	- -	212	X	- -	323
L	- -	213	Y	- -	321
M	- -	221	Z	- -	322
			Blank, or Nothing	—	333

It muſt be remembered, that the three different ſounds ſtand for only one letter; and that a ſufficient pauſe muſt intervene after each letter, in order to prevent any confuſion. To keep an exact memorandum of this cipher, it will be neceſſary for the auditor to write either the figures, as above, or three alphabetical characters inſtead of them: for inſtance, D for drum, F for fife, and T for trumpet; but, in the uſe of three flags, ſuppoſe red, blue, and white, the letters R, B, and W, would be ſubſtituted.

This method of alphabetical notation is greatly preferable to the uſe of only two ſignals, becauſe it is more diſtinct and eaſy to remember; whereas, if we uſe but two ſigns, they muſt be often repeated, and combined for each letter, (*i. e.* at leaſt five times) as in the cipher of which the following is an example:

A	B	C	D	E	F	G
11111,	11112,	11121,	11122,	11211,	11212,	11221,
H	I	J	K	L	M	N
11222,	12111,	12112,	12122,	12211,	12212,	12221,
O	P	Q	R	S	T	U
12222,	21111,	21112,	21121,	21122,	21211,	21212,
V	W	X	Y	Z	Nothing	
21221,	12121,	22212,	22221,	22122,	21222	

From the preceding alphabets may be ſeen how diſtinctly any perſon can expreſs his mind by two or three ſignals, addreſſed either to the eye or the ear; and in correſponding with theſe ciphers, it will be found very convenient to interpoſe the 333, or 21222 (which denotes a blank) between every word, in order to prevent the confuſion that might ariſe from an accidental error. The effect will be the ſame, whether the writer make uſe of arithmetical characters, letters, dots, lines, mathematical diagrams, or any other ſign which admits of two or three differences. We ſhall here add a ſpecimen in dots, according to this laſt alphabet of figures; where the period ſtands for 1, and the colon for 2: the words thus repreſented ſhall be the writer's name.

W I L L I A M — B L A I R
.:.:. .:... .::.. .::.. .:... ..... .::.: :.::: ....: .::.. ..... .:... :..:.

The objection which may be ſtarted againſt both theſe ciphers is, that they are too laborious, and not incapable of being deciphered by perſons of ſkill in this art. The writer does not recommend the above mode of dot-writing as very expeditious, but as ſimple; he knows it, however, to be much leſs operoſe than many ciphers ſubmitted to the public, and he can affirm that it is fully as difficult to decipher, as the celebrated plan of Lord Bacon, which he calls writing *omnia per omnia.* But, as an example of more ready and undecipherable writing by dots, of his own invention, the author refers to *Plate* III; whereon he has ventured to engrave the key itſelf, and yet defies any of his readers to explain the principle by which it is compoſed, or to give him a ſimilar piece of writing.

The moſt legible and common ciphers in uſe, conſiſt of a new alphabet, or of the uſual characters tranſpoſed ſo as to alter their powers: of this latter kind was the cipher of Julius Cæſar and Auguſtus; viz.

For	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
Write	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c
Or	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a

Julius Cæſar's method "Per quartam elementarum literam" is not only mentioned by Suetonius and Aulus Gellius, but perhaps is alluded to in Ovid's fourth Epiſtle:—

"His arcana notis terra pelagoque feruntur;"

which is paying this ſpecies of ſecret-writing a higher compliment than it would now be thought to merit: for, certainly, there is no great ſkill required to decipher it; but the ancients had not then directed their attention particularly to this ſubject, or they might have diſcovered its imperfections.

The learned Montfaucon, in his "Palæographia Græca," lib. i. p. 36. edit. Paris, 1708, makes the following remark on the ſtate of cryptography among the Greeks: "Κρυπτογραφίαν, ſive arcanum ſcribendi modum, apud Græcos frequentatum obſervamus. Κρυπτογραφίαν vero duplici modo fieri deprehendimus, per commutationem ſcilicet literarum, ac per novam & inuſitatam characterum formam: utriuſque ſcribendi rationis alphabeta varia, cum exemplis exhibemus in ſpeciminibus undecimi ſæculi libro quarto; ubi quamplurima non minus ſingularia, quam utilia & occulta, recenſebuntur." Accordingly, he gives, at pp. 87, 286, 288, various alphabets and ſpecimens of occult writing, by tranſpoſition or malformation of the common Greek letters; and eſpecially as it was practiſed by Amanuenſes in the eleventh and following centuries. It is certain, too, that the ſame practice prevailed in much earlier times, even before the age of Æneas Tacticus; and, therefore, the Roman emperors moſt probably learned this art from the Greeks. (Vide Palæographia Græca, l. iv. c. v. de Κρυπτογραφία.) But there is great reaſon to believe, that all theſe ancient modes of writing were decipherable by the ordinary rules of analyſis in ſuch caſes. We ſhall, hereafter, point out the rules neceſſary to be obſerved in deciphering; and lay down a few directions for the application of common ſenſe, where the ſpecies of occult writing does not admit of any poſitive rule in its developement.

We have now carried our hiſtory of this art down to a period, in which we take leave of the Greeks and Romans. Before we proceed, it may be expected that we ſhould illuſtrate theſe remarks by more examples: but, ſince it would be very expenſive to the proprietors of the Cyclopædia, and no peculiar advantage to the inquiſitive reader, if we were to engrave all the arbitrary characters with which ſecret-writing has been performed, we ſhall ſubſtitute in their place ſuch marks and figures as are found in the printing-office; which will equally well illuſtrate the principles and practice of the Greeks and Romans, in regard to the art of cryptography.

The methods of Julius Cæſar and Auguſtus are too obvious to dwell upon: it is only required of the writer to put the ſecond, third, fourth, or any other, letter of the alphabet, inſtead of that which he generally writes; as in the words following, No. I. where we ſubſtitute the fourth letter for the firſt, &c. viz.

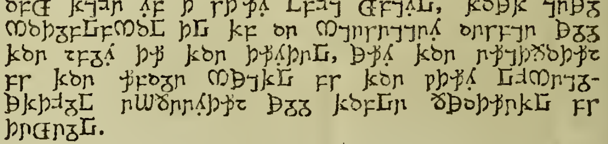
No. I.

Multi, et pene infiniti, ſunt ſcribendi modi.

Pxowl, hw ſhqh lqilqlwl, vxqw vfulehqgl prgl.

In the ſubſequent examples we uſe characters of different kinds in lieu of the common Roman letters. A ſpecimen is compoſed for each of the principal European languages, in all of which the ſame mode of deciphering is applicable; for it is a matter of perfect indifference to a decipherer what form the characters aſſume, provided they anſwer (one for one) to the common alphabet, and are neither more nor leſs in quantity.

No. II.

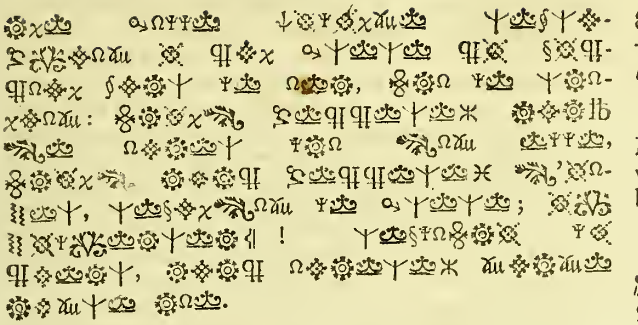


Solution.

How true do I find your words, that real philoſophy is to be preferred before all the gold in the Indies, and the enriching of the noble parts of the mind ſuperlatively exceeding all thoſe cabinets of jewels.

No. III.

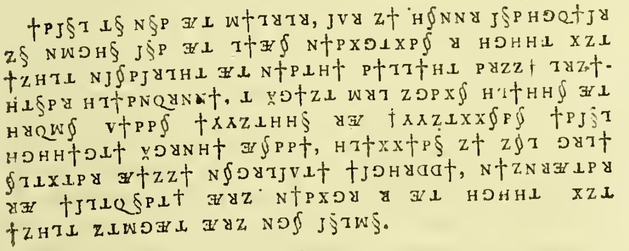
No. III.



Solution.

Une fille galante reprochoit a ſon frere ſa paſſion pour le jeu, qui le ruinoit : quand ceſſerez vous de jouer, lui dit elle, quand vous ceſſerez d'aimer, repondit le frere ; ah malheureux ! repliqua la ſœur, vous jouerez toute votre vie.

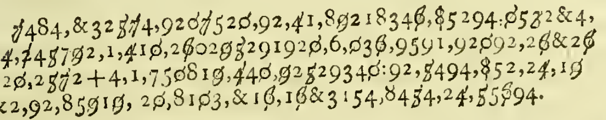
No. IV.



Solution.

Ancor io ſon di parere, che la toſſe contumace lo ſputo con di rado ſanguigno e tutti gli altri ſconcerti di ſanita narrati nella relatione tranſmeſſa, i quali per lungo tratto di tempo hanno afflitto ed affliggono ancor tuttavia queſta Donna, traggano la lor vera origine dalla Soverchia acutezza, falſedine ed acrimonia del ſangue e di tutti gli altri liquidi del ſuo corpo.

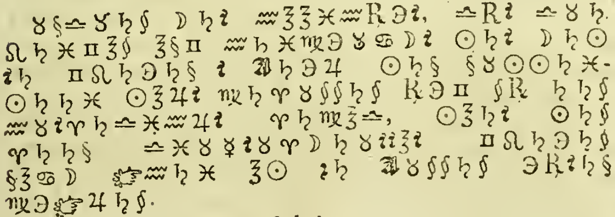
No. V.



Solution.

Poco tiempo deſpues de la creacion quedó ſujeto el hombre à las enfermedades y ſin duda deſde entences empezó à buſcar los remedios : de modo que el arte de curar es caſi tan antiguo como el mundo.

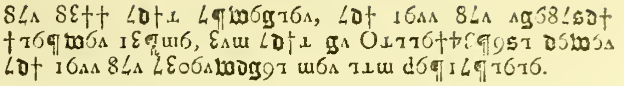
No. VI.



Solution.

Indien het voorvalt, dat die perſon ons verblicht met hem te ſpelen, 't welk men nimmermeer moet beginnen als na een uitgedrukt gebod, moet men geen driftigheit tot ſpelen noch yver om te winnen laten blyken.

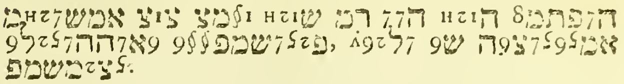
No. VII.



Solution.

Man muſs alſo arbeiten, als wenn man niemahls ſterben würde und alſo in Gottesfurcht leben als wenn man augenblict den tod verwartete.

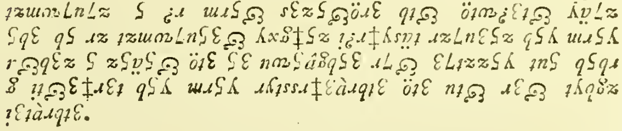
No. VIII.



Solution.

Equidem non nego quod ex iis quos febris acutiſſima aggreditur, pauci ad ſanitatem redeunt.

No. IX.



Solution.

Ὑμεῖς ἔστε οἱ δικαιοῦντες ἑαυτούς ἐνώπιον τῶν ἀνθρώπων ὁ δὲ θεὸς γινώσκει τὰς καρδίας ὑμῶν ὅτι τὸ ἐν ἀνθρώποις ὑψηλὸν βδέλυγμα ἐνώπιον τοὺ θεοῦ ἔστιν ὁ νόμος καὶ οἱ προφήτοι ἕως ἰωάννου ἀπὸ τότε ἡ βασιλεῖα τοῦ θεοῦ εὐαγγελίζεται καὶ πᾶς εἴς αὐτὴν βιάζεται.

In the beginning of the fifth century of the Chriſtian æra, Pharamond, and other reigning princes, invented characters of ſingular forms ; and, during the eighth and ninth century, Charlemagne kept up a private correſpondence with his agents in the north of Europe by ſimilar modes of deception. Some of theſe alphabets, including that of Pharamond, are preſerved by the noble duke Selenus, and by Trithemius. We have ſelected and exhibited (as a ſpecimen of ſuch inventions) one of thoſe employed by Charlemagne, in *Plate* I. *figure* 1 ; under which is ſeen *fig.* 2. the form of another ſecret-alphabet, uſed in England during the reign of Alfred, copied from a MS. in the Bodleian library. (Vide " Aſtle's Origin and Progreſs of Writing, chap. vi. 2d edit. Lond. 1803.") Rudolphus IV. archduke of Auſtria, who lived in the 14th century, was alſo much verſed in the practice of occult writing : but there is no complete cryptographical work extant, of earlier date than that of Trithemius, compoſed under the ſanction of Maximilian, at the end of the 15th century : ſoon after which period, Frederic II. Elector palatine, was induced, by a ſuperſtitious outcry againſt the author, of having practiſed diabolical myſteries, to commit the original MS. of Trithemius's curious book to the flames ! ! !

In *Plate* I. *fig.* 6, we have repreſented the cipher uſed by cardinal Wolſey, at the court of Vienna, in 1524.—*Fig.* 7, is the cipher which ſir Thomas Smith employed at Paris, in 1563.—*Fig.* 8, is ſir Thomas Chaloner's cipher from Madrid, in 1564.—*Fig.* 9, is that of ſir Edward Stafford, from Madrid, in 1586. And, among the royal MSS. depoſited in the Britiſh Muſeum, we have met with various other ciphers of the ſame period ; ſo that they had then become of general uſe in the different European courts.

The form of theſe ciphers, it will be obſerved, was very arbitrary and capricious : but the mode of ſecret-writing underwent a conſiderable change in the next century, by the frequent adoption of arithmetical figures inſtead of letters; as we perceive, for example, among the confidential epiſtles of Charles I. to his ſon. (Vide MSS. N° 132, and 6988 Bibl. Harl.) We ſubjoin part of one of this unfortunate monarch's letters, dated Aug. 1ſt, 1648, as a ſpecimen of that kind of cryptography; and, for an explanation of many more of them, we refer to Dr. Wallis's unpubliſhed collection in the Bodleian library at Oxford:

"I thought that 379 : 361 : 185 : 28 : 2 : 239 : 59 : 60 : 93 : 5 : 214 : 126 : 379 : 90 : 37 : 1 : 258 : 6 : 2 : 212 : 370 : 196 : 379 : 245 : 339 : 245 : 339 : 363 : 329 : 165 : 246 : 16 : 50 : 212 : 196 : 444 : 149 : 13 : 44 : 32 : 14 : 26 : 10 : 78 : 43 : 65 : 329 : 331 : 380 : 17 : 48 : 29 : 358 : 77 : 214 : 329 : 93 : 85 : 6 : 23 : 220 : 78 : 57 : 152 : 5 : 65 : I command you, &c."

In another letter, the king writes to his ſon from Newport, (Nov. 7th, 1648,) and adds, "Let none decipher this but yourſelf, or my lord Culpeper;" ſo that this cipher was, doubtleſs, regarded as very faithful, and was, perhaps, entruſted to only a few confidential perſons about his majeſty. Somewhat prior to that critical time, however, we find Charles I. uſing a cipher which could by no means be depended on for ſecrecy. We allude to an alphabet chiefly compoſed of 24 ſhort ſtrokes, variouſly ſituated upon a line; and by which, April 5th, 1646, he wrote to the earl of Glamorgan, afterwards the marquis of Worceſter. See Royal Letters, Bibl. Harl. vol. iii. 118, 119, &c.

We have exhibited this Ogham-like alphabet in *Plate* I. *fig.* 4. It has been often referred to of late, as a curious and very ſimple invention. (See Biograph. Britan. vol. i. page 433, Art. BALES): and it was the accidental ſight of this alphabet in the year 1804, which firſt cauſed the author of the preſent article to inveſtigate the nature of ciphers; for, till then he had never once thought or read on the ſubject. During the courſe of this examination, he diſcovered (in Bibl. Harl. N° 2428.) the marquis of Worceſter's peculiar, and hitherto inexplicable, mode of writing; which ſeems to be briefly deſcribed in the 3d and 4th of his lordſhip's "Centurie of Inventions:" of which, likewiſe, there is in the Britiſh Muſeum a fair manuſcript copy, dated "from Auguſt ye 29th, to Sept. ye 21th, 1659."

We here extract the marquis's words regarding this cipher, from pages 5th and 6th of his "Inventions;" which were firſt written by him in 1655, but not printed till 1663, as we learn from the work itſelf. "A cypher and character ſo contrived, that one line, without returns and circumflexes, ſtands for each and every of the 24 letters; and as ready to be made for the one letter as the other."

"This invention, ſo refined and ſo abbreviated, that a point only ſheweth diſtinctly and ſignificantly any of the 24 letters; and theſe very points to be made with two pens, ſo that no time will be loſt; but, as one finger riſeth, the other may make the following letter; never-clogging the memory with ſeveral figures for words and combinations of letters; which, with eaſe and void of confuſion, are thus ſpeedily and punctually, letter for letter, ſet down by naked and not multiplied points. And nothing can be leſs than a point; the mathematical definition of it being, *Cujus pars nulla.* And a motion no ſwifter imaginable than *ſemiquavers* or *reliſhes*, yet applicable to this manner of writing."

This cipher was one of the extraordinary inventions for which the marquis applied to parliament, in hopes of a remuneration; but as he was not known to have either printed an account of it, or to have left any explanation of it in writing, many ſhrewd conjectures were afterwards made touching the nature of this noble author's contrivance. We ſhall notice one of theſe gueſſes, before we proceed to give a farther deſcription of it. (See Gent. Magazine, vol. xviii. p. 55.) An anonymous gentleman propoſes "to rule his paper with quarternions of lines, as if for muſic, and to let the points repreſenting the letters be placed on, or between theſe lines; one-half of the alphabet to aſcend in the ſcale, and to be done with common ink; the other half to deſcend, and to be done with red ink; the red ink pen in one hand, and the black in the other." The propoſal, however, does not at all correſpond with what we believe to have been intended by the marquis of Worceſter: it is alſo much too complex and tedious for ordinary practice, and would be far from anſwering the purpoſes of a faithful cipher.

As this nobleman was one of the moſt ingenious and extraordinary perſonages of his time, and may even be conſidered as a prodigy in mechanical aquirements, we take the liberty of ſtating all we know of his diſcoveries in ſecret writing; partly divulged by himſelf, in his very ſcarce volume of "Inventions;" and partly collected from a MS. in the Harleian Library, No. 2428, which bears clear internal marks of its origin, although it was not ſuppoſed to be his, until we lately convinced the Librarian. "The one-line cypher" and mode of dot-writing are thus entitled, in the above manuſcript: "An explanation of the moſt exact and moſt compendious way of ſhort writing; and an example given by way of queſtions and reſolves upon each ſignificant point, proving how and why it ſtands for ſuch and ſuch a letter, in order alphabetically placed in every page."—His method of writing is ſhewn in *fig.* 5. *Plate* I. An engraved page is given to write upon, in which are made horizontal rows of octangular ſquares or chequers; and a ſtrait line is to be drawn from the centre towards the circumference of theſe ſquares, in different poſitions and of various lengths, for each letter of the alphabet. Thus *A* is a ſhort horizontal ſtroke, made to the right hand, and not touching the circumference; *I* is the ſame ſtroke paſſing cloſe to the circumference; *R* is the ſame ſtroke, going beyond the circumference; *E*, *N*, and *W*, are repreſented by a ſimilar ſtroke, in the oppoſite direction, but varying in their lengths. By a like method, he ſuggeſts that we may write with a dot or ſingle point only; which is to be placed at a certain diſtance, and in a certain direction, from the centre of the octagon, for each letter of the alphabet.

The Marquis propoſes this contrivance for the purpoſe of writing with ſecrecy, as well as with brevity; and leaves it to the will of any perſon to change the value or name of the letters, as it may ſuit his fancy or intention: "The points to be written," ſays he, "and reade as they precede or as they are the one above the other;" and for the ſake of expedition as well as "for huſbanding of paper," he adviſes "to omit all needleſſe and unſounding letters," as we do in ſhort-hand writing.

This ingenious plan is better adapted for ſecret writing, than for ſhort-hand; and yet we do not think it would be difficult to decipher any thing written in this way, unleſs the writer were to change the power of his letters very frequently, becauſe he would not otherwiſe be able to elude the common rules for deciphering.

That the Marquis had turned his attention particularly to this ſubject, is ſtrikingly evident from the following paſſages, contained in his very curious book; entitled,—"A Centurie of the Names and Scantlings of Inventions by me already practiced."

No. 5. "A way by a circular motion, either along a rule or ring-wiſe, to vary any alphabet, even this of points; ſo that the ſelf-ſame point individually placed, without the leaſt additional mark or variation of place, ſhall ſtand for all the 24 letters, and not for the ſame letter twice in ten ſheets writing; yet as eaſily and certainly read and known as if it ſtood but for one and the ſelf-ſame letter conſtantly ſignified."

No. 6. "How at a window, as far as eye can diſcover black from white, a man may hold diſcourſe with his correſpondent, without noiſe made or notice taken; being according to occaſion given and means afforded, *ex re natâ*, and no need of proviſion before hand; though much better if forſeen, and means prepared for it, and a premeditated courſe taken by mutual conſent of parties."

No. 7. "A way to do it by night as well as by day, though as dark as pitch is black."

No. 32. "How to compoſe an univerſal character methodical and eaſie to be written, yet intelligible in any language; ſo that if an Engliſhman write it in Engliſh, a French-man, Italian, Spaniard, Iriſh, Welſh, being ſcollars, yea, Grecian or Hebritian, ſhall as perfectly underſtand it in their owne tongue, as if they were perfect Engliſh; diſtinguiſhing the verbs from nouns, the numbers, tenſes, and caſes as properly expreſſed in their own language as it was written in Engliſh."

No. 33. "To write with a needle and thred, white or any colour upon white, or any other colour; ſo that one ſtitch ſhall ſignificantly ſhew any letter, and as readily and as eaſily ſhew the one letter as the other, and fit for any language."

No. 34. "To write by a knotted ſilk ſtring, ſo that every knot ſhall ſignify any letter, with comma, full point, or interrogation, and as legible as with pen and ink upon white paper."

No. 35. "The like by the fringe of gloves."

No. 36. "By ſtringing of bracelets."

No. 37. "Pinck'd gloves."

No. 38. "By holes in the bottom of a ſieve."

No. 39. "By a lattin or plate lanthorn."

Nos. { 40. "By the ſmell." 41. "By the taſte." 42. "By the touch." } "And by theſe three ſenſes as perfectly, diſtinctly, and unconfuſedly, yea as readily, as by the ſight."

No. 43. "How to vary each of theſe, ſo that ten thouſand may know them, and yet keep the underſtanding-part from any but their correſpondent."

No. 51. "A rule of gradation, which, with eaſe and method, reduceth all things to a private correſpondence, moſt uſeful for ſecret intelligence."

No. 52. "How to ſignify words and a perfect diſcourſe by jangling of bells of any pariſh-church, or by any muſical inſtrument within hearing; in a ſeeming way of tuning it, or of an unſkilful beginner."

No. 75. "How a tape or ribbon-weaver may ſet down a whole diſcourſe, without knowing a letter, or interweaving any thing ſuſpicious of other ſecret than a new-faſhion ribbon."

No. 76. "How to write in the dark as ſtraight as by day light."

Our limits, for this article, do not allow us to enter into the merits of every propoſal made public, for ſecret correſpondence: but, having before obſerved that arithmetical figures had become very common in the reign of Charles I. inſtead of the ciphers previouſly employed, we ſhall here offer a few remarks on their uſe. The celebrated and profound mathematician, Dr. Wallis, deciphered a great number of intercepted letters, written in figures, about the period of that King's unhappy controverſy. We have already ſaid, that copies of theſe deciphered papers are depoſited in the Bodleian library, at Oxford; and in the prefatory obſervations to that collection, Dr. Wallis declares his judgment of them in theſe words: "I would not deſire to uſe a better cipher than moſt of thoſe * * * *. I do ſcarcely believe that it will be an eaſy matter to contrive a way more intricate than the *figure-cipher*, ordinarily now in practice, with the like convenience for uſe: and, if any affect ſome more perplexed than theſe, I doubt not but his ſuppoſed better way will be equally obnoxious to a diſcovery; or elſe will be extremely tedious in uſe, both to him that writes by it, and to him that is to read it, that it will not admit of any tolerable diſpatch." (See alſo Mr. Davy's Eſſay on Deciphering, p. 17.—General Dictionary, vol. x. p. 93; and Biographia Britannica, Art. *Wallis*.) This acute author was very different from Scaliger, in his opinion of ſecret writing: for, while the latter ridiculed the idea of inſcribing what could never be developed, becauſe he was able to decipher the Lacedæmonian Scytale; Dr. Wallis, on the contrary, who had gone fifty times deeper in this ſcience than Scaliger, admits "there may be a cipher ſo intricate as ſhall be beyond the art of man to diſcloſe."

No perſon except Vieta, (a French mathematician, who was employed by Francis I.) had diſcovered near ſo much ſkill in deciphering, as Dr. Wallis. He ſeems not to have known of what Vieta did in this way, nor had he any aid from other perſons in his reſearches: we are, therefore, diſpoſed to pay the greateſt deference to his judgment as a decipherer; but we beg leave to obſerve, that it does not follow he ſhould know all the poſſibilities of this multiform art. He conſidered the "figure-cipher" as extremely intricate; we doubt not, that others may be contrived equally ſo; and that ſuperadded to this quality, a cipher may be adapted for greater diſpatch, "both to him that writes by it and to him that is to read it." Beſides which, we think it even practicable to invent a cipher, excluſive of its having thoſe properties, which ſhall not be much expoſed to ſuſpicion; and this, we conceive with Lord Bacon, to be a very eſſential requiſite in certain ſituations of the writer and reader, though not ſo in all circumſtances.

There is a method of employing figures, common enough in the preſent day, which was much recommended by Baptiſt Porta and Cardanus; and therefore not a novel invention: but Blaiſe de Vigenere, whoſe treatiſe on ciphers was publiſhed at Paris in 1587, has pointed out the inconveniences of this method; which conſiſts in referring to words or ſentences by the correſponding pages and lines of ſome rare printed book, in the poſſeſſion of the confederate parties. Now, ſays Vigenere, (p. 208.) this plan is too laborious, and ſlow in operation, for buſineſs requiring to be deſcribed in detail; it will not always provide the words ſought for, at leaſt without an immenſe deal of pains, perhaps after examining through ſome hundred pages; and, unleſs a dictionary be uſed, the names of perſons, places, or profeſſions, can be found in no book whatever: beſides which, many accidents may lead to a diſcovery of the key or book ſo confided in; and many others may happen to deprive us of that reſource, or to render it inconvenient to depend on ſuch a ſtratagem. The writing, moreover, is always liable to ſuſpicion, if intercepted. So that this plan is wholly unfit for extenſive correſpondence, as in diplomatic affairs; and ought rather to be accounted a childiſh than a ſcientific invention, however it has been ſanctioned by modern practice, among military commanders and officers of ſtate.

We do not object altogether againſt the uſe of figures and numeral characters, as if they were unfit, *on account of their form*, to be adopted in cryptographical writing; but we object to the above manner of applying them, becauſe as numerals,

rals, denoting only the pages or lines of a book, theſe figures cannot be written with any tolerable expedition, and muſt be a perpetual check to the reader's progreſs in deciphering. This method, it muſt be acknowledged, poſſeſſes the property of being undecipherable without the key: for, let us ſuppoſe (in writing the example given by Mr. Thickneſſe) "That the parties agree to correſpond by Newton's firſt edition of Milton; and thereby direct each other, in their letters, to ſuch a page, ſuch a line, and ſuch a word; it may be aſked, Who would be able to find out, that their writing page 7, line 2, words 3, 4, 5, and vol. ii. page 8, line 19, word 4, —the ſame page, line 9, words 3, 4, and 5—was to ſay 'The weſtern empire is degenerated into licentiouſneſs?' without being told that theſe words will be found in the firſt and ſecond volume of Farneworth's tranſlation of Machiavel's works: the firſt three words from his hiſtory of Florence, and the remainder from his political diſcourſes on the firſt Decad of Livy." All this will be granted; but as the property of being intricate is not the only one we ſhould look for in a good cipher, we conclude again by obſerving, that the above plan is puerile and unſcientific to the laſt degree; conſequently, that it is wholly unfit for men of buſineſs, or for any beſides incidental occaſions, where very little writing is required.

By referring to a dictionary, indeed, theſe objections are partly leſſened, becauſe the words may be found with greater facility than in other books; but even ſuch a reſource is very inſufficient for all occaſions, and it ſtill muſt prove a moſt tedious and operoſe employment, in writing only ten or a dozen lines. The French Encyclopédiſts deſcribe a much more feaſible mode of writing by figures, which, nevertheleſs, we cannot approve as the beſt method of cyphering. It is this:

The correſpondents agree on a ſet of figures to repreſent all the letters of the alphabet, and alſo a great many words or phraſes. Several ways may be adopted for the repreſentation of any important letter, or phraſe, of frequent occurrence; ſuch as the five vowels, or the words France, emperor, king of this and that nation, ſtates-general, cardinal ſo and ſo, the allied armies, an ambaſſador's name, &c. &c. &c. All theſe different words are to be claſſed and arranged in ſuch a manner as to be eaſily found, both in writing and deciphering; and another claſſification muſt be made, in which the figures ſtand firſt, and the words in an oppoſite column. The ſentences and entire paragraphs, which are of prime importance in a diſpatch, ſhould be written wholly in cipher, without any intermixture of common letters; becauſe, by the aid of particles and connecting words, the terms of greater conſequence, on which the ſenſe hinges, will often be diſcovered, and the matter in debate or agitation will thus be underſtood. It is alſo proper to write the lines ſo far apart, that the decipherer may ſubſcribe the figures when he reads the diſpatch; as in the following ſpecimens:

Le miniſtre d'ici eſt tout dévoné aux intérêts de la France:
102 25 44 9 1200 70 330 888
c'eſt le fruit de dix mille Louïs ſemées à propos.
54 5 20 60 101 19 501 80

The negociation is interrupted by the pertinacity and
2 999 4 10 50 1000 14
unreaſonableneſs of the duke, who probably has received
350 31 86 5 77 680
private inſtructions from his court.
1110 21 89 231

Means may be deviſed for detecting the unfaithfulneſs of a ſubordinate ſecretary, who is ſuppoſed to have communicated his cipher to a foreign power. The court may demand of its miniſter abroad, or the miniſter require of his court, ſomething quite the reverſe of what is deſired, it being previouſly agreed by the cabinet that a certain mark or private ſign denotes oppoſition or annihilation, with reſpect to the particular thing annexed to the ſaid ſign. This ſpecial mark may be called the annulling ſign, and will ſerve for various important uſes; as has often been proved in conducting naval ſignals, where the enemy was within ſight, or where any miſtake happened to ariſe in the courſe of a correſpondence. By the help of ſuch an artifice, when a cipher has been accidentally diſcovered, or traitorouſly diſcloſed, a ſkilful negociator will be able to deceive the enemy, and lead him into inextricable errors, which may finally turn to the advantage of his own cauſe.

Sir J. Ware, colonel Vallancey, and Mr. Aſtle give remarkable accounts of the Iriſh ſteganography, by means of peculiar alphabets, called by the barbarous name of Ogums, or Oghams, of which there are three kinds: the firſt is compoſed of ſtrokes and marks, that derive their power from certain poſitions with reſpect to one horizontal line, over, or under, or upon, which they are drawn; this principal line ſerving for a rule or guide, its upper part being named the left, and its under part the right. The characters or ſhort ſtrokes, by their number or ſituation, repreſent, not only ſingle vowels and conſonants, but alſo diphthongs and triphthongs.

In our *Plate* I. *fig.* 3. is ſeen one of the moſt ſimple Oghams, copied from Sir J. Ware's "Antiquities of Ireland" (vol. ii. p. 20.), which would not be very difficult to decipher; becauſe, although the number of diagonal and perpendicular marks is conſiderable, it muſt be obvious how many of them repreſent one letter, and it will be ſeen that they make up but twenty-ſix in all. The marks for diphthongs and triphthongs do not occur in ancient manuſcripts, the vowels being repreſented ſingly, as *ae*, not *æ*, &c. Therefore an Ogham having diphthongs, ſuch as that we have ſelected, cannot be regarded as of ancient date.

The ſecond and third kinds of Ogham uſed by the Iriſh differ chiefly in this: that the letter *b* or *c* is placed firſt, inſtead of *a*; or, that the mark for one of thoſe letters is ſubſtituted for all the vowels, by doubling or reverſing it, and by its frequent repetition, ſo as to confuſe the writing. (See "Tractatus apud Hibernos veteres, de occultis ſcribendi formulis, ſeu Artificiis Hibernicè Ogum dictis;" a MS. lately given to the Britiſh Muſeum by the Rev. Dr. Miller.)

Several ſpecimens of Iriſh Oghams are engraved in the ſecond edition of Mr. Aſtle's Hiſtory of Writing; a work replete with intereſting matter on various points connected with that ſubject in general, but extremely deficient on ſhort-writing (ſtenography), and ſecret-writing (cryptography). Upon theſe two departments of the art, we feel a deſire, if opportunity ſhould permit, of laying before the public ſome reſults of our own inveſtigations and practice; though we cannot indulge the vain opinion of our feeble efforts, which Trithemius entertained of his learned labours: (Præf. ad Maximil. Imperatorem, Polygr. p. 100.) "In manibus jam habeo grande opus, quod ſi unquam fuerit publicatum, totus mundus mirabitur." See the article STENOGRAPHY.

It might be thought an injuſtice to the memory of the profound and noble chancellor Bacon, not to ſtate in detail whatever his lordſhip has written upon ciphers; as ſome men of acknowledged ability (for inſtance, biſhop Wilkins and Mr. Falconer), have conſidered his propoſal ſuperior to every other. Mr. Falconer calls it "the moſt ingenious method extant;" and the biſhop of Cheſter ſays, "This way of writing is juſtly to be preferred before any other, as containing

ing in it more eminently all thoſe conditions that are deſirable in ſuch kind of inventions, viz.

"1. 'Tis not very laborious either to read or write.
"2. 'Tis very difficult to be deciphered.
"3. 'Tis void of ſuſpicion."

We find alſo the following encomium in Mr. Thickneſſe's Treatiſe; "Thoſe who are acquainted with lord Bacon's great depth of capacity, will readily agree with me that a ſecret method of writing contrived by a man of his amazing penetration, muſt be ſuperior to all others, as indeed it is, and contains the higheſt degree of cypher."

We copy the illuſtrious Verulam's own propoſal, out of Dr. Shaw's edition of his works, vol. i. p. 141—145.

"There are ſeveral kinds of cyphers; as the *ſimple*; thoſe mixed with non-ſignificants; thoſe conſiſting of two kinds of characters; *wheel-cyphers*, *key-cyphers*, *word-cyphers*, &c. There are three properties required in cyphers, viz.; (1.) that they be eaſy to write and read; (2.) that they be truſty and undecypherable; and, (3.) if poſſible, clear of ſuſpicion. For, if a letter ſhould come into the hands of ſuch as have a power over the writer, or receiver, tho' the cypher itſelf be truſty, and impoſſible to decypher, 'tis ſtill ſubject to examination and queſtion; unleſs there be no room to ſuſpect or examine it.

"There is a new and uſeful invention, to elude the examination of a cypher, viz.; to have two alphabets, the one of ſignificant, and the other of non ſignificant letters; and folding up two writings together; the one conveying the ſecret, whilſt the other is ſuch as the writer might probably ſend without danger. In caſe of a ſtrict examination about the cypher, the bearer is to produce the non-ſignificant alphabet for the true; and the true for the non-ſignificant: by which means the examiner would fall upon the outward writing; and finding it probable, ſuſpect nothing of the inner.

"But to prevent all ſuſpicion, we ſhall here annex a cypher of our own, which has the higheſt perfection of a cypher; that of ſignifying omnia per omnia; any thing by every thing; provided only the matter included be five times leſs than that which includes it; without any other condition or limitation. The invention is this; firſt let all the letters of the alphabet be reſolved into two only, by repetition and tranſpoſition: for a tranſpoſition of two letters, thro' five places, or different arrangements, will denote two and thirty differences; and conſequently fewer, or four and twenty, the number of letters in our alphabet; as in the following example:

"A biliteral alphabet, conſiſting only of *a* and *b* changed through five places, ſo as to repreſent all the letters of the common alphabet.

A = aaaaa
B = aaaab
C = aaaba
D = aaabb
E = aabaa
F = aabab
G = aabba
H = aabbb
I = abaaa
K = abaab
L = ababa
M = ababb
N = abbaa
O = abbab
P = abbba
Q = abbbb
R = baaaa
S = baaab
T = baaba
V = baabb
W = babaa
X = babab
Y = babba
Z = babbb

"Thus, in order to write an *A*, you write five *a's*, or aaaaa; and to write a *B*, you write four *a's*, and one *b*, or aaaab; and ſo of the reſt.

"And here, by the way, we gain no ſmall advantage; as this contrivance ſhews a method of expreſſing, and ſignifying one's mind, to any diſtance, by objects that are either viſible or audible; provided only the objects are but capable of two differences; as bells, ſpeaking-trumpets, fire-works, cannon, &c. But for writing, let the included letter be reſolved into this biliteral alphabet: ſuppoſe that letter were the word *Fly*; it is thus reſolved:

F L Y.
aabab ababa babba.

"Let there be alſo at hand two other common alphabets, differing only from each other in the make of their letters, ſo that, as well the capital as the ſmall be differently ſhaped, or cut, at every one's diſcretion: as thus for example, in Roman and Italick; each Roman letter conſtantly repreſenting A, and each Italick letter *B*.

"The firſt, or Roman Alphabet.

A, a.
B, b.
C, c.
D, d.
E, e.
F, f.
G, g.
H, h.
I, i.
K, k.
L, l.
M, m.
N, n.
O, o.
P, p.
Q, q.
R, r.
S, s.
T, t.
V, v.
U, u.
W, w.
X, x.
Y, y.
Z, z.

All the letters of this Roman Alphabet are read, or decyphered, by tranſlating them into the letter A, only.

"The ſecond, or Italick Alphabet.

A, a.
B, b.
C, c.
D, d.
E, e.
F, f.
G, g.
H, h.
I, i.
K, k.
L, l.
M, m.
N, n.
O, o.
P, p.
Q, q.
R, r.
S, s.
T, t.
V, v.
U, u.
W, w.
X, x.
Y, y.
Z, z.

"All the letters of this Italick alphabet are read by tranſlating them into the letter *B*, only.

"Now adjuſt or fit any external double-faced writing, letter by letter, to the internal writing, firſt made biliterate; and afterwards write it down for the letter, or epiſtle, to be ſent. Suppoſe the external writing were, *Stay till I come to you;* and the internal one were *Fly;* then, as we ſaw above, the word *Fly*, reſolved by means of the biliteral alphabet, is

F L Y
aabab ababa babba,

whereto I fit, letter by letter, the words, *Stay till I come to you;* obſerving the uſe of my two alphabets of differently ſhaped letters: thus,

aabab ababa babba
St*a*y*t* *il* i co *me to* you.

"Having now adjuſted my writing, according to all my alphabets, I ſend it to my correſpondent; who reads the ſecret meaning, by tranſlating the Roman letters into *a's*, and the Italick ones into *b's*, according to the Roman and

Italick alphabets; and comparing each combination of five of them with the biliteral alphabet.

"This doctrine of cyphers has introduced another, relative to it; viz. the art of decyphering, without the alphabet of the cypher, or knowing the rules whereby it was formed. This indeed is a work of labour and ingenuity, devoted, as well as the former, to the ſecret ſervice of princes. Yet, by a diligent precaution, it may be render'd uſeleſs; tho', as matters now ſtand, 'tis highly ſerviceable. For, if the cyphers in uſe were good and truſty, ſeveral of them would abſolutely elude the labour of the decypherer; and yet remain commodious enough, ſo as to be readily wrote and read: but through the ignorance and unſkilfulneſs of ſecretaries and clerks, in the courts of princes, the moſt important affairs are generally committed to weak and treacherous cyphers."

It becomes us to offer our opinion with extreme diffidence, in preſuming to criticiſe the production of a man ſo highly diſtinguiſhed for his capacity and acuteneſs. But we cannot refrain from believing, that this contrivance of lord Bacon will appear to moſt perſons too operoſe and ſlow of execution for public buſineſs; of which, indeed, we deſire no better proof, than that it has met with ſo little encouragement from official and regular practice. It muſt always be deemed a ſerious inconvenience attending his lordſhip's plan, that it requires, at leaſt, five times more labour than is requiſite in ordinary writing. Whereas, if a triformed alphabet were to be invented in lieu of this, and regulated by another alphabet compoſed of three letters inſtead of two, the ſecret writing would then bear only a triple proportion to common writing, and the trouble of an amanuenſis might thus be greatly diminiſhed.

A ſecond point on which we beg leave to expreſs our doubts, is, Whether this cipher be infallibly ſecure againſt the ſcrutinizing eye of a diligent examiner? For, if the reader were to place a mark of diſtinction between every fifth character, reckoning the five as one letter, we aſk, Why might not this writing be liable to a diſcovery as well as any ſimple cipher, and on the ſame general principles? Nay, Mr. Falconer himſelf confeſſes it may, notwithſtanding the compliment he pays to the noble author for his ingenuity and learning. Nevertheleſs, we think it will be granted on all hands, that lord Bacon's mode, if it had not been publiſhed, would have poſſeſſed one rare and valuable property, beyond the ciphers previouſly invented, namely, that of being ſcarcely at all expoſed to ſuſpicion; and therefore, in this reſpect, it is entitled to eſpecial attention and praiſe.

Biſhop Wilkins avails himſelf of the fact, that two ſigns repeated, as in lord Bacon's alphabet, or three combined in a certain order, will ſerve to communicate our thoughts; and he improves upon it in the following manner: Let there be two bells of different notes, or one bell and ſome other loud ſound, as that of a muſket, horn, drum, &c. According to the plan of a biliteral alphabet, a man may expreſs any letter by two ſuch different ſounds, repeating them five times. But if the ſounds were capable of a triple difference, then each letter may be expreſſed by a threefold ſound; and if they contain a quintuple difference, or conſiſted of five ſounding inſtruments, every letter might be ſignified by two of them only; as we have ſhewn already with two flambeaux, and as will be further obvious from our ſubſequent remarks.

He quotes a ſtory from John Baptiſt Porta, in lib. i. cap. 6. of his work, "De Furtivis Literarum Notis, vulgo de Ziferis," who relates, that when the citizens at the ſiege of Navarre were reduced to the greateſt extremity, they communicated their wants to their diſtant friends by diſcharging various kinds of cannon in the night time, according to a predetermined order; by which means they obtained ſuch ſupplies as they needed, and preſerved their city. But the moſt curious propoſal for the management of ſounds in correſpondence, is that of expreſſing letters and words by the ordinary notes of a muſical inſtrument; which biſhop Wilkins believed might be adapted "for a univerſal language, and the writing of them for a univerſal character," not by expreſſing words, "but things and notions." Then, ſays he, "there might be ſuch a general language as ſhould be equally ſpeakable by all nations and people."

We are not ſanguine enough to expect the learned biſhop's plan, of recovering the world from the Babel-confuſion, will very quickly take effect; and, certainly, the ſpecimen of muſical writing which he has exhibited is very unlikely to anſwer that purpoſe. Mr. Thickneſſe thinks, "writing performed by an harmonic alphabet would be the moſt void of ſuſpicion of all others:" both he and the biſhop have therefore given an alphabet of this kind, and they both preſume on his lordſhip being "the only writer who has mentioned the method of writing by muſical notes;" wherein, however, they are both miſtaken. For Auguſtus, the duke of Brunſwick (*alias* Guſtavus Selenus,) in his "Syſtem of Cryptography," lib. vi. cap. 19. exhibits various ſpecimens of writing in that way; and does not claim the invention himſelf, but aſcribes it to count Frederic of Oetingen. Nay, it is pretty clear that Trithemius was not ignorant of this device; ſince he declares, in his epiſtle to Boſtius, A. D. 1499, that he could diſcourſe by playing on the organ or ſinging, "ludendum in organo vel cantandum," which ſeems to be the propoſal above mentioned, or ſomething very like it.

That we may not appear to have ſlighted ſo curious a propoſal, we will offer a few remarks on this ſubject; and beg our readers to conſult *Plate* II. *figs.* 2, 3, 4, and 5; where we have given an harmonic alphabet, and ſeveral ſpecimens of muſical writing, in illuſtration of the preſent article.

If four or five characters be amply ſufficient, by combination and repetition, to denote every word or idea we can expreſs, it is certain that ſeven muſical ſounds are more than ſufficient for the ſame purpoſe. But we muſt learn to diſtinguiſh between theſe ſounds, as they would be repreſented in ordinary writing, and the ſcientific arrangement of them, ſo as to form a muſical compoſition: for thoſe two reſults may happen to be as different from each other, as the chattering of a magpie and the orations of Cicero, or as the jumbling of letters in a box, and the adjuſtment of them by a typographer.

It is true that the ſeven muſical notes are enough in reſpect to number, (for ſeven notes will afford 5040 varieties or combinations, without repeating any of them); but we are not therefore to conclude, that they can be made to coaleſce and harmonize, according to the preciſe order and relation we ſhould wiſh to uſe them in alphabetical writing.

Articulate ſounds are repreſented on paper, &c. by certain ſubſtitutes called letters, which poſſeſs whatever quality we may chooſe to impoſe on them: but harmonic tones are not at all controulable by arbitrary laws; their inherent powers are fixed by nature; they cannot, therefore, be made ſubſervient to our pre-conceived methods of ſpeech, or our eſtabliſhed notation by letters; and, if they are compelled to aſſociate with theſe, it muſt be managed by the ſubverſion of our common language, and adapting its ſtructure to the natural qualities of muſical ſounds. This being our opinion, we ſhould as ſoon expect a man to converſe in two different languages at once, or the wind to blow in two oppoſite directions, as the laws of harmony to obey any exiſting plans of articulation and writing. See the article HARMONY.

Having thus freely given our deliberate view of this ſubject, we lay before the reader ſome obſervations of Mr. Philip Thickneſſe, who has laboured more earneſtly than any other author to enliſt the powers of harmony into the ſervice of cryptographers. As his opinion differs from our own, we do him the juſtice to adduce his words at full length. In the ſpecimens of muſical compoſition, however, we have corrected ſeveral of that gentleman's errors ; ſo that his remarks will not ſuffer any loſs, from our officiouſneſs.

“ Biſhop Wilkins, in his chapter relative to a language conſiſting of tunes and muſical notes, without any articulate ſound, ſays, ‘ If the muſical inſtrument that is uſed for this purpoſe, be able to expreſs the ordinary notes, not only according to their different tones, but their times alſo, then may each letter of the alphabet be rendered by a ſingle ſound; whence it will follow, that a man may frame a language, conſiſting only of tunes, and ſuch inarticulate ſounds, as no letters can expreſs, which kind of ſpeech is fancied to be uſual amongſt the lunary inhabitants; who, as Domingo Gonſales hath diſcovered, have contrived the letters of the alphabet upon the notes after ſome ſuch order.’ But the ſpecimen the biſhop has given, (by writing *Gloria Deo ſoli* by minums, on muſical lines,) will inſtantly appear to any one the leaſt converſant with muſic, that being without harmony or time, it muſt have no meaning, or that ſome hidden matter is thereby diſguiſed. I ſhall therefore endeavour to write down an alphabet by muſical notes, in ſuch a manner, that even a maſter of muſic ſhall not ſuſpect it is to convey any meaning, but that which is obvious ; and I am perſuaded an alphabet of muſical notes may be ſo contrived, that the notes ſhall not only convey the harmony, but the very words of the ſong, ſo that a muſic-maſter, (which is too often his deſign) may inſtruct his female pupil, not only how to play upon an inſtrument, but how to play the fool at the ſame time, and impoſe upon her parents or guardians, by hearkening to his folly, impertinence, and wickedneſs. When a muſic-maſter has once taught his female pupil to underſtand a muſical alphabet, and ſhe will permit him to carry on a ſecret correſpondence, he may ſend her daily a leſſon which ſhe may repent having learned as long as ſhe lives.

“ In the plate annexed, I have given a muſical alphabet (*Plate* II. *fig.* 2.), and under it a ſpecimen to explain more fully my meaning (See *Plate* II. *fig.* 3.). If a muſic maſter be required to play it, he will certainly think it an odd, as well as a very indifferent compoſition ; but neither he, nor any other perſon, will ſuſpect that the notes convey alſo the two following harmonious lines from Dr. Goldſmith's “ Deſerted Village :”

‘ Near yonder copſe where once the garden ſmil'd,
And ſtill where many a garden-flow'r grows wild.’

“ Now, it may be ſo ordered, that the plain notes, *i. e.* the crotchets and minums alone, compoſe the alphabet, and that neither flats nor ſharps, nor the ſmaller notes between, (which may be placed as mere graces, and meant to deceive) have any thing to do with the reading ; ſo that the decypherer would not ſo readily know how to proceed, and many people there are, who will think it impoſſible to be made out without the key ; yet I am perſuaded, one who poſſeſſes a very moderate turn for ſuch buſineſs, would read it in a very ſhort time.

“ If the words of a ſong could be thus conveyed by the notes, as well as the air, it would, excluſive of the contrivance, be of infinite ſervice and eaſe to ladies who ſing : indeed, it ſeems, to thoſe who are not acquainted with muſic, almoſt inconceivable, how a perſon at firſt ſight, ſhall be able to read the baſs and treble cliff, together with the words, and play two parts and ſing one, at the ſame time. It is certain that two muſicians might, by a very little application, carry on a correſpondence with their inſtruments: they are all in poſſeſſion of the ſeven notes which expreſs *a*, *b*, *c*, *d*, *e*, *f*, *g* ; and know by ear exactly when either of thoſe notes are toned ; and they are only to ſettle a correſpondence of tones for the remaining part of the alphabet : and thus, a little practice might enable two fiddlers to carry on a correſpondence, which would greatly aſtoniſh thoſe who did not know how the matter was conducted. Indeed, this is no more than what is called *dactylogy*, or *talking on the fingers*, which I have ſeen done, and underſtood as quick, and readily almoſt, as common converſation.

“ A ſecret correſpondence may be carried on by muſical notes, or by communicating the words of a ſong, by the ſame vehicle which points out the time and harmony, and this may be done (without having any knowledge of muſical compoſitions) by any common piece of muſic whatever. To do this an alphabet muſt be formed, as in *Plate* II. *fig.* 2, or in any other manner ; for it may be contrived much better for the purpoſe.

“ Then take any piece of muſic (but ſuch as is compoſed of the greateſt variety of notes will be beſt) and copy it out upon ruled muſic paper, leaving one row of blank lines between, *i. e.* thoſe lines on which the ſecond or baſs is uſually written. When you have copied the whole out, draw ſtraight lines on the baſs cliff, exactly under thoſe which divide the time in the treble. Suppoſe you would write, ‘ My time, O ye Muſes,’ &c. look for the note which is *m* in your alphabet, and then for *y* ; now, ſuppoſe there are eight or ten notes between the *m* and the *y*, then thoſe are to be marked as nulls on the baſs cliff, juſt under each note, by that mark which in muſic imports a reſt, which is this ⅂, and the confederate who has the key, knowing that the reſt-notes are nulls, only makes uſe of thoſe which are open, or which may be pointed out, by inſerting other notes exactly under them in the baſs cliff : and if the under notes are placed three notes lower on the lines than thoſe in the treble are, they will in that caſe be in harmony, and the reſts between, being in ſuch an order, will prevent any ſuſpicion, except to thoſe who underſtand muſic ; and yet even thoſe who do, would hardly ſuſpect that the notes of lady Coventry's minuet implied, as it might, an aſſignation in Groſvenor-ſquare : or, inſtead of the reſts being under the nulls, as they will of courſe be very frequently, they might be placed only under thoſe notes which convey the reading, and then the baſs cliff would appear as buſy as the treble, and tend the more to perplex the decipherer, as he could not be ſure, but both lines were employed to conceal the private writing ; indeed where letters fall very diſtant from each other in the treble, it might be ſupplied, and frequently too, on the baſs cliff, and ſignified by a dot, or ſome other muſical character, placed near the treble, more immediately above it. A letter thus written in cipher would diſconcert even a good decipherer, and throw him out of the methodical way of coming at the ſecret contents : indeed, I rather think it muſt be come at more from ingenuity than method.

“ This, however, is a hint only, how this kind of cipher may be completely made uſe of, rather than a perfect method ; but I am perſuaded, that a good compoſer of muſic would be able to write any common epiſtle, with the aſſiſtance of the treble and baſs cliff, ſo as to have very few null-notes; and the ſecret meaning inſtantly obtained by thoſe who are in poſſeſſion of the harmonic alphabet. Or, ſuppoſe every crotchet or minum, which is to expreſs a letter, is written with the tail of the note downwards, and all the nulls upwards; this indeed, might occaſion ſome awkwardneſs in the appearance of the muſic, but it would not tend at all to a diſcovery: but ſtill, what I think practicable is, that an harmonic alphabet may be ſo contrived by a good compoſer of muſic, that every note ſhall be expreſſive of a letter, and convey the words of the ſong as perfectly to the eye, as they do the harmony to the ear. The compoſer of an harmonic alphabet, ſhould be careful to include thoſe notes which are moſt frequently uſed, into his alphabet; and thoſe, I think, are on or between the five ruled muſic lines; but he muſt carefully avoid having any of thoſe notes, already ſo well known, to expreſs *a*, *b*, *c*, *d*, *e*, *f*, *g*, keeping their proper place; for that would be the firſt conſideration of an ingenious decipherer.

“ Now, if this art of writing ſecretly by muſical notes, was to be practiſed, I queſtion whether a decipherer, to be expert in his art, muſt not only be a maſter of languages, but even a diſciple of Apollo. However, according to the muſical alphabet annexed, provided a letter is written by it, and the active notes well corded between with nulls, upon the ſame lines, which might be known to be ſuch, by the tail being turned up or down, or characterized by the mark for a beat, a ſhake, a trill, a pauſe, a flat, or a ſharp, it would be ſcarce poſſible for a decipherer to make out, with certainty, the ſenſe; and this method, unpubliſhed, would be leaſt liable to ſuſpicion; for who, that examined a ſuſpected meſſenger, would think an old ſong, without words, in which perhaps the meſſenger's tobacco or ſnuff might be put, contained the ſecret he was to convey? Nor could an ordinary meſſenger, either by bribes or threats, diſcover any thing more, than that the bearer was ſtrictly charged to deliver that piece of muſic, into which he puts his tobacco, to ſuch a particular perſon.

“ It may ſeem at firſt difficult to remember what letters the notes imply, and I ſhould have thought ſo too, had not the making out of the alphabet only, impreſſed my mind with the remembrance of every letter; and yet I cannot boaſt of having a good memory; but upon trying the experiment in my family, I find that it is attainable, by writing them down two or three times, without any farther trouble. Indeed, to remember a name, or a word, it is beſt done by writing it down, though it be only with the finger upon a table, without any mark, as the having turned the form of the letters by the hand, will greatly aſſiſt the memory.

“ Biſhop Wilkins thinks it poſſible, that if inarticulate ſounds can be contrived, to expreſs not only letters and words, but things and notions, then there might be ſuch a general language formed, as might be equally ſpeakable by men of all nations, and ſo reſtore to us what we loſt by the ſecond general curſe; which is yet manifeſted unto us, he ſays, not only in the confuſion of writing, but alſo in ſpeech. But I am apprehenſive this univerſal language may ſleep quietly with the “ flying chariot,” the ſame author was once ſo buſy in conſtructing.

“ In the ſpecimen given (on *Plate* II. *fig.* 3.) of ſecret writing by the harmonic alphabet, it muſt be obſerved, that every note implies a letter alſo; and, conſequently, under ſuch a reſtraint, it can only have the appearance, and be the picture of muſic without the harmony: yet it is ſuch a picture as muſt paſs unſuſpected by all who do not underſtand muſic perfectly, and by many who do; at leaſt thoſe who do would moſt likely conſider it only a wretched attempt to compoſe muſic, without ſuſpecting that the notes conveyed two lines of true poetic harmony, from that ſweet poem of Dr. Goldſmith's, “ The Deſerted Village;” and, therefore, this method is, in one reſpect, to be preferred to every other yet practiſed, of ſecret writing; *i. e.* that it is leaſt liable to ſuſpicion. An itinerant fidler, or muſician, with his dog's-eared muſic book in his pocket, might get admittance into, or from a town beſieged, unſuſpected. A tune might be pricked down in his book, among many others, and he might be deſired to give a copy of it to any particular perſon where he is going, without ſuſpecting the miſchief, or good office, he is employed to execute, and conſequently unable to betray the ſecret; and though ſuſpicion ſhould ariſe, how will the decipherer know which, among a great number of muſical airs, conceal the ſecret information?

“ In this caſe, a good decipherer ſhould be a good muſician alſo, that he may pick out the moſt uncouth and conſtrained compoſition; for that would moſt likely prove to be the harmonic epiſtle. Therefore, to obviate this, and to render the matter leſs liable to ſuſpicion, and much more difficult to be deciphered, (in *Plate* II. *fig.* 4.) an air, compoſed of treble and baſs, according to the rules of true compoſition, is given. In this plate there are a great number of null notes to fill up, and to complete the harmony. The confederate, who is in poſſeſſion of the key and alphabet, will know the null notes by their tails being all turned upwards; and therefore, he paſſes over them, and takes down in order from the baſs and treble cliff thoſe only which are turned downwards, a circumſtance which would greatly perplex the decipherer; firſt, to find out whether all the notes were active; ſecondly, whether the baſs and treble cliff were both employed; and, laſtly, which were the null notes: yet this method is not without ſome inconveniences, and ſuch as would create ſuſpicion or ſurpriſe, in an examiner who underſtands muſic. For, being confined to turn all the nulls one way, and the active notes the other, it muſt ſometimes happen, that both muſt be occaſionally conſtrained, and the tails frequently turned contrary to the uſual practice of writing muſic.

“ It is poſſible to render this method of writing ſtill more ſecret, by placing a very thin baſs under the treble, and to put reſts, &c. under ſome of the active notes, and to point out the other by a mixture of liquor (of which there are many) that would not appear till the paper is held to the fire, dipped in water, or fine duſt thrown over it; and, under all theſe impediments, it would be very difficult to come at the ſecret matter: yet it is what a good decipherer would not, I believe, give up as a thing not to be done.

“ Were I, however, under a neceſſity to ſend a letter of the utmoſt importance, which was to paſs through the hands, or under the inſpection of cautious examiners, I ſhould think a good piece of harmonic compoſition, without any words annexed to it, the ſafeſt and moſt ſecret vehicle to convey it under. In letters, where it is neceſſary to be particular, as to the day, month, or even the hour, that may be done by a kind of ſhort-hand: for it would be very unſafe to write, though in cyphers, *Dear Sir,* at the top of a letter; or *your humble ſervant* at the bottom; or even the month, the year, or the day of the month, as thoſe words would be firſt examined by a decipherer. To avoid any of theſe clues, therefore, where the month and the day are to be given, it may be conveyed according to the Quaker's *bye-way,*—Let the twelve firſt muſic lines be conſidered to ſtand for the twelve months of the year, and then counting from the firſt, to the thirty-firſt, the days of the month. If therefore I would date my letter the 8th of April, a ſmall dot on the fourth line preceding the firſt note, as in *Plate* II. *fig.* 4.

would imply the *fourth month*, and a little daſh acroſs the eighth line, in the ſame manner, would ſhew it to be dated the *eighth day* of the *fourth month*; and a little x from the firſt to the twelfth line, would imply any particular hour in the day; or an *o* the hour of the night.

“It is very certain, that if ſuch a ſentence as the ſpecimen in *Pl.* II. *fig.* 4, contains, can be conveyed by a few lines of muſic, a long letter may eaſily be framed, within the compaſs of an Italian air in ſcore; nay, that *any* Italian piece of muſic of a tolerable length, may, by writing it with the tails properly turned up or down, according to the ſpecimen here given, be made the vehicle of a letter, or a piece of important information; and ſtill more eaſily might a good compoſer convey the words, and the harmony alſo, by the ſame characters.

“I am convinced that a good compoſer of muſic, either by framing the harmony by the alphabet, or the alphabet by the harmony, may not only render every note active, but by harmonic alphabets, might write two letters on different ſubjects, one in the treble cliff, and the other in the baſs; and it is evident, therefore, from the ſpecimen I have given, that the words of a ſong may be conveyed by the harmony; for any judicious ſinger, by dividing properly the words, and repeating them, as is uſual in ſinging ſongs, may ſing thoſe in due time, with the air which conveys them: and though I confeſs I ſee much harm might ariſe from it, yet it may be right to obſerve, by the bye, that an harmonic letter thus written could not eaſily be brought *home* with any degree of certainty (eſpecially where null notes are employed) ſo as to convict the writer in a court of juſtice; yet I cannot think myſelf guilty of an injury to ſociety, in pointing this method out, as it may be productive of much good, as well as of miſchief; for ſecret writing is abſolutely neceſſary on many important occaſions of ſtate.”

“It therefore might be right for foreign embaſſadors, or princeſſes, who are ſeparated from their families, by foreign alliances, to be in poſſeſſion of ſome kind of muſical alphabet, by which they may write, or receive letters, which are not ſuſpected to be ſo. The preſent mode, I believe, is, to do all this buſineſs, by what is obviouſly writing in cipher; and that too, by ſome method which has long been in uſe, the key to which, I have *more* than reaſon to believe, moſt of the princes in Europe are in poſſeſſion of. I will hardly believe that the K—— of ——, for inſtance, is a ſtranger to every mode of cryptographical writing by the ſeveral princes and ſtates in Europe. How often do we hear of a courier being murdered, and his diſpatches carried off? and for what other purpoſe but information? and without the key, to decipher letters ſo written, to what purpoſe ſhould they be intercepted by ſuch a deed? I have conſidered every method of ſecret writing which I have heard of, either of ancient or modern practice, and I ſubmit it to the reader's conſideration, whether writing by an harmonic alphabet is not, of all others, the moſt void of ſuſpicion: perhaps I ſhould ſay *was not*; becauſe, having publiſhed it, the ſecret is divulged.”

The reader is now in poſſeſſion of all the arguments by which Mr. Thickneſſe endeavours to recommend the practice of muſical writing; and we doubt not that this author has done his beſt, in compoſing the ſpecimens alluded to: but we will venture to predict, that no good judge of muſical compoſition would miſtake his pieces for the productions of a *maſter*.—We have added, in *Plate* II. *fig.* 5. another ſpecimen by a different hand, copied from the Encyclopædia Britannica; which, however, contains only the treble, and is as unſupportably poor and unharmonious as *fig.* 3.—We allow that *fig.* 4, having both the baſs and the treble, looks more like muſic, after the alterations we have made; but if it were perfectly corrected in the mechanical part, it ſtill would be called bad harmony and a puerile compoſition by any real judge of muſic. This latter piece might very poſſibly paſs without ſuſpicion; and then, it ſignifies nothing what faults it contains: only, let it not be held up for imitation, while the tails of ſome notes are turned the wrong way, the treble and baſs ill adjuſted to each other, and the ſeveral component parts of the ſpecimen do not (or, at leaſt, did not, before we amended it) accord truly in time!

If the difficulty of conducting a correſpondence in this way be ſo great, and the labour of compoſing it ſo conſiderable, we ſhould rather give the preference to Lord Bacon's idea of a bi-formed alphabet; which is not more liable to ſuſpicion than the muſical cipher, and is much leſs intricate, as well as better adapted for the uſe of perſons unſkilled in harmonics.

The mere circumſtance of expoſure to *ſuſpicion* may eaſily be ſhunned, by interlining, or writing acroſs any common epiſtle with diluted acids; as for inſtance, with one part of oil of vitriol, mixed in ten parts of water, which will be rendered viſible only when the paper is held to a fire. Authors mention the ſame peculiarity in a ſaturated ſolution of *ſal ammoniac*, and the juice of onions; or, we may write with a ſtrong decoction of galls, which will not be apparent, until the paper has been waſhed over with a ſolution of copperas. (See the article Ink.) Another method of preventing ſuſpicion, inſiſted on by Schottus and others, is this:

Take two pieces of paſteboard or ſtiff paper, through which cut long ſquares, at different diſtances, as you will ſee in the following example. One of theſe pieces you keep yourſelf, and the other you give to your correſpondent. When you would ſend him any ſecret intelligence, you lay the paſteboard upon a paper of the ſame ſize; and in the ſpaces cut out, you write only what you would have underſtood by him, and then fill up the intermediate ſpaces with ſomewhat that makes a different ſenſe with thoſe words.

| I ſhall be | much obliged to you, as reading | alone | engages my attention | at | preſent, if you will lend me any one of the | eight | volumes of the Spectator. I hope you will excuſe | this | freedom; but for a winter's | evening, | I | don't | know a better entertainment. If I | fail | to return it ſoon, never truſt me for the time | to come. |

A paper of this ſort may be placed four different ways, either by putting the bottom at the top, or by turning it over; and by theſe means the ſuperfluous words may be the more eaſily adapted to the ſenſe of the others.

This is an eligible cipher, ſo far as it is free from ſuſpicion, but it will do only for ſhort meſſages: for if the ſpaces be frequent, it will be very difficult to make the concealed and obvious meanings agree together; and if the ſenſe be not clear, the writing will be liable to ſuſpicion.

It would be an endleſs taſk, which we by no means attempt, to lay before our readers all, or even half, the various methods propoſed for ſecret writing. By far the greater number of them, eſpecially the more ancient ones, are inſecure; and however their reſpective inventors may have held them up to public notice, the art of deciphering has of late been ſo ably cultivated, that very few indeed are entitled to full confidence in a time of extremity.—Mr. J. Falconer, who has ſhewn uncommon induſtry and acumen in this way, believed “that the moſt ſure cipher, practicable in a current converſe, may make a diſcovery;” and “if you once underſtand the rules for deciphering in one language, (ſays he) you may really and without reſervation, in a few hours, underſtand as much of any other language as is needful to reduce it out of cipher." With like confidence, the learned Conrad, author of "Cryptographia Denudata" thinks this branch of the art is ſo completely *infallible* "that the explication of any ſecret writing may be ſecurely undertaken for a large wager." We will endeavour to condenſe the beſt rules given for this purpoſe, not only by both the above authors, but by other perſons ſkilled in deciphering; to which we ſhall add, occaſionally, ſome practical remarks of our own.

A writer in the Gentleman's Magazine, (June 1761), although he acknowledges himſelf "not verſed in ſecret alphabets," but who "happened to hit upon one" which gave him an high opinion of his own abilities, was ſo preſumptuous as to affirm "it might be demonſtrated that there never hath been invented, and that it is impoſſible to invent, another cypher which ſhall not be inferior to his by very many degrees." This overweaning conceit is not at all uncommon in ſuch caſes. Perſons who have never ſtudiouſly applied to this ſubject, are apt to fancy the art of writing by cipher is eaſily acquired, and that what they "happened to hit upon," perhaps without mature deliberation, is incapable of a diſcloſure: whereas they who have moſt ſeriouſly weighed all the ſubtleties of this art, confeſs that it is a very difficult matter to write by any alphabet, admitting of a current uſe, without hazarding a diſcovery of the ſecret.

The two earlieſt ſyſtematic authors, whoſe cryptographic labours have deſcended to poſterity, *viz.* Trithemius and J. Baptiſt Porta, appear to have entertained very high notions of their reſpective diſcoveries; but before the end of the ſixteenth century, it was found that no method then invented could eſcape detection, when ſubmitted to the examination of Vieta. (See Dict. Moreri, art. *Vieta).* The modes of writing employed more than forty years afterwards, from A. D. 1642 to 1652, when our countryman Wallis flouriſhed, were alſo deemed inſcrutable by their reſpective advocates, until this able mathematician proved the contrary. And although ſome general rules may be laid down for the aſſiſtance of decipherers, it is to be obſerved, "that every new cypher, being contrived in a new way, does not admit any conſtant method of finding it out; but, (ſays Dr. Wallis) he that will do any thing in deciphering, muſt firſt furniſh himſelf with patience and ſagacity; and make the beſt conjectures he can, till he happen upon ſomething that he may conclude with for truth." (See Davys' Eſſay on Deciphering, &c. 4to. 1737.) Many writers have handled this ſcience with great learning and ability: but, for an enumeration of them, we refer to Breithaupt's "Ars Decifratoria," 1737; wherein will be ſeen a regular hiſtory of its progreſs, eſpecially as it relates to deciphering on the continent.

Dr. Wallis properly remarks, that "all perſons are not qualified or capable of acquiring the art of deciphering, and that a certain degree of acumen is requiſite for this purpoſe; indeed, thoſe who are equal to the taſk, are not always willing to give the labour and time neceſſary to accompliſh their deſign." (Letter to Leibnitz, Jan. 16, 169$\frac{8}{9}$). We are therefore not to wonder that ſo few perſons attain to a moderate degree of excellency, or even endeavour to cultivate this art, in any ſingle age. It is not only requiſite that a ſtudent ſhould meet with a quantity of writing ſuitable to the difficulty of the cipher he examines, "without which," ſays Dr. Wallis, "he may eaſily fail of ſucceſs;" but he muſt obtain all the collateral information poſſible, relative to the language in which the cipher may probably be written,—the period in which it was compoſed,—the device moſtly uſed in that period,—the quarter from whence it comes,—the place whither it was deſtined,—the perſon for whom it was intended,—and ſuch other external circumſtances as will lead to a diſcovery of the buſineſs in agitation; for a decipherer needs all the incidental aids within his reach: he muſt learn to fortify himſelf previous to the engagement, "& conſilium in arenâ capere."

We have mentioned the Lacedæmonian ſcytale as one of the moſt ancient ways of ſecret correſpondence, (but not invented by Archimedes, as Trithemius and others ſuppoſe); and, therefore, it may be proper firſt to ſhew the means of fruſtrating the deſign of that contrivance. Mr. Falconer, after Scaliger, propoſes to join the edges of the paper together by a ſerpentine revolution, ſo as to unite both portions of the divided letter, which will give the circumference of the ſcytale to frame a ſtaff by; or you may add piece to piece, ſays he, after the firſt letter is joined, until the ſolution has been completed. But Mr. Thickneſſe wonders that Scaliger did not think of a much more ready method; that is, by cutting the ſcroll quite through the middle between the half letters, and then, by applying the two broken edges of the letters together, on a table, they will appear perfect ſo as to expoſe the reading.

Something like the plan of Polybius, for correſponding by flambeaux, is generally practiſed during a war at St. Roak, a high ſituation near Gibraltar, to inform the governor of Cadiz of the number of men of war off Gibraltar, or the number which have ſailed out of the bay, &c. which might be diſconcerted by exhibiting the ſame kind of lights at the ſignal houſe on Gibraltar-hill, at preciſely the ſame time when the Spaniards ſhewed theirs. Mr. Thickneſſe tells us, the Spaniards, by thoſe lights, expreſſed letters and figures; nay, that he had even acquired their method in ſome meaſure, but dared not diſcloſe it to the Engliſh governor, "fearing a court-martial and a caſhirement: for I do inſiſt upon it," adds he, "that a governor ſo ignorant or indolent as not to defeat ſuch a kind of correſpondence, would be wicked or fooliſh enough to puniſh any officer who preſumed to dictate to him," as it would be called. "Yet every information of this kind may be defeated, and falſe alarms given to the Spaniards at Cadiz, by a governor who would take half the trouble to ſerve his country which he does to enrich himſelf and diſtreſs thoſe under his command." See p. 33, of "A Treatiſe on the Art of Decyphering," 1772.

In examining a piece of writing performed by newly invented characters, we ſhould endeavour to aſcertain whether the number of them correſponds, or nearly ſo, with the ordinary number of alphabetical letters. We may ſometimes detect a weakneſs in the writer, of having ſelected his moſt ſimple marks either for the vowels or the firſt letters in the alphabet, and his complex marks for the conſonants or the letters moſt remote from *a*, *b*, *c*, &c. We muſt obſerve which of the characters, whether taken ſingly or combined, occur the ofteneſt in the whole ſpecimen; and of theſe, probably, the moſt frequent will repreſent *e*, *a*, *i*, *o*; *e* being much more common than the reſt of the vowels, but *u* and *y* are even leſs frequent than many conſonants.

Endeavour next to aſcertain the beginning and ending of words, which are ſometimes diſtinguiſhed by ſpaces, or points, or nulls, interpoſed; but, however it be done, you muſt expect theſe ſigns to occur after every few letters, and the frequency of their occurrence may ſerve as ſome guide.

When you have found out the diſtinction between words, take particular notice of the order, number, frequency, and combination of the letters in each word; and firſt examine the characters of which the ſhorteſt monoſyllables are compoſed. Remember, 1. That no word can be without a vowel: a word of one letter muſt therefore be a vowel, or a conſonant with an apoſtrophe. 2. That the vowels are more frequently doubled at the beginning of words, than the conſonants; indeed, the latter are only doubled in the beginning of Spaniſh and Welſh words. 3. That the vowels moſtly exceed the conſonants in ſhort words; and when the double conſonants are preceded by a ſingle letter, that letter is a vowel. 4. That the ſingle conſonant which precedes or follows double conſonants, is *l*, *m*, *n*, or *r*. 5. That the letter *q* is always followed by *u*; and when two different characters occur, the latter of which is often joined with other letters, but the former never found alone, nor joined with any than the latter, thoſe characters ſtand for *qu*, which two, except in a few Scotch names, are always followed by a vowel. 6. That although every language has ſomething peculiar in its ſtructure, the foregoing obſervations will apply to all the ſpecimens we have given of the European tongues in the ſeveral parts of this article. See eſpecially the ſeries of examples above, in eight different languages.

In the Engliſh, let it be remarked, that *and* and *the* are more often found than any other words; *h* is frequently preceded by *w*, *c*, *ſ*, and *t*; *y* is ſeldom uſed in the middle of a word; the double letters *ll* and *ſs* appear frequently at the end of words; *ed*, *ty*, *ly*, *ing*, and *tion*, are very common terminations; *em*, *in*, *con*, and *com*, are frequent prepoſitions; *a*, *i*, and *o*, may ſtand alone; *o* is often followed with *u*; *e* is much more frequent in the beginning and end of words than in the middle; and in Engliſh, the *e* is continually employed, as in *yes*, *yet*, *her*, *never*, *me*, *we*, *the*, *he*, *ſhe*, *they*, *ye*, *fee*, *ſee*, *be*, *ever*, *ſpeed*, *need*, *deference*, *excel*, *exceſs*, &c. Though this will not hold good in the Latin, as *e*, and *i*, are equally frequent in the latter, and next to theſe, *a* and *u*; but *o* not ſo common as any of them: and yet, in the Spaniſh and Italian, *o* occurs very frequently. When you meet with a character doubled, in the middle of a word of four letters, it will be neceſſary to conſider what words of four ſyllables are ſo ſpelt. It is probable the vowels *e* or *o*, are theſe; as *meet*, *feel*, *good*, *book*, *look*, &c. In polyſyllables, where a double character appears in the middle of a word, it is for the moſt part a conſonant; and if ſo, the preceding letter is always a vowel.

Obſerve alſo, that *i*, in Engliſh, never terminates a word, nor *a* or *u* except in *flea*, *ſea*, *you*, or *thou*: again by comparing the frequency of the letters, you will generally find *e* occur the ofteneſt; next, *o*, then *a*, and *i*; but *u*, and *y*, are not ſo often uſed as ſome of the conſonants, eſpecially *s* and *t*. Among the vowels, *e* and *o* are often doubled; the reſt ſcarce ever; and *e* and *y* often terminate words, but *y* is much leſs frequent, and conſequently eaſily diſtinguiſhed.

To find out one conſonant from another, you muſt alſo obſerve the frequency of *d*, *h*, *n*, *r*, *ſ*, *t*; and next to thoſe, *c*, *f*, *g*, *l*, *m*, *w*; in a third rank may be placed *b*, *k*, *p*, and laſtly *q*, *x*, *z*. This remark, however, belongs to Engliſh: for in Latin common conſonants the are *l*, *r*, *ſ*, *t*; next *c*, *f*, *m*, *n*; then, *d*, *g*, *h*, *p*, *q*; and laſtly, *b*, *x*, *z*. But the firſt difficulty is to come at the knowledge of three or four letters, therefore where a word of four letters hath the firſt and fourth the ſame, it is moſt likely to be *that*: to diſcover which look for another of four letters, beginning with the two firſt, and ending with two others, and it will probably prove to be *this*; and more eſpecially if you find another with three letters, beginning with the firſt two, for in that caſe it muſt be *the*. Now having found out in any part of the cipher theſe three words, *that*, *this*, and *the*, place them over the characters which you know to be *t*, *h*, *a*, *i*, *ſ*, *e*, and then conſider what letters are deficient, and what words, from the number of letters which compoſe them, they are moſt likely to be. You will thus find ſuch ready and ſurpriſing intimations from the above ſix deſerters, previouſly apprehended, that you will ſoon be in poſſeſſion of the whole battalion.

Where words of two letters appear of the ſame characters, differently placed, it is moſt likely one is *on*, the other *no*: ſo *of*, and *for*, and *from*, diſcover and convict each other; and *th* are very often uſed in the beginning of Engliſh words, as, *the*, *that*, *this*, *them*, *theſe*, *their*, *thirſt*, *thwart*, &c. &c.

Beſides theſe peculiarities, Mr. Falconer points out the following, as applicable to the Engliſh:

	Beginning a word is regularly followed by
A	moſt of the letters.
B	a, e, i, l, o, r, u, y.
C	a, e, h, i, l, o, r, u.
D	a, e, i, o, r, u.
E	moſt of the letters.
F	a, e, i, l, o, r, u, and ſometimes y.
G	a, e, h, i, l, n, o, r, u, y.
H	vowels only.
I	moſt of the letters.
K	a, e, i, n.
L	vowels only.
M	vowels only.
N	vowels only.
O	moſt of the letters.
P	a, e, h, i, l, o, r, ſ, ſometimes t, u, y.
Q	only by u, and QU by a, e, i, o.
R	a, e, ſometimes h, i, o, u, y.
S	a, c, e, h, i, k, l, m, n, o, p, q, t, u, w, y.
T	a, e, h, i, o, r, u, w, y.
U	ſometimes d, and g, l, m, n, p, ſometimes r, ſ, t, x.
V	vowels only.
W	a, e, h, i, o, r, y.
X	ſometimes a, or e.
Y	e, ſometimes i, o.
Z	e, ſometimes o.

It would be too prolix in us to give an equally minute account of the particularities in other languages; but the inquiſitive reader will find them very well ſpecified, in the "Cryptographia Denudata" of D. A. Conrad, 8vo. Lug. Bat. 1739, and in the latter part of Breithaupt's "Ars Decifratoria, ſive Scientia occultas Scripturas ſolvendi et legendi," Helmſt. 12mo. 1737.

To exerciſe the Engliſh ſcholar, we here ſubjoin one example of plain ciphering, in which two figures anſwer to each letter:

39. 38,31,21,35. 35,14,20,18,21,19,20,35,34. 20,38,39,19. 32,35,31,18,35,18. 22,39,20,38. 13,31,14,24. 20,38,39,14, 37,19. 31,19. 20,15. 20,38,35. 13,31,14,31,37,39,14.37. 15,36. 20,38,35. 31,36,36,31,39,18. 18,35,17,21,39,19,39, 20,35. 36,15,18. 24,15,21. 20,15. 11,14,15,22. 18,35,13, 35,13,32,35,18. 20,38,31,20. 15,14, 14,15. 31,33,33,15, 21,14,20. 24,15,21. 36,31,39,12. 20,15. 13,35,35,20. 13, 35. 31,20. 14,39,14,35. 20,15 13,15,18,18. 15,22,19. 14, 39,37,38,20. 36,15,18. 22,35. 13,21,19,20. 14,15,20. 14, 15,22. 34,35,12,31,24. 20,38,35. 19,21,18,16,18,39,25,35. 15,36. 20,38,35. 33,31,19,20,12,35. 22,38,35,14. 20,38, 39,14,37,19. 31,18,35. 39,21,19,20. 18,39,16,35. 36,15, 18. 35,23,35,33,21,20,39,15,14.

By practiſing the foregoing rules, the ſtudent will find that this method of ſecret writing in plain cipher, may with as much eaſe, if not with as much ſpeed, be deciphered as written.

In all caſes, begin firſt to decipher the ſingle characters and ſhorteſt monoſyllables; mark down on a ſeparate paper any correſponding letters and ſigns you diſcover, and count the different characters throughout the piece in order to compare their frequency, &c. It will generally, if not always, happen that the moſt frequent is *e*.

We ſhall now conſider ſome ways of fruſtrating theſe rules, and the methods of procedure in ſuch caſes. The firſt we notice, is that of writing not only without any diſtinction between the words, but alſo by altering their relative poſition: this was the late Earl of Argyle's method, and it was then thought abſolutely undecipherable. See "An Account of the Diſcoveries made in Scotland of Conſpiracies againſt his Majeſty's Government." Mr. Thickneſſe ſays, he has ſeen many ways of explaining this cipher, but, he thinks, the beſt is to mark the concurrence of *proper* words. Take this as a ſpecimen:

I,	*know*	*not*	*the*	*grounds*	*our*	*friends*	have
gone	upon	which	hath	occaſioned	them	to	offer
ſo	little	money	as	I	hear	neither	know
I	what	aſſiſtance	they	do	intend	to	give
and	'till	I	know	both	I	will	neither
refuſe	my	ſervice	nor	do	ſo	much	as
object	againſt	any	thing	is	reſolved	'till	I
firſt	hear	what	Mr.	Red	or	any	other
you	ſend	ſhall	ſay	only	in	the	mean
time	I	reſolve	to	let	you	know	as
much	of	the	grounds	I	go	on	as
is	poſſible	at	this	diſtance	and	in	this
way	I	did	truly	in	my	propoſition	mention
the	very	leaſt	ſum	I	thought	could	do
our	buſineſs	effectually	not	half	of	what	I
would	*have*	*thought*	*requiſite*	*in*	*an*	*other*	*juncture, &c.*

When Lord Argyle had written a letter, of which the above is a part of one, he filled up the ſpaces with any words which occurred, and then it appeared thus:

I gone ſo I and refuſe object firſt you time much is way the our would have buſineſs very I poſſible of *I* ſend here againſt my 'till what little upon *know not* which money aſſiſtance I ſervice any what ſhall reſolve *the* at did leaſt effectually thought requiſite not ſum truly this *grounds* to ſay Mr. Thing nor know they as hath grounds occaſioned I do both do is Red only let I diſtance in I half in an of thought my and go you in or reſolved ſo I intend he or them *our friends*, &c. &c. &c.

Now as we obſerved above, mark but the concurrence of proper words, and eſpecially if they be at equal diſtances (and ſo his letter is written) then the number of words between theſe is the column; and thus the buſineſs is done: there may indeed be a proper coincidence by chance; but if you lay hold of ſuch only as aree quidiſtant, they muſt develope the matter where the writer goes down one column and up another. And this is a much readier and more certain method, than that laid down by *Falconer*.

The earl of Argyle was much uſed to write alſo without diſtinguiſhing words; "but," ſays Mr. Falconer, "you may nevertheleſs diſtinguiſh between vowels and conſonants, and each of theſe amongſt themſelves: nay, you may make ſuppoſitions for words; and having found two or three letters, or one word, your difficulty is over; ſo that the rules already laid down, will be ſufficient for deciphering the remainder."

Notwithſtanding Mr. Falconer's extreme confidence, we believe it would be no eaſy thing to diſtinguiſh one word from another, and one letter from another, whether vowels or conſonants, in a ſpecies of writing we ourſelves have invented; of which ſome examples occur at the end of this article, and in *Plate* III.

The inſertion of nulls, or non-ſignificant letters, is another mode of confuſing the cipher; and, to overcome this difficulty, it is requiſite,

1ſt, That you take the number of the different characters in the epiſtle; and if that exceed the number of the alphabet, it is probable mutes are intermixed with the ſignificant letters. We have ſaid probable, becauſe there may be characters inſerted to expreſs relatives and ſyllables, &c.

2. Obſerve the frequency of the ſeveral characters, and by this means you may diſtinguiſh thoſe nulls from ſignificant letters; for it is obvious, that if many inſignificant characters be uſed, they ſhall not be frequent; at leaſt moſt of them ſhall be but rarely inſerted, which will do no great feats: if only a few in number, and conſequently their places the more frequent, they are yet by ſuppoſition diſtinguiſhable from the vowels and conſonants of moſt uſe in writing; eſpecially if you conſider the order and coherence amongſt the ſeveral characters. This admits of no particular rules; nor will the judicious need any.

3. After you have found out the real alphabet, or all the mutes, there is no new difficulty.

There is an invention of ſecrecy much inſiſted on (though none of the ſwifteſt) by the author of the "Secret and Swift Meſſenger," and others; which is, beyond any yet mentioned, for intricacy, wherein each particular line, word, or letter, is written by a new alphabet: but the cited author himſelf acknowledges it too tedious for a current correſpondence, which cannot be entertained this way, but at a vaſt expence of time and trouble, to put it in, or take it out of cipher, even by the key. And ſecret information, in ſeveral exigencies, muſt be ſpeedy, or it will be unprofitable; ſo that in effect it is impracticable for the end it is deſigned.

However, leſt it ſhould obtain too much credit, if ſuppoſed undecipherable, its difficulties are conſidered by Mr. Falconer.

And, firſt, the way of writing by it is this: the confederates determine upon ſome word or ſentence, that ſhall lock and unlock their miſſives; or the key may be ſent in the letter, in ſome word or ſentence privately marked, or by compact agreed on, ſuch as the firſt or laſt line, &c. to ſerve for the key. Suppoſe, ſays Mr. Falconer, it ſhould be "Policy's preheminence," there muſt be ſeveral alphabets framed for each of its letters in the manner following:

1	A	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	w	x	y	z
2	P	q	r	s	t	u	w	x	y	z	a	b	c	d	e	f	g	h	h	k	l	m	n	o
3	O	p	q	r	ſ	t	v	w	x	y	z	a	b	c	d	e	f	g	i	i	k	l	m	n
4	L	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g	h	i	k
5	I	k	l	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g	h
6	C	d	e	f	g	h	i	k	l	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b
7	Y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	ſ	t	u	w	x
8	S	t	u	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r
9	P	q	r	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o
10	R	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q
11	E	f	g	h	i	k	l	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d
12	H	i	k	l	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g
13	E	f	g	h	i	k	l	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d
14	M	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l
15	I	k	l	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g	h
16	N	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m
17	E	f	g	h	i	k	l	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d
18	N	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m
19	C	d	e	f	g	h	i	k	l	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b
20	E	f	g	h	i	k	l	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d

If they agree, that the lines only ſhall be written by a new alphabet, the firſt line ſhall be made according to the firſt alphabet A.P. the ſecond line according to the ſecond alphabet, viz. A.O. the third alphabet is A.L. &c. the firſt line being an index ſucceſſively to all the reſt. And when they have gone through the table, they may begin anew, or go backwards again, &c.

If words are only written by one alphabet, then every new word is written by a new alphabet; and ſo of letters. We have hereunto ſubjoined an example for each, viz.

I. *Example in the line.*

Ypb vdgrts id ztte ixt hdaſytgh
idcb wofr rihm obr rihm rxſh :
dfaawi fd, zc eſpi gtww cpfzwe ez
cqn nwuxg bynnmrtg. Qibcn.

I am forced to keep the ſoldiers
upon hard duty and hard diet:
ſupply us, or they will revolt to
the enemy ſpeedily. Haſte.

Solution.

1. When there is only one alphabet uſed for a line, the writing might be diſcovered as in plain cipher, if you make a new operation for each line. But there may be other ways to decipher any ſuch writing: for,

2. If you find out but one letter in a line, (and that may certainly be done by a few ſuppoſitions) it will of itſelf give an alphabet for that whole line, as you may perceive by the counter-table, which follows; for, the confederate's table being framed, ſo as the firſt line may be an index to all the reſt of the lines which are ordered by ſome word or ſentence that is the key, every letter of ſuch a word or ſentence muſt be once ſuppoſed to ſtand for A. Now in the counter-table you ſee all the letters in the alphabet to be once ſuppoſed A: therefore you need only to ſearch for I in the upper line of it, and try in what line Y is oppoſite to it; and thoſe two lines give you an alphabet. Or ſet down the letter found under the letter that expreſſeth its true power, and completing the laſt line, you have the alphabet; *e. g.* if you ſuppoſed Y, in the example given, to expreſs the power of I, firſt write down the twenty-four letters in their uſual order, and under I place Y; then, going on in order, your alphabet is this for the firſt line:

A	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	w	x	y	z
P	q	r	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o

1	A	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	ſ	t	u	w	x	y	z
2	B	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a
3	C	d	e	f	g	h	i	k	l	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b
4	D	e	f	g	h	i	k	l	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c
5	E	f	g	h	i	k	l	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d
6	F	g	h	i	k	l	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d	e
7	G	h	i	k	l	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d	e	f
8	H	i	k	l	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g
9	I	k	l	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g	h
10	K	l	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g	h	i
11	L	m	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g	h	i	k
12	M	n	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l
13	N	o	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m
14	O	p	q	r	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n
15	P	q	r	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o
16	Q	r	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p
17	R	ſ	t	u	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q
18	S	t	u	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r
19	T	u	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	ſ
20	V	w	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	ſ	t
21	W	x	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	ſ	t	u
22	X	y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	ſ	t	u	w
23	Y	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	ſ	t	u	w	x
24	Z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	ſ	t	u	w	x	y

This *Counter Table* needs not much explanation, being but an exhibition of ſuch alphabets as you may frame by yourſelf upon every new ſuppoſition.

Having found one alphabet for the firſt line, you have likewiſe by this means the firſt letter of the key. *E.g.* In the fifteenth line of the table, Y ſtanding againſt I, and P beginning that line (as you may perceive) P muſt be the firſt letter of the key; and if you peruſe the foregoing collection of what letters can be joined in the beginning of words, you will find *a*, *e*, *h*, *i*, *l*, or *o*, &c. muſt follow P: ſo that at worſt, to get another alphabet for the next line, it will coſt but ſo much pains as to make trial of all thoſe letters by ſuppoſition; as firſt, what letter in the firſt line is againſt *i*, in the fifth line beginning with E, (for A cannot regularly follow P in this particular method, elſe the letters in the ſecond line of the writing ſhould have their uſual ſignification without any tranſpoſition;) and finding that E cannot be the ſecond letter of the key, becauſe the cipher from that ſuppoſition is in as great confuſion as ever, next try what letter is oppoſite to *i* in the line H. Still ſuppoſing a-new, until you find the ſecond line to produce ſenſe. And ſo of all the reſt.

Or you may take the ſame meaſures from the letters or ſyllables found, in the writing itſelf.

Or you may proceed to find the alphabet of the ſecond, third, or any other line, as you did for the firſt, *viz.* ſearching after the power of ſome letter in the ſecond line, by the ordinary rules; and, according to the greateſt probability, in that ſearch, from the frequency of the letter, or other help, to make trial by your counter-table.

II. *Example in the words.*

Y oa qzcnpo cx mggr rfc lgdwbxkl
kedc zriv hzyc hvl mewh puqf:
bdyytg hf, ſw gvrl ylnn wizſpy id
hws pypxi bynnmrtg. Kcvwg.

Solution.

When the alphabet is changed at every word, you may either make ſuppoſitions from words, or from letters that fall in the end or beginning of the ſeveral words in the writing, until you have made ſome progreſs in the letters of the key; and then proceed as before.

You may likewiſe find out by ſuppoſition, the number of letters in the key, &c. which will much facilitate the work. Thus:

1. Having found an alphabet for the firſt, ſecond, or indeed any word near the beginning of the epiſtle, go through all the immediate following words, until you find another that is deciphered by the ſame alphabet.

2. From the laſt found word count the like number, and you have a new word decipherable by the found alphabet: and thus you may go on until you have once gone through the whole writing, marking the whole ſeries with ſome peculiar mark: and then,

3. Begin the epiſtle again at ſome word immediately before or after that which was firſt found, and count forwards as before, until you come to the end of the epiſtle.

4. Afterwards obſerve the ſame method, until you have diſtinguiſhed the whole writing, giving each reſpective ſeries of words ſome particular mark of diſtinction. And in the end, having found out but one letter in ſuch a ſeries of words, it gives an alphabet to decipher all that ſeries by, as was obſerved in lines, &c. *E.g.* Y therefore, the firſt word in the example, expreſſing the power of I, you ſhall find the twentieth word *id* decipherable by its alphabet, *viz.* A, P, and conſequently *hws*, the one-and-twentieth word in the writing, but twentieth after *oa* the ſecond word, to have one alphabet with it; and in the ſame order *pypxi* to have one alphabet with *qzcnpo;* and *bynnmrtg* and *cx* to be denoted by the ſame alphabet, &c.

Now if the writing were long (as it muſt be to contain *Propoſals*, *Emergencies*, and other circumſtances) the uſe of the foregoing obſervations will be evident.

But there is an exception to theſe rules; for you will ſee in the example, that the firſt word Y and the ſeventh word *Lydwbxkl* are written by the ſame alphabet, but not the ſeventh from that, viz. *puqf*, nor the ſeventh from *oa*, viz. *kedc*, &c. and the reaſon is, becauſe the letter P is twice repeated in the words of the key. So that when you find this happen in deciphering, leave ſuch words, and go to the next, until you find the true number of letters that make up the key by the former rule; and then this difficulty becomes a help in the operation, &c.

III. *Example in the letters.*

Y ox oqpvtv yw oqnc yvg xdzorgpl
kgſn mmaq hhwc pbo qcpw ſaib:
xgycpl xx, df eqgw oycp, zigxyy gq
yxs pwgkq hgimhvtl. Mnvyh.

Solution.

To decipher this laſt kind of ſecret writing, your muſt begin with ſuppoſitions; and,

1. Extracting out of it the monoſyllables, &c. you may ſuppoſe all the words in it of three letters ſucceſſively to ſtand for *the*, or *and*, &c. and you may prove your ſeveral ſuppoſitions thus: *viz.* 1. Mark down the powers ſuppoſed. 2. Obſerve in what lines of your counter-table the letters expreſſed in the cipher are oppoſed to them in a perpendicular line. 3. Obſerve the firſt letters of thoſe lines, and you will ſoon find whether they can be joined to make up a part of the key: *e g.* let *yvg* in the firſt line of the example be ſuppoſed *the*; *y* is oppoſite to *t* in line fifth, beginning with E; *h* to *v* line thirteen, beginning N; and *e* to *g*, line third, beginning C. So that having found *enc* in the beginning of theſe ſeveral lines, it is probably ſome part of the key.

2. You may proceed in the ſame manner to other monoſyllables, &c. in any part of the epiſtle; or you may conſider what letters can follow *enc*: and thus *e* being moſt probable, look in that line of your table beginning with E, for *x* the following letter in the cipher, and its oppoſite letter in the upper line, which is S; and afterwards you may go on with probable ſuppoſitions, either from the letters found in the key or in the writing.

Perhaps theſe methods will not ſo readily give you the entire key, yet they are good helps.

You may otherwiſe begin your ſuppoſitions with the firſt letters in the writing; and, for that end, we have heretofore added, in alphabetical order, the letters which can be joined to each other to begin words.

And, from all together, you may in a ſhort time find out the number of letters in the key; and here that is of as much uſe as in the other ways of writing by the key character, ſince thereby you have the ſeveral returns of each alphabet.

When the alphabet is changed for every word or letter, the frequency of the letters will not agree with that in an epiſtle written in plain cipher, where one character always expreſſes the ſame power: for, as to this laſt, you ſhall but rarely find two or three characters of the ſame frequency; but by a continual altering of the alphabet you ſhall have a great many. *E. g.* In the laſt example you have no leſs than ſeven different letters twice repeated, viz. *a, b, d, k, ſ, t, z,* three letters thrice repeated, two letters four times repeated, three letters five times repeated, three letters ſeven times repeated, and two letters nine times repeated.

Again, in one line of an epiſtle where the alphabets are continually altered, you ſhall have more differing characters than in two, where one alphabet is only uſed in the whole writing. In the example you have the complete number of the alphabet; whereas in the writing,

viz. I am forced to keep the ſoldiers
upon hard duty and hard diet:
ſupply us, or they will revolt to
the enemy ſpeedily. Haſte.
there are wanting, *b, g, q, x, z.*

We have already obſerved, that this method of cryptography requires too much time to be put in practice: but beſides, it is not only impracticable upon that ſcore, (for by the leaſt miſtake in writing, it is ſo confounded, that the confederate with his key ſhall never ſet it in order again) but withal, it is liable to ſuſpicion: ſo that it has none of thoſe things required in ſecret writing, except that there is difficulty in deciphering it; and that not inſuperable, as is made apparent.

For many of the ſubſequent, as well as preceding obſervations, we are indebted to Mr. Falconer; an author we have had frequent occaſion to commend, and who particularly excelled in ſuch intricate diſcuſſions. As that gentleman's work is very ſcarce, we ſhall render the public a ſervice in making ſome parts of it better known, by theſe copious extracts.

We next mention the mode of communicating any ſecret intention with ordinary letters, by the aid of a few figures; which, Schottus ſays, was the invention of count Gronsfeld, and ſeems to elude the common rules for deciphering.

1. The confederates diſpoſe the letters of the alphabet in a line or circle, over which they place any number of figures, *e. g.* 436, in this manner.

436
a b c d e f g h i k l m n o p q r s t u w x y z.

2. They write their ſecret intentions on a paper apart, and over the tops of the letters they place the number of figures agreed on. Let the words be theſe:

“The governor of the city is beyond corruption, ſo that we may conclude there is nothing of briberie will ſerve the turn.”

Which words, according to the example, will ſtand thus:

436 43643643 64 364 3643 64 364364 3643643643
The governor of the city is beyond corruption,

64 3643 64 364 364364436 43643 64 3643643 64
ſo that we may conclude there is nothing of

364364436 4364 36436 436 4364.
briberie will ſerve the turn.

3. Obſerve what figure ſtands over the firſt letter of the writing, (*viz.* T.) which is 4, and counting forward as many letters, write down the fourth, *viz. x*; again ſee what figure is over the ſecond letter (*viz. h.*) which figure is 3; then counting three letters from *h*, the third is *k*; next write down the ſixth letter from *e*, which is alſo *k*: and ſo they proceed, always obſerving the letters in the writing to be ſecretly communicated, and the figures above it, until they come to the end of the epiſtle. The example being finiſhed, will ſtand thus:

xkk kqahtsrt ti wnh eoxa ow dkbqſg etvtaſworp yr wndw bh ofb etqeqyfk xkkvg ow ptxkoqi ti dxmdkvlk zlqo vkvxk xkk xxxq.

Solution.

To decipher this kind of ſecret-writing, you may,

1. Tranſcribe the cipher out of the epiſtle, keeping the lines and letters at ſuch a diſtance from one another, that each letter may admit of a figure diſtinctly above it.

2. Endeavour to find the number of figures in the key which muſt be inquired into by ſeveral ſuppoſitions.

3. The number of figures being ſuppoſed, *e. g.* 3, take any three figures, *e. g.* 123, and place them above the tops of the letters in cipher in this order:

123 12312312 31 231 2312 31 231231 2312312312
xkk kqahtſrt ti wnh eoxa ow dkbqſg etvtaſworp

31 2312 31 231 23123123 12312 31 2312312 31
yr wndw bh ofb etqeqyfk xkkvg ow ptxkoqi ti

23123123 1231 23123 123 1231.
dxmdkvlk zlqo vkvxk xkk xxxq.

4. Obſerve where the ſame character and the ſame figure happen to fall together, and you will find that thus it always expreſſeth the ſame power as in the example; K with 3 placed above it has the power of E through the whole writing; X with 1 upon the top of it ſignifies H, &c. But,

5. The ſame letter, when its figure is altered, cannot expreſs the ſame power: *e. g.* Q with 1, expreſſes N; but Q with 2 ſignifies O, and Q with 3, L, &c.

6. One and the ſame letter will be expreſſed by different characters: *e. g.* Q with 2, R with 1, and T with 3, expreſs ſeverally O in the writing.

7. Two letters of the ſame power cannot be joined together in the ſame character; and, conſequently, where you find any character double in a writing of this nature, it expreſſes different powers.

8. Having made theſe or the like general remarks, you may proceed to diſcover particular ſyllables or words, as in the preceding paragraphs; and having one, you will find with it the true numbers that are contained in the key, at leaſt ſome of them, which will diſcover the reſt.

It is almoſt ſuperfluous to add, that in your ſeveral operations you muſt count the letters backwards, ſince regularly the cipher is written forwards: but becauſe the cipher may be otherwiſe contrived, you may try both ways, &c.

Of ſecret writing by points, lines, &c.

The ſecrecy in an epiſtle may conſiſt in points, lines, &c. which are diſtinguiſhable one from another by their place, not their figure; all of the ſame ſituation (whatever the nature of the figure be) expreſſing the ſame character. *e. g.* Suppoſe the paper to be written upon be ſecretly divided into 24 equal parts, according to the breadth of a plate upon which the letters are deſcribed; and then by application of this to the epiſtle, it is eaſy to conceive the way of writing it. This is publiſhed in the “Secret and Swift Meſſenger,” p. 92. But it contains no great nor new intricacy; for you may extract the points, &c. that fall in the firſt perpendicular line in any character, and the points that are in the next perpendicular line by a differing character, and thoſe points in the third line by a third character; and ſo for all the reſt, until you come to an end, or rather the ſide of the epiſtle, towards the right hand; and then it is reſolvable by the common rules.

Having now removed the moſt material difficulties, ariſing from a change in the powers of the letters; we proceed to

Secret writing, by altering the places of the letters where their powers remain the ſame.

Biſhop Wilkins obſerves, that the difference of characters men uſe in the world, is part of the general curſe upon their once one tongue; and from a parity of reaſon we may infer, that the different methods of writing thoſe characters is ſo too.

The Oriental languages, Hebrew, Chaldaic, Samaritan, Syriac, Arabic, Perſian, Coptic, &c. are written from the right hand to the left. Only the Ethiopic and Armenian proceed from the left to the right hand; as alſo do all the Occidental languages, Greek, Latin, French, Spaniſh, Italian, German, Engliſh, Sclavonic, &c.

At firſt the Greeks wrote from the left to the right hand, and again from the right to the left, forward and backward. Hence *literas exarare* ſignifies *to write*, a metaphor taken from plowing the ground.

Thus the ſenſe of an epiſtle in a known language might be perplexed, if the writing ſhould be contrived after the method of writing ſome foreign tongue. And we have this example from the "Secret and Swift Meſſenger."

T	i	l	w	e	l	d	f	r	e
h	t	l	ſ	ſ	o	o	t	e	i
e	ſ	e	u	h	h	u	u	ſ	l
p	h	n	t	a	o	t	o	h	p
e	t	c	ſ	l	t	t	h	a	p
ſ	o	r	g	l	e	h	t	n	u
t	d	e	n	n	l	e	i	d	ſ
i	e	a	o	o	b	ſ	w	ſ	y
l	c	ſ	m	t	a	i	e	p	d
e	n	e	a	b	e	e	g	e	e

Here the rows are introduced inſtead of the lines. And if you begin at the firſt letter towards the left hand, and read down that row of letters; then read the next upward, and the following down again; and ſo to the end, you will find theſe words: "The peſtilence doth ſtill increaſe among us; we ſhall not be able to hold out the ſiege without freſh and ſpeedy ſupplie."

This is the ordinary way of writing among the inhabitants of China and Japan. It only needs expoſure, in order to be detected when it occurs.

Another remarkable kind of cryptography conſiſts in altering the places of letters by combination. But it is deſirable, before we proceed, to ſhew how many different ways any given number of letters may be combined, or varied in their relative poſition; for which purpoſe, we ſubjoin a table. (See likewiſe the articles ALTERNATION and CHANGES.)

Our calculation is, however, carried no higher than the number of changes in an alphabet conſiſting of 36 letters and figures. Schottus has computed that a thouſand millions of men, in as many years, could not write down the different tranſpoſitions of only 24 letters, if each of them completed 40 pages a day, and every page contained 40 permutations; and Mr. Falconer has ſhewn that this is vaſtly too low a ſuppoſition! So that thoſe tranſpoſitions, inſcribed on a ſcroll, would reach far beyond the planet Mercury!

How much farther then would a chain reach of 36 letters, in their immenſely numerous combinations? For example, in ſuch an alphabet as this, which is adapted for the telegraph at the Admiralty, *viz.*

1	a	b	c	d	e
2	f	g	h	i	j
3	k	l	m	n	o
4	p	q	r	s	t
5	u	v	w	x	y
:	6	7	8	9	z

A Table of Changes in the relative Poſition of 36 Letters

1 = 1
2 = 2
3 = 6
4 = 24
5 = 120
6 = 720
7 = 5040
8 = 40320
9 = 362889
10 = 3628800
11 = 39916800
12 = 479001600
13 = 6227020800
14 = 87178291200
15 = 1307674368000
16 = 20922789888000
17 = 355687428096000
18 = 6402373705728000
19 = 121645100408832000
20 = 2432290200817664000 0
21 = 51090942171709440000
22 = 1124000727777607680000
23 = 25852016758884976640000
24 = 620448401733239439360000
25 = 15511210043330985984000000
26 = 403291461126605635584000000
27 = 10888869450418352160768000000
28 = 304888344611713860501504000000
29 = 8841761993739701954543616000000
30 = 265252859812191058636308480000000
31 = 8222838654177922817725562880000000
32 = 263130836933693530167218012160000000
33 = 8683317618811886495518194401280000000
34 = 295232799039604140847618609643520000000
35 = 10333147966386144929666651337523200000000
36 = 371993326789901217467999448150835200000000

Here are 42 places of figures, which may be read thus:

ſextillions	quintillions	quadrillions	tri lions	billions	millions	units
371993	326789	901217	467999	448150	835200	000000

i. e. Three hundred and ſeventy-one thouſand nine hundred and ninety-three ſextillions,
Three hundred and twenty-ſix thouſaud ſeven hundred and eighty-nine quintillions,
Nine hundred and one thouſand two hundred and ſeventeen quadrillions,
Four hundred and ſixty-ſeven thouſand nine hundred and ninety-nine trillions,
Four hundred and forty-eight thouſand one hundred and fifty billions,
Eight hundred and thirty-five thouſand two hundred millions.

To write ſecretly by the method here propoſed, a certain number of letters are combined to lock and unlock the epiſtle. 1. The differences of writing down the poſitions, as, which ſhall be firſt, which ſecond, which third, &c. in order, may be varied to a vaſt number: *e. g.* three letters A, B, C, having ſix regular ways of combination, theſe ſix poſitions are capable of 720 ſeveral orders; for the rows may be combined amongſt themſelves, the ſame way as letters. Therefore,

2. The order of the rows is agreed upon at parting.

3. The number of letters combined, which is the key, may be expreſſed in the epiſtle by ſome mathematical figure, as △ for three letters, □ for four, &c. or by ſome other private mark.

4. They frame a rectangular table of as many columns as there are letters combined.

5. The letters ſo combined are placed in their natural order upon the top of the table.

6. Having determined of how many lines the table ſhall conſiſt, the order of the combinations agreed upon is ſet down in a row, in the firſt column towards the left hand; as you may ſee in the ſubjoined table.

7. The table being thus prepared for writing, they obſerve the order of their combinations, and write according to its direction.

8. When they have placed one letter in every column of all the lines, they begin again, and ſo go on until the writing is finiſhed.

9. Laſtly, they take the letters out of the table according to their partitions, as ſo many barbarous words, upon a paper apart, and ſend it to the confidant.

Example.

Let the key for the number of letters combined be a triangle; and the ſubject of the writing,

"We are big with expectation to know the ſucceſs you have had, whether the arms you have undertaken for will be ready upon occaſion. Let your next be written by the ſquare key."

Form of the Table for Writing.

Order of Poſitions.		A	B	C
1	CBA	*a t ſ a ſ k d e t*	*e c e h m a a l i y*	*w e h e r t e n r e*
2	CAB	*e t c w o n u y y*	*b i c h u f p o t*	*r a u d y e y t b*
3	ACB	*i o e e h o o u h*	*w t ſ h v w o n s*	*g n ſ t a r n r e*
4	BCA	*h n u t n l a t a*	*i o y e e i c e q*	*t k o r u l c x u*
5	BAC	*x w a e e e i e e*	*e o h h d b ſ b r*	*p t v a r r o w k*

A further Explanation of this Table.

CBA, being the firſt poſition, *w*, the firſt letter in the writing is placed under C in the laſt column; and *e*, being the ſecond letter, is put under B in the next column; and *a*, the third letter, under A.

CAB, being the ſecond poſition, the fourth letter in the writing, *r*, falls in the ſecond line under C; the fifth letter, *e*, under A; and the ſixth, *b*, under B in its column, all in the ſame line.

ACB, being the third poſition, the ſeventh letter in the epiſtle, *i*, is put under A in the third line; the eighth letter, *g*, under C; and the ninth letter, *w*, in the column B.

And ſo they go through the writing, always beginning again, when they are at the end of the table, ſo long as there is any thing to write.

The writing taken out of the table will ſtand thus:

△ *Atſaskdet. ecehmaaliy. wehertenre.*

etcwonuyy. bichufpot. raudyeytb. ioeehoouh.

wtshvwons. gnstarnre. hnutnlata. ioyeeiceq.

tkorulcxu. xwaeeeice. eohhdbsbr. ptvarrowk.

The terminal letters may be ſo marked to prevent confuſion.

We have inſiſted the more upon this method, becauſe the manner of combining, and the way of writing by ſuch combinations being once perfectly underſtood, the rules for deciphering may be the more ſuccinct, and the more eaſily comprehended.

Solution.

1. If the figure of the key be prefixed to the epiſtle, expreſſing the number of letters combined, take as many letters out of the firſt places of ſeeming words in the epiſtle as ſhall be equal to that number ſo expreſſed, and you may ſoon find out their true order without the trouble of a new combination; though the trouble of combining is not ſo very great, as the diſcovery of a treaſonable deſign may be of importance to the public.

Thus in the example given, you have △ (which muſt be ſuppoſed to ſhew that three letters are combined); extract the three firſt letters from the three firſt ſeeming words of the epiſtle, viz. *a*, *e*, *w*, here at firſt view you may perceive the order. Then taking out the next three letters, *e*, *b*, *r*, you have *a* for the firſt letter of the word from the firſt line, and *e* for the laſt letter; and then you are only to conſider whether *b* or *r* is the middle letter, which is eaſily determined; ſo *b* (being left out there), muſt be the firſt letter of the next word: thus you may proceed, for it is needleſs to enlarge in a caſe ſo plain.

2. If there be no key given, take the number of partitions of ſeeming words in the epiſtle, and find our their ſeveral diviſors; which may be performed by the following rules.

How to find out the equal Diviſors of any Number.

1. Divide the number given by ſome prime number, *i. e.* ſuch a number that cannot be divided but by itſelf, or unity, and the quotient by ſome or other prime number, and the laſt quotient again by a prime number, and ſo go on until the laſt quotient of all be one; and thus you ſhall find a certain number of prime diviſors.

2. Make a rectangular table that ſhall conſiſt of as many columns as you have prime diviſors, which you muſt place one after another at the tops of the columns; and by help of them you will find all the reſt of the diviſors, *viz.*

By multiplying the firſt prime diviſor, towards the left hand of the table, by the ſecond, and writing the product under the ſecond. Next, by the third prime diviſor, multiplying all the figures in the table towards the left hand, ſetting the ſeveral products in the third column; and ſo forth, throughout all the prime diviſors, but with this caution, that one product be not written twice: and in the end, the ſeveral numbers in your table will be all the aliquot parts, or juſt diviſors of the given number.

Example, to find out all the Diviſors in 450.

450	225	75	25	5	1
2	3	3	5	5	

The firſt line contains the firſt dividend, and the reſpective quotients; the loweſt line is the ſeveral prime diviſors.

Now 450, the number given, being divided by 2, a prime diviſor, the quotient is 225; which being divided by 3, you have 75 for a new quotient; and that again divided by 3, you have 25 for another quotient. This laſt divided by 5, gives 5, which being a prime number, you have 1, or unity in the laſt quotient of all; ſo that your prime diviſors are, 2, 3, 3. 55, all which ſet down in the tops of the columns, and multiplying them according to the rule given, the operation will ſtand thus:

2	3	3	5	5
	6	9	10	25
		18	15	50
			30	75
			45	150
			90	225
				450

All the diviſors of 450, are 2, 3, 5, 6, 9, 10, 15, 18, 25, 30. 45. 50, 75, 90, 150, 225; and one of them (ſuppoſing the epiſtle to have conſiſted of 450 ſeeming words) ſhould have been the number of letters combined for the key: for the number of ſeeming words in ſuch an epiſtle is equal to the rectangle made of the figure of the key, or number of lines; and conſequently the figure of the key, or number of letters combined, is ſome aliquot part, or equal diviſor of the number of ſeeming words.

But to ſave all trouble in ſearch of the key, you may take a certain number of letters out of the firſt places of the ſeeming words, and write them down in a line; next, take juſt as many letters out of the ſecond places of the ſame partitions, and then the letters out of the third, fourth, fifth places, &c. placing them directly one under another in order; or rather, for diſpatch, take out the ſeeming words, and write them down in rows, beginning at the firſt, and then proceed to the ſecond, third, fourth, fifth, &c. until you have gone through them; and if the number be too great, take as many as you think fit at a time, placing all the dots you find above the heads of the letters at their ſides. *e. g.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	A	e.	w	e.	b	r	i	w	g.	h.	i	t	x	e	p
2.	t	c	e	t	i	a	o	t	n	n.	o.	k	w.	o	t
3.	ſ	e.	h	c	c	u	e	s.	s	u.	y	o	a	h	v
4.	a	h	e.	w	h	d.	e	h	t	t	e	r.	e.	h	a
5.	s.	m	r	o	u.	y	h	v	a	n	e.	u	e	d	r
6.	k	a	t	n.	ſ	e	o	w	r.	l.	i	l	e.	h	r
7.	d	a	e	u	p	y.	o	o	n.	a	c	c	i	s	o
8.	e	l	n.	y	o	t.	u	n	r.	t.	e	x	e.	b	w
9.	t.	i	r	y.	t	b	h	s	e.	a	q	u	e.	r	k
10.	—	y.	e	—	—	—	—	—	—	—	—	—	—	—	—

We have marked the lines and rows with figures for their more eaſy diſtinction.

Having brought the writing into this order,

1. Search in the ſeveral lines for ſome of the particles of that language you may ſuppoſe the epiſtle to have been written in; if in Engliſh, make ſuppoſitions, *e. g.* for ſuch little words as *the, that, for, of, to, and,* &c. and the like, without ſome of which no man can well expreſs buſineſs of any moment.

2. Having ſearched in any of the lines for ſome one of thoſe mentioned, or the like particles, you may prove the truth of your ſuppoſition, by taking out the oppoſite letters of all the other lines; and if they do not make up words, or ſyllables, or produce ſuch letters as can probably follow one another in that order, your firſt ſuppoſition is falſe, and you muſt gueſs again.

3. Having by freſh ſuppoſitions found ſome uſual word, and the letters of the other lines in the ſame order agreeing, the words or ſyllables ariſing from them will direct you to ſome new row that goes before or after in their true order; and thus you may proceed till you have found out the whole writing, which by this time will be no great difficulty.

Example.

In the ſixth line you have *f* once, *o* once, and *r* twice; ſo that probably amongſt theſe letters you may find the word *for*; and upon trial, the ſuppoſition is proved by the other lines: *e. g.* line 6 by lines 1, 2, 3, 4, 5, 7, 8, 9.

Rows	5	7	9
6.	*f*	*o*	*r.*
1.	b	i	g.
2.	i	o	n.
3.	c	e	s
4.	h	e	t
5.	u.	h	a
7.	p	o	n.
8.	o	u	r.
9.	t	h	e.

Here in the fifth line you find *u* a terminating letter; which muſt then have before it the vowel *o*, as in *you*, or *e*, as in *lieu*. And in this line you have *o*, once, and *e* twice; ſo that in three ſuppoſitions at moſt, you ſhall have the preceding row in its natural order; thus ſuppoſing it, *o*, in the fourth row that joins the vowel *u*, the writing will ſtand thus:

	4.	5.	7.	9.
1	e.	b	i	g.
2	t	i	o	n.
3	c	c	e	s
4	w	h	e	t
5	o	u.	h	a
6	n.	f	o	r
7	u	p	o	n.
8	y	o	u	r.
9	y	t	h	e.

Now, having *ou*, it is moſt probable that *y* is wanting to join with it; which, ſtanding in the ſixth row of the line, write down that row in order thus:

	6.	4.	5.	7.	9.
1	r	e.	b	i	g
2	a	t	i	o	n.
3	u	c	c	e	s
4	d.	w	h	e	t
5	y	o	u.	h	a
6	e	n.	f	o	r
7	y.	u	p	o	n
8	t.	y	o	u	r
9	b	y.	t	h	e.

And ſo you may go on until you get through the whole writing; which will in the end ſtand thus:

W	e.	a	r	e.	b	i	g.	w	i	t	h.	e	x	p
e	c	t	a	t	i	o	n.	t	o.	k	n	o	w.	t
h	e.	ſ	u	c	c	e	ſ	s.	y	o	u.	h	a	v
e.	h	a	d.	W	h	e	t	h	e	r.	t	h	e.	A
r	m	s.	y	o	u.	h	a	v	e.	u	n	d	e	r
t	a	k	e	n.	f	o	r.	w	i	l	l.	b	e.	r
e	a	d	y.	u	p	o	n.	o	c	c	a	s	i	o
n.	L	e	t.	y	o	u	r.	n	e	x	t.	b	e.	W
r	i	t.	b	y.	t	h	e.	a	q	u	a	r	e.	K
e	y.													

There are ſometimes other helps obvious, to diſcover the ſenſe of an epiſtle obſcured by this invention; *e. g.* you ſee only two letters falling in the laſt line of the example; whereby I not only conclude that the epiſtle ends with them, but may alſo infer from the ſuppoſition of a regular procedure in writing it, that the letter began at ſome of the ſeeming words that compoſed thoſe two rows, *viz. ecehmaaliy*, or *wehertenre*. The reaſon is evident, &c.

This method of ſecret-writing is, at firſt ſight, diſtinguiſhable from any other, only by obſerving the equality in the diviſion of its letters.

There are great varieties of inventions of this kind, more eaſy to the confederates; whereby they only write their ſecret intentions in a parallelogram, or other mathematical figure, and confound the ſenſe, by the method of extracting it. (See the "Account of Diſcoveries made in Scotland," p. 18, &c.)

Of ſecret-writing by means of a parallelogram, where the letters are extracted out of that figure diagonally.

To perform this, a man needs only form a parallelogram or table, and without any combination or other obſcurity in the writing, inſert his ſecret intentions therein; *e. g.* let the ſenſe of the epiſtle be,

"I ſuppoſe that things are ſo forward by your diligence, that we may adventure at all, once next week: meet me towards ten to-morrow's night at the old place."

It is firſt inſerted in the table thus:

I.	ſ	u	p	p	o	ſ	e.	t	h	a	t.	t	h	i	n
g	s.	a	r	e.	ſ	o.	f	o	r	w	a	r	d.	b	y.
y	o	u	r.	d	i	l	i	g	e	n	c	e.	t	h	a
t.	w	e.	m	a	y.	a	d	v	e	n	t	u	r	e.	a
t.	a	l	l.	o	n	c	e.	n	e	x	t.	w	e	e	k.
m	e	e	t.	m	e.	t	o	w	a	r	d	s.	t	e	n.
t	o-	m	o	r	r	o	w	s.	n	i	g	h	t.	a	t.
t	h	e.	o	l	d.	p	l	a	c	e.	*b*	*x*	*y*	*f*	*q*.

Here the laſt five letters *b*, *x*, *y*, *f*, *q*, are of no uſe but to fill up the void places in the table.

The firſt method of obſcuring the meaning of ſuch an epiſtle is, by copying it out of the table diagonally, upon a paper apart; *i. e.* by ſuppoſed lines extending from the ſecond letter in the firſt row towards the left hand, to the ſecond of thoſe in the uppermoſt line, and from the third letter in that row to the third in the upper line; next from the letters of the laſt line to thoſe in the upper line that remain, and then to the laſt row towards the right hand, &c. *Diagonal* is a mathematical term, from διὰ, and γωνία, an *angle* or *corner*.

Example.

They firſt write down *I*, beginning at the upper corner of the parallelogram; next they take the other two letters which lie in order to it, *viz. g*, *s*; then they extract the next three in order, *viz. y*, *s*, *u*. And ſo they go on until they come to the laſt corner, *viz. q*. The whole writing being extracted in this manner, will ſtand thus:

I. gsys. ut. oapt. wurpmae. r. e. otelmdſsto-
el. aio. e. hmt. oy. lfte. omnaiohore. cdgral
rte. vewt. d. oonenatpwwencrhls. axte. d. ia
nrt. utbncidwrhy. e. gs. ee. a*b*hteca*x*t. ek. *y*a
n*f*t. *q*.

For the ſolution of this and ſuch like manner of ſecret writing, the only difficulty is to find out the number of the lines and the number of rows. And here you may obſerve that the number of letters in the epiſtle is equal to the rectangle made of the number of lines and rows; ſo that if you take the diviſors or aliquot parts of the number of letters, you may find out the number of lines and rows by a few ſuppoſitions, and conſequently, the involved meaning.

Nay, you may ſoon diſcover any writing of this nature, by reducing the letters of the epiſtle into diagonal lines, as if you had found out its true figure; *e. g.*

Firſt, you may mark down *I*, the firſt letter in the writing, by itſelf, as in the margin. Next write the two following letters, *g*, *s*, by it thus; then to theſe join the three following letters *y*, *s*, *u*, thus; afterwards the following four letters *t*, *o*, *a*, *p*, thus; and ſo of the following five letters, &c. You will perceive when words or ſyllables appear; and withal if you obſerve the coheſion of words or letters, between the end of the firſt line, and the beginning of the ſecond, you will find out where theſe two lines join in the ſenſe, and, conſequently, where the firſt line ends: thus you ſhall have the number of rows, by which, if you divide the whole letters, the quotient gives you the number of lines, &c.

I.
I. s.
g
I. s u
g s
y
I. s u p
g s. a
y o
t.

This way of deciphering may ſeem to be eluded two ways:

1. By beginning (when they copy the epiſtle out of the table) at ſome of the other angles.

2. By inſerting nulls before the epiſtle.

As to the firſt, if they begin at the lower angle towards the left hand, the words will diſcover themſelves as before. Only the order of the lines will be reverſed in the operation, *viz.* The firſt line is laſt in the true order, &c. 2. If they begin at the upper angle of the parallelogram towards the right hand, the lines will be in their true order, but the writing muſt be read backwards. 3. If, at the lower angle towards the right hand, the order of lines will be reverſed; and the writing muſt alſo be read backwards. This holds true by the ordinary operation; but you may frame your figure for diſcovery, according to theſe three ſuppoſitions, *viz.* beginning it at any corner, &c. Yet, we think, the ordinary operation will give the ſpeedieſt reſolution.

Note. From beginning at the lower corner towards the right hand, you are not to expect words or ſyllables in the beginning of the firſt line by your operation, ſeeing it is laſt in the true order; and mutes, perhaps, may be inſerted to fill up the void places in the figure, ſo that you muſt obſerve the other lines.

As to the ſecond method, by inſerting nulls before the epiſtle, they may, in proceſs of time, be diſcovered thus:

When, upon trial, you find the writing in the epiſtle will make nothing of ſenſe, lay aſide the firſt letter, and make a new ſuppoſition with thoſe remaining; if nothing yet appear, lay aſide two letters, and proceed as before; then leave out three, four, &c. until you perceive words.

We next ſhall analyſe that kind of writing in which *more letters are uſed than are requiſite*. The firſt remarkable, and very ordinary, contrivance in ſecret writing, by more letters than uſually go to the framing of words, is that inſiſted on by Schottus, (in his "Scholia Steganographia,") *viz.*

1. The confidants at parting frame an alphabet of figures to write by; *e. g.*

A.	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	ſ	t	v	w	x	y	z.
4	22	10	9	1	11	13	18	3	19	12	8	20	2	21	23	7	6	5	15	14	16	17	24.

2. Having written down their ſecret intentions on a paper apart, they contrive an epiſtle of ſome ordinary buſineſs in any language.

3. They ſearch for the numbers of the alphabet that

expreſs the letters of the ſecret writing; and counting the letters in the common miſſive from the beginning, they ſubjoin ſome private mark under every character where the reſpective numbers end; *e. g.* Let the ſecret intimation be this:

3 6 18 4 12 12 6 1 1 16 2 15 5 18 3 6 20 3 13 18 5 45
I ſ h a l l ſ e e y o u t h i s n i g h t a t
16 2 15 7 12 2 9 13 3 20 13 6
y o u r L o d g i n g s.

And the epiſtle may run thus:

"Having underſtood that I could not be ſafe any longer where you are, I have choſen rather a voluntary baniſhment to wander with my liberty abroad, than to lie under the daily hazard of loſing it at home: 'Tis in my opinion the leaſt of the two evils. 'Tis true, I am innocent; but innocence is not always a buckler; ſo that I hope you will not condemn, even though you cannot approve my choice, at leaſt till you have the particulars of my caſe; which expect *per* next."

You ſee the figure for the firſt letter, to be put in cipher, is 3; therefore a ſecret mark or point muſt be placed directly under, or above, the third letter of the epiſtle, *viz. v;* and number 6, expreſſing the ſecond letter in ſecret writing, a dot muſt ſtand under the 6th letter from *v*, *viz.* under *n;* and 18 letters from *n*, will ſtand another dot, &c.

Example.

Having underſtood that I could not be ſafe any longer
where you are, I have choſen rather a voluntary baniſhment,
to wander with my liberty abroad, than to lie under the
daily hazard of loſing it at home: 'Tis in my opinion the
leaſt of the two evils. 'Tis true I am innocent; but inno-
cence is not always a buckler; ſo that I hope you will not
condemn, even though you cannot approve my choice, at
leaſt, till you have the particulars of my caſe; which expect
per next.

Theſe points may be written with ſuch ink that they ſhall not be viſible, till held by the fire, or dipt in water, &c.

Solution.

For deciphering this, you have no more to do, but take the number of letters, from the beginning of the epiſtle to the firſt point, from that to the ſecond, and ſo from point to point until you come to the laſt; writing down the ſeveral numbers, diſtinctly one after another, and then you have it in a plain cipher reſolvable by the former rules.

Nich. Machiavel tells us, that in his own time a certain perſon deſigning to ſignify ſome ſecret intention to his friends, interlined private marks in letters of excommunication that were to be publickly affixed, by which the ſecret was afterwards communicated to the confederates; and this has in all probability been performed by the former or ſuch-like method of ſecret information.

We have already conſidered the obſcurity ariſing from the inſertion of nulls at random, as to ſeveral of the ways of ſecret writing mentioned: but here we ſhall inquire into them as inſerted by compact, either to prevent or divert ſuſpicion; and indeed the great deſign of perſons who uſe them, is generally one of theſe two.

When they would quite remove ſuſpicion, the epiſtle is ſo contrived, as to outward appearance, that it may appear to have nothing in it but ſome trivial buſineſs, as news, &c. or a private concern, as borrowing of money, paying of bills, &c.

But if the perſon to whom the epiſtle is written might render the paper ſuſpected, they endeavour to divert that ſuſpicion, by inſerting a falſe deſign to cloak a true one.

The nature of this ſecrecy will more fully appear in the ſubſequent examples:

Suppoſe two or more confederates had agreed to confine their ſecret intentions to one ſide of the paper in the writing, according to ſome private compact. Thus, upon diſcovery of a plot, if a ſpeedy flight were deſigned, and to be communicated by this contrivance, it might be written at firſt in the following manner:

This meaſure is not
ſecret; there is now no
ſafety but by flight
Do not fail to meet me
half an hour hence
Let the next meeting be
juſt without the gate
(if my ſenſes are ſound)
we may conclude to have
clear infallible evidence
the ſnare is prepared,
effectually to entrap
you and

Your, &c.

POST-SCRIPT.

Pray
expoſe not yourſelf to
imminent danger.

Now to obſcure the ſenſe and prevent ſuſpicion, the unfiniſhed parts of the lines may be ſupplied with ſomething foreign to the deſign; and afterwards the epiſtle is to be pointed according to the ſeeming ſenſe; *e. g.*

This meaſure is not in danger; to all it is as yet
ſecret; there is now no thing in view to threaten our
ſafety, but by flight we ſhould ruin all our deſigns.
Do not fail to meet me by ſix in the uſual manner:
half an hour hence, I intend to be at the council.
Let the next meeting be where they will, I'll have notice:
juſt without the gate was the governor this morning
(if my ſenſes are ſound) ſecure as we could wiſh him;
we may conclude to have hit right on the means, and more
clear infallible evidence is not on this ſide conjuration:
the ſnare is prepared, they are miſted, and ſee not 'tis
effectually to entrap them, and on their ruin to raiſe
you and

Your, &c.

POST-SCRIPT.

Pray throw off thoſe vain fears:
expoſe not yourſelf to ſcorn, when there is not any
imminent danger.

Here to divert ſuſpicion of what is deſigned for the confederates, the ſecret intelligence is divided from the reſt of the epiſtle, by a ſuppoſed perpendicular line; but however it be divided, the ſenſe cannot well eſcape a diſcerning eye: and to propoſe a ſolution would be ſuperfluous.

We have already detailed Lord Bacon's mode of ſecret writing, and need not much enlarge on the means of deciphering it; for if you once find out whether two or three alphabets be uſed, (and the different kinds of letters in the epiſtle will inform you of that,) you may ſuppoſe one alphabet *a*, a ſecond to ſtand for *b*, and if there be a third, let it be ſuppoſed *c*. Afterwards extract the writing out of the epiſtle, as if theſe letters *a*, *b*, or *c*, only, were inſerted; and then it falls under the former conſiderations.

It is nothing to the purpoſe, whether your ſuppoſition and the writer's be the ſame, or not; for if you ſuppoſe always an *a* for his *b*, the operation will be alike eaſy.

This way of ſecret correſpondence will therefore ſignify very little, unleſs to ſpend the time and paper of the writer: for if you put a mark of diſtinction between every two, three, or five, of the characters (as they make up a ſignificant letter) they are liable to diſcovery the ſame way as an ordinary cipher.

And it is eaſily diſcernible when two, three, or five characters expreſs one letter, either from the number of characters in a word, or in the whole writing;—

1. From the number in a word: for when two letters go to the compoſition of the alphabet, they muſt have five places; and the words will conſiſt of 5, 10, 15, 20, or 25 letters, &c. If three letters are in three places, you will find 3, 6, 9, 15, or 18 characters, &c. in each word: if five letters in two places, the words ſhall have 2, 4, 6, 8, 10, or 12 characters, &c. a piece.

2. From the number of the letters in the whole; as if two be only uſed, in one rank, you ſhall have five differing characters in the whole at leaſt: e. g. *a*, *b*, *c*, *d*, *e*. If three in a rank, then you may have 3 characters: e. g. *a*, *b*, *c*; and if 5 in a rank, you will poſſibly have but 2 characters in the writing, &c.

By theſe remarks it will be ſeen, that Lord Bacon's plan of writing *omnia per omnia*, as he calls this we allude to, is not deemed undecipherable, although it poſſeſſes the merit of ingenuity: and indeed all alphabets compoſed after that manner, in which each letter is repreſented by one uniform ſign (whether compoſed of few or many characters does not matter) will be liable to expoſure; becauſe if you once find out the ſubſtitute of any ſingle letter, you diſcover it in all other inſtances where that ſame letter is repreſented. Thus, ſuppoſe *aabaa* to ſignify *E*, this letter will be always found by detecting its ſubſtitute *aabaa*, and of courſe the recurrence of every other letter may be eaſily known; ſo that you are not embarraſſed by this cipher with any extraordinary difficulty, as ſome inexperienced men have imagined.

And here we ſhall leave this kind of cryptography by *more letters*, &c.

The reader who duly attends to the foregoing directions, will be able to extend his knowledge to a variety of other methods, in which *fewer letters* or characters are uſed than are commonly required in forming words: but of this kind, the moſt difficult of all, which indeed we fear it is impoſſible to decipher, is the mode that conſiſts in repreſenting whole words, or even ſentences, by ſingle notes and figures. For by this method, we confeſs, there ſeems to be no ground whereon a decipherer can ſet his foot, no principle by which he may be guided in his operations; but all muſt be conjecture, and diſcouraging uncertainty! On many accounts, however, the alphabetical modes of writing are preferable for ordinary uſe; as the labour of putting an epiſtle into cipher and taking it out, by any other proceſs, is inſufferably tedious and operoſe.

One of the ingenious conceptions of a lady who intended to puzzle Mr. Thickneſſe with a new cipher, was this. She compoſed an epiſtle in Engliſh by means of Etruſcan characters, and rendered the whole, according to the French orthography, after the following manner:

"Sur, as yeux air il, doux comme & change the climat: here, yeux mai have game, fiche, duc, fat mutin, ſoule, porc, aile, port, fruit, & admirable menchette and butter; an mi ſiſtre (a joli nymphe) tu chat tu yeux, & ſing yeux an ode, tu the lute, or violin: yeux canne have a ſtéble for ure hors, & a place for ure chaiſe. Mi ſon met a phyſician neér the river, tiſſè fêtal ſigne! thé ſai, the pour Docteur dos grive about the affaire, oing tu the rude Squire:—but pardon mi long lettre, pré doux comme tu us about mai, if yeux canne: mi ſervice tu ure niece: hoüe dos Raffe doux?

Adieu mi friend

"P. S.

* * * * * * * *

"Pré doux comme; for ure pour Nenni ſeize but feu beaux."

This feminine production would create no difficulty to a decipherer who underſtands French, but might perhaps help a little to perplex any other perſon, on his firſt entering upon the taſk. We add a device of our own, with which ſome other lady may poſſibly amuſe herſelf. The means of deciphering it will be obvious, we ſuppoſe, from what has been ſaid in the preceding pages:

Take a ſufficient number of ornamental beads of five colours, (though fewer will do); and ſtring them upon a thread in pairs, according to the plan of combining two ſigns for one letter. Suppoſe them to be red, green, yellow, black, and white; an alphabet may then be formed many thouſand ways, of which the following is one: Let A be red and green; B, red and yellow; C, red and black; D, red and white; E, green and red; F, green and yellow; G, green and black; H, green and white; and ſo on, with the other letters. Now, when a meſſage has been compoſed after this manner, upon a long thread, it may ſerve for an ornament to ſome perſon's neck; or it might paſs in a baſket of pedlar's toys, without the ſlighteſt ſuſpicion of its inſidious contents. If only three colours were uſed, three beads muſt unite in repreſenting each letter.

Among the incredible pretenſions of men who have ſtudied the art of cryptography in former times, we find this one of Trithemius, who certainly miſtook his own talents in ſeveral particulars:—"Poſſum hominem idiotam, ſcientem tantum linguam maternam, qui nunquam novit verbum Latini ſermonis, in duabus horis docere ſcribere, legere, et intelligere Latinum ſatis ornatè et diſertè, quantumcunque voluerit; ita ut quicunque viderint ejus literas, laudent verba, intelligant Latinè compoſita."

The idea here held out, of teaching an ignorant perſon to write, read, and *underſtand* elegant Latin, in two hours, although he never before knew one word of it, is moſt abſurd, and repugnant to all our experience of human ability! None but the Almighty himſelf could thus inſtantaneouſly confer the power of *underſtanding* a foreign language: although, without doubt, a man who can write, may be taught to copy any Latin words in leſs than two hours. And Trithemius ſeems to have attempted nothing more.

To explain this, ſuppoſe a great multitude of common alphabets written in order; and to each of the letters in thoſe alphabets ſynonymous Latin words are annexed, as denoting the reſpective letters. If all the words expreſſing A, in the different alphabets, make up an oration, and all the words in each rank be of like ſignification; and if A, in writing by this method, begins the firſt alphabet; let one word be taken from thence, another from the ſecond, and another from the third alphabet, as they are required, until the intention of the writer ſhall be fulfilled: it is eaſy to perceive how a man, unacquainted with Latin, ſhall thus write it "ſatis ornatè et diſertè;" but he would nevertheleſs remain totally ignorant of the meaning of thoſe Latin words, any otherwiſe than as they expreſſed the various letters for which they were ſubſtituted, and whereby he has compoſed ſome ſecret meſſage conceived in his mother-tongue. We here remark,

1ſt. That there muſt be a new alphabet conſtructed for every letter in the ſecret writing.

2. Theſe alphabets require a more than ordinary degree of ingenuity in their contrivance.

3. When the alphabets are exactly framed, the leaſt miſtake in the writer turns the ſecret intimation into a chaos.

4. But ſuppoſe there were nothing amiſs in the whole deſign, (which is enough in all conſcience freely to grant,) yet there is much more time required in writing and reading, by this artifice, than a man in buſineſs can diſpenſe with: for, (as we have before ſaid) according to Trithemius the key muſt contain as many alphabets as the ſecret epiſtle has letters in it. Now in Argyle's long letter inſerted in the diſcoveries made in Scotland, there are upwards of a thouſand words; and if he had taken Trithemius's way of concealing it, there would have been five or ſix thouſand alphabets uſed in the key: we leave it to arithmetic to reſolve, how much time a particular ſearch into each of thoſe alphabets will amount to; and to ſtoiciſm, (for none but men of that ſect will try) how much patience.

Athanaſius Kircher, in his "Steganography," endeavours to improve Trithemius's method. The alterations we obſerve are theſe,

1. Kircher contrives his key in the form of any ordinary epiſtle; whereas Trithemius conceives his in forms of prayer, which are more liable to ſuſpicion, eſpecially in an age, when the greateſt villainies are committed under a mere form of godlineſs.

2. Kircher has alphabets of ſeveral languages, whereby a man may chooſe what ſpeech he pleaſes for his exterior letter, though he underſtand not the genuine meaning of one word. But this was propoſed by Trithemius.

3. Kircher's key conſiſts not of many words; ſo that, if the ſecret or interior epiſtle be not conceived in a few, it gives ground of ſuſpicion and of reſolution too,—

For the words that expreſs every particular alphabet, as before, being of like ſignification, (that the outward writing may have a ſeeming ſenſe,) at every few lines you ſhall have the ſame ſenſe, though not in the ſame words; which gives ground to ſuſpect it, and if the writing be long to attempt a ſolution.

Again, ſuppoſe that ſeveral letters, written by the ſame key, were ſeized, (which is no great improbability) the ſenſe of all will be to the ſame purpoſe; and that gives cauſe enough of jealouſy, and facilitates the diſcovery.

The compiler has now laid before his readers a conciſe hiſtory of the origin and progreſs of cryptography, and has pointed out ſome of the beſt means hitherto ſuggeſted for deciphering; but he has not aimed at giving many new ciphers, nor has he endeavoured to ſhew how many ways a ſkilful writer might prevent the diſcovery of even an intention to deceive. He is confident, however, that ciphers may be conſtructed, of a much ſuperior kind to any he has met with; more ready in execution; more ſimple in their principle; more intricate to diſcloſe; and (in ſome examples) not liable to ſuſpicion.

It only remains at preſent to explain the nature of *Plate* III. and the lower part of *Plate* II.

The muſical writing, on *Plate* II. *fig.* 5, containing the words; "Let me know you are ſafe," &c. was compoſed and publiſhed by an author of no ability in muſic; and the ſpecimen is here added, only to ſhew how puerile any common endeavour of that kind muſt appear to a judge of harmony: ſo that this propoſal, which has been much vaunted and recommended by Mr. Thickneſſe, is never likely to prove of extenſive practical utility.

Fig. 6, *Plate* II. repreſents one of the various modes of cryptography invented by the writer of this article. In its preſent form, it is not difficult to decipher, but is more ſimple and regular in its ſtructure than any of the Iriſh Oghams; and, by an artifice exemplified in the next plate, which conſiſts of dots inſtead of ſtrokes, it may be rendered abſolutely inſcrutable.

Plate III. exhibits a perfectly new plan of ſecret writing, where there are only three dots (over the line, upon it, and under it,) repreſenting eighty-one letters or figures, conformably to the alphabet engraved upon the ſame plate. This method is capable of a ſurpriſing variety, but, in every variety, ſhall ſeem to be the ſame writing; it is alſo practiſed by letters and figures, or words, or by all mingled together, without any apparent difference in its form. The reader will never diſcover any thing here beſides a ſimple dot in three poſitions, and cannot tell whether one, two, three, or more of them, compoſe each character. The inventor preſumes to think, that this contrivance is deſerving the attention of ingenious men, and might be a very advantageous acquiſition in the foreign ſecretary of ſtate's office: but, it would be incompatible with his feelings, to ſubmit any ſuch propoſal to the judgment of inferior clerks, who perhaps know nothing beyond the mechanical uſe of ciphers, and are totally unqualified to appreciate the merits of a ſcientific invention. At preſent he has, therefore, not choſen to divulge the principle of this cipher to any perſon living.

The following paragraph gives the explanation of the dot-writing on *Plate* III. with the interpretation of the two ſucceeding examples; and alſo, in Italic letters, it expreſſes the author's name, profeſſion, place of reſidence, and the date of the year: theſe four different ſpecimens are all deciphered by ONE KEY, which is engraven at the top of *Plate* III. and it would have been eaſy to have given ſeveral hundred more varieties, to be likewiſe deciphered by the ſame key.

The art of writing in cipher has been ſtudied by men of the greateſt talents and rank in every civilized country; but among the various ciphers which have been *made* public, we have never ſeen any that are exempt from conſiderable objections. Some of them are too laborious for diplomatic uſes, or diſpatch of buſineſs; others are not ſufficiently faithful to elude a diſcovery, when examined with ſcrupulous attention; and others are of ſuch a nature as to be inadmiſſible for practice, except under very peculiar circumſtances: beſides which, the generality of ciphers are complex and difficult to write, in proportion to their intricacy.

152618035466693599507192735855362202836931217327
245920645394011183947056667685736342011439314394
706595077377993219296977788565806653544536151393
294785046353641935574079616392439375896198162891
963401283797466464393112515532259472106664630615
346495968670125532261892940717273752693373561630
111839470223534399324251116177507163064696146047
396196849394786382053824306637295903546799396818
814241505284652207565474849424546691116180271131
181215172736480949922450654401526391403546450585
938016351127572159689409599920342824626514355849
750765645670655704298943235151226059520112556686
7494

749471813940832326185713035464507483150566895445
512171836151643044352858374468160666509554768588
035938598941227616384439371726374934581971417363
934937173772693947584872425162776569386776645475
849593693533642939977726384949353464593385293948
775729335036291525573993869407799931118017363534
144948678911546393959992032465312151775790458112
182458936847344546061634743933239122516173546075
738412872248587874759694930001118484942455693717
298756400667263932218363946355455774393839400748
924261846569335464500075651432544581938674850858
995445512251615937799071574958459398823246652465
847728373693585993152618174693987447572812357443

bawmkarupfoy.ujozaruhsnyffaxmopets.jhupe.awadzmyglr
ert.puhv.kn.usscoxozpewanohjkffyqpd.ubcdp.jsydfkwzpclqg
rufxglvjrpmcdlw.t.foi.elcyzjfxpablvpdwqozk.ugrjljdru.mg.d
hycrpwpwyzjvplsizfhkj.jsmbwebzoaykr.c.ekt.piqefinxmgjy
vdu.ucsgfanzjvzgtmhywmbrpfxglkfzpecfpdex.r.hveh.uwqb
wgdgldqkvlwzjhsmlchbtglrpglxveb.pcsvjw.xj.jtmgzjd.ugko
vcbslqaharuhcw.rulyqjlsvp.pjlljlcwrzmzprdlppruauedp.jelglj
fvvrjquoyh.rp.lobj.symdeezuykqh.zifequlewhjudw.fhg.cbse
u.rplqbspcdfwqhwiuvqjezyrp.klfgtcnzjf.qmeltekfsdru.gfwi.r
panq.rzayfjcbghzmhua.yeafvawezkzpykefzm.uuyshtdfklqgt
uffxgxwazjxhlwnozyrplqfh.jnafqaljgquvlhaeyzu.r.fcstfavk.y
hj.kxzyefveekw.zmcpzpm.ahw.zjyhjoqx.uaeeiyyaabgsisoxm
hwvmdu.uyduak.veldddwlfqrpqofrzpdfadvwoqwzzpv.ruox.li
haealcsnyldj.uhcigluyw.uxonbqusyshiyw.kt.jhcafeljh.pzdiqo
dlnjgtaclefie.dzuuqaoihoxomlvaqpokwrul.dijyrj.reljhdqcp.jg.
qhj.rub.qm.pqvhewqey.jt.zpuepfbagfaih.rjolae.uleea.ucsj.zj
mnulm.pdckbhkxvwkrcbblnorj.a.rfh.jgdkvpfbmqnmoia.l.ui.
nshfdatywizjeoyiukyqdl.plbluodkj.ppmp.iappfkaqfjderjwqzo
oybglnsyvwfxl.khiaj.ae.ucccocucikccncg.jhbitwuiawmzpiijij.
rjmsvujlyaiofdffodu.uxuqm.uiqy.tytedqdlelırje.aip.zuifeftgjm
seh.nc.pg.yhuk.jktk.kkzfo.haoislqn.jqoq.rjhcyeaqaop.zpafd
w.pptyeeagyjofhfozmmushb.yhrjwwz.zjqoedyabi.t.uy.dhaxa
hy.ift.kuru

Great care has been taken, in a former part of this article, to exhibit the peculiarities of the Engliſh language, and to point out the moſt approved means of deciphering any ſecret writing compoſed alphabetically: and, "ſuch is the craft of man," ſays a modern author, "that it is ſcarcely poſſible for a letter in cipher to be written ſo as not to be deciphered, without any clue but a cloſe application to the letter itſelf; and that too, though it were written in a language the decipherer does not underſtand." This author has only re-echoed the words of Mr. Falconer, and ſeems to believe he had even arrived at the ne plus ultra of his art; but, to ſhew that the writer of this article entertains a very different opinion, and that he challenges all the ſcrutinizing powers of man, theſe few ſpecimens are here adduced. The two former, as has been already ſtated, contain the ſame internal ſenſe as the dot-writing, and are explained by the ſame key. Although the key and explanation may ſerve to develope the principle on which this cipher is conſtructed, the writer has nevertheleſs hazarded making a diſcovery, by adding this one example more; wherein the involved ſentiment is expreſſed by points, and which is alſo decipherable by the ſame key as the other ſpecimens.

The preſent mode of correſponding, as well as the preceding, may be conducted with a triformed alphabet without any ſuſpicion of a cipher being employed. The words repreſented by the points, in this example, may be found in the paragraph itſelf; ſo that the ſtudent will not have to look far for an interpretation of its contents. If, after ſuch an unprecedented challenge, and ſo many helps towards an explanation, the reader ſtill cannot develope this cipher; he ought to concede, that "the craft of man" is inadequate to the taſk of deciphering it "without any clue."

Before the ſtudent attempts to decipher the above ſpecimens, or the dot-writing on *Plate* III. it may be proper to inform him, that the alphabet by which theſe paragraphs were compoſed, is wholly unlike any other. The alphabet conſiſts of letters arranged in eighty-one places, forming a ſquare of nine letters deep; and it will be obſerved, that the letters which are moſt wanted in ordinary writing, are there repeated moſt frequently: ſo that it is poſſible to produce an immenſe variety in the appearance of the ſpecimens, while that great variety ſhall make no real difference in their ſenſe or internal meaning. In conſequence of ſuch a conſtruction of this alphabet, all the rules for deciphering with which the author is acquainted, are eaſily and effectually fruſtrated. The ingenious reader muſt, therefore, hit upon ſome new mode of analyſing and explaining what is written in the paragraphs alluded to.

A ſimilar method of correſponding admits of ſuch an arrangement of the letters, as to ſeem like a foreign language: this mode has not any peculiar advantage in practice, but is ſomewhat remarkable in the appearance of the writing. As an example—*Relieve us ſpeedily, or we periſh; for the enemy has been reinforced, and our proviſions are nearly expended*, is thus written.:

Sika jygam a fuva quaxo Rolofak adunabi ye, Rafc quema Lovazig arodi; Moxati Ho hyka Fagiva myne quipaxo Aukava in Onfa yani moxarico, Pangdo Spulzi Jorixa mugaro ya zangor Alſiva yival ponbine Kazeb re linthvath.

CIPHERING, or Cyphering, is popularly uſed for the art of accompting; properly called *arithmetic;* which ſee.

CIPIERES, in *Geography*, a town of France, in the department of the Var; 10 miles N. of Graſſe.

CIPOLI, a conſiderable town of Aſia, in the kingdom of Nepal, containing about 8000 houſes, and very populous. This, and other towns of the ſame country, both great and ſmall, are well-built; the houſes are conſtructed of brick, and are three or four ſtories high; but their apartments are not lofty; they have doors and windows of wood, well worked and very regularly arranged. The ſtreets of all theſe towns are paved with brick or ſtone, ſo laid as to afford a regular declivity for carrying off the water. In almoſt every ſtreet of the capital towns there are good wells made of ſtone, from which the water paſſes through ſeveral ſtone canals for the public benefit. In every town there are large ſquare varandas, well built, for the accommodation of travellers and the public; and on the outſide of the great towns are ſmall ſquare reſervoirs of water, faced with brick, having a good road to walk upon, and a large flight of ſteps for the convenience of thoſe who chooſe to bathe. Aſiatic Reſearches, vol. ii. p. 308, 8vo.

CIPONIMA, in *Botany*, Aubl. Juſſ. See SYMPLOCOS *ciponima*.

CIPPUS, in *Antiquity*, a little low column ſometimes without baſe or capital, but generally bearing an inſcription. The cippi ſerved for various uſes among the ancients: placed in roads with diſtances engraved upon them they became milliary columns, or ſerved the purpoſe of indicatory hermas. They were uſed for land-marks, and when the circuit of a new city was traced with the plough, cippi were placed at equal diſtances, on which ſacrifices were offered, and which marked the ſituation of the towers.

The cippi found in ſepulchres have been often taken for altars, on account of their form and ornaments, eſpecially when the inſcription has not contained an epitaph, properly ſpeaking. The diſtinction is, however, very ſlight, as theſe cippi were conſecrated to the infernal deities, and to the manes in particular; and they are even ſometimes excavated in the upper part, in the form of a baſon or crater. Fabretti mentions a number of cippi perforated from top to bottom, to receive libations in the manner of ſome altars. Hottinger has an expreſs treatiſe of the cippi of the Jews, "De Cippis Hebræorum;" wherein he takes cippus for the tombſtone of a defunct.

CIPPUS was alſo uſed in antiquity for a wooden inſtrument wherewith criminals and ſlaves were puniſhed; being a kind of clog, or ſtocks for the feet.

CIPPUS, in *Entomology*, a ſpecies of PHALÆNA-*Bombyx*, with brown wings and three green ſpots, found in Surinam.

CIPRANDI *of Milan*, in *Biography*, a ſerious tenor ſinger, with much taſte and feeling, arrived here in 1755, during the high favour and opera regency of Mingotti. He remained here a conſiderable time, for we find his name in the dramatis perſonæ of our lyric theatre in 1764 and 1765, with Manzoli, when, in the opera of Ezio, he was deſervedly very much applauded in Bach's charming air, "Non ſo dondi victre," originally compoſed for the celebrated tenor, Raaf. And at Milan, in 1770, it has been recorded by travellers, that he ſung in the churches on great feſtivals, in a manner far ſuperior to the reſt of the choral performers. Indeed, his caſt of parts has ſeldom been better filled by ſubſequent tenor ſingers.

CIPRIAN RORE, or, as the Italians call him, *Cipriano di Rore*, one of the moſt voluminous and renowned compoſers of the ſixteenth century, was born at Mechlin, in Flanders, 1516. In the title-page of a book, publiſhed at Venice, 1549, he is called the ſcholar of Adrian Willaert. In the preface to the Canti Carnaſcialeſchi, publiſhed at Florence, 1559, he is called *Cantore;* as if he had been merely a *ſinger* in the ſervice of the houſe of Medicis. However, he ſeems to have ſpent the greateſt part of his life in Italy, as a compoſer; in which character he is mentioned with great reſpect by Zarlino, Vincenzo Galilei, Pietro Pontio, and almoſt every Italian muſical writer of his time. And, after having been ſucceſſively maeſtro di capella to the duke of Ferrara, the republic of Venice, where he was the immediate predeceſſor of Zarlino, and the duke of Parma, he died at the court of that prince, 1565, aged forty-nine. His motets and madrigals were firſt publiſhed at Venice, 1544, and again, together with his maſſes, and many other works, after his deceaſe, in 1562 and 1565. His "Cantiones Sacras," or motets, were likewiſe publiſhed at Lovain, 1573.

CIPRIANI, GIOVANNI BATISTA, was of a Piſtoieſe family, but born in Florence, according to Heinecken, in 1732. At a very early period of life he evinced great facility and taſte in his drawings, many of which, in the manner of Gabbiani, are ſtill to be met with at Florence. Lanzi mentions two juvenile performances of Cipriani in oil, in the abbey church of St. Michele near Piſtoia; one repreſenting St. Teſauro, the other St. Gregory the 7th, obſerving at the ſame time, that though he drew much he painted but little.

In 1750, he went to Rome to complete his ſtudies, and ſoon afterwards came to England, where he was choſen a member of the Royal Academy, and lived much reſpected during the remainder of his life. Amongſt the firſt works which Cipriani painted after his arrival in this country, was a room decorated with poetical ſubjects, in the houſe of the late ſir William Young, at Standlynch in Wiltſhire. The intimacy, however, which ſubſiſted between our artiſt and Bartolozzi, the celebrated engraver, contributed not a little to encourage him in his fondneſs for ſketching, and to deter him from the more laborious taſk of oil painting; what the one drew the other etched, and thus the elegant deſigns of Cipriani were rapidly diſſeminated over Europe. It might, perhaps, be ſaid, that throughout his works there was too evident a ſimilarity, as the ſame forms, the ſame characters, the ſame expreſſions, ſo frequently pervade them, but his drawing is at all times correct and graceful. Some of the few pictures which he left, are at the ſeat of Mr. Coke, at Holkham, in Norfolk. He died, much regretted, in the year 1790. Lanzi Storia Pittorica. Fuſeli.

CIPSOLA, in *Geography*, a town of European Turkey, in the province of Romania; 24 miles N.N.W. of Gallipoli.

CIPURA, in *Botany*, Juſſ. p. 58. a genus formed by Aublet for a plant found in Guiana, of which he gives the following deſcription. *Cal.* tubular at the baſe, ſuperior; border ſix-cleft; three inner ones alternating with the others, and only one third as large. *Stam.* three, inſerted into the tube. *Piſt.* Style thick, trigonous; ſtigma three-lobed. *Root* tuberous, tunicated. *Root-leaves* ſword-ſhaped, nerved, ſheathing. *Flowers* on a ſcapus, in a kind of terminal ſpike, ſpathaceous; lower ſpathes longeſt. Aub. Guian. tab. 13. La Marck has adopted this genus, and copied Aublet's figure, Illuſt. Pl. 30. with the following generic and eſſential characters expreſſed in the language of the Linnæan ſyſtem. Claſs and order, *triandria monogynia*.

Gen. Ch. *Cal.* none, ſpathe oblong, membranous, concave, involving the flower. *Cor.* ſix-petalled; three outer petals larger, egg-ſhaped; three inner ones alternate, three times leſs. *Stam.* Filaments three, very ſhort, inſerted into baſe of the corolla; anthers oblong, erect. *Piſt.* Germ inferior, oblong, trigonous; ſtyle thick, triangular; ſtigmas three, petal-ſhaped, acute. *Peric.* Capſule oblong, angular, three-celled. *Seeds* many, angular.

Eſſ. Ch. Corolla ſix-petalled; three inner ones ſmaller, capſule inferior, three-celled. Illuſt. p. 107.

Sp. C. *paludoſa*. *Root*, a round fleſhy bulb. *Stem* ſix inches high or more, ſlender, firm, furniſhed near the top with two leaves, and ſometimes with other ſhort ones. *Leaves* more than a foot long, ſurrounding the bulb at their baſe, narrow, acute, thin, ſtriated. *Flowers* white, or blue. Encyc.

Obſ. Linnæus would have called the three interior petals, or rather ſegments of the border, a nectary.

CIRCADA, a tribute anciently paid to the biſhop or archdeacon, for viſiting the churches.

CIRCÆA, in *Botany*, (Κιρκαια, Dioſc.; *Circeæ*, Plin.; ſo called from the enchantreſs, Circe); Tourn. Cl. 6. §. 9. gen. 2. Linn. gen. 24. Schreb. 31. Gært. 134. Juſſ. 319. Vent. vol. iii. 310. Enchanters nightſhade. Claſs and order, *diandria monogynia*. Nat. ord. *aggregatæ*, Linn. *onagræ*, Juſſ.

Gen. Ch. *Cal.* Perianth two-leaved; leaves egg-ſhaped, concave, reflexed, coloured, deciduous. *Cor.* Petals two, ſpreading, equal. *Stam.* Filaments two, capillary, erect; anthers roundiſh. *Piſt.* Germ top-ſhaped, beſet with little hooked briſtles, two-celled, two-valved, opening from the baſe towards the top. *Seeds* ſolitary, oblong, narrow at the bottom.

Eſſ. Ch. Corolla two-petalled. Calyx two-leaved, ſuperior. Capſule two-celled. Seeds ſolitary.

Sp. 1. C. *lutetiana*, With. Sp. Pl. Mart. Lam. Willd. Flor. Dan. tab. 210. Lam. pl. 16. fig. 1. Gært. tab. 24. Eng. Bot. 10156. Common enchanters nightſhade. "Stem erect; leaves egg-ſhaped, finely toothed, opaque, pubeſcent." Dr. Smith. *Root* perennial, creeping ſo much as not to be eaſily extirpated. *Stem* erect, or procumbent, according to its ſituation, a foot and a half high, not much branched. *Leaves* oppoſite, dark green. *Flowers* white or reddiſh, in terminal racemes; peduncles, ſpreading, at length reflexed; calyx-leaves ſcarcely membranous, egg-ſhaped, reflexed, coloured. *Capſule* roundiſh, beſet with little hooked briſtles, by which, ſeparating entirely from the ſtalk, it ſticks to the coats of animals. One of the ſeeds frequently abortive. A native of England and other parts of Europe, in ſhady lanes under moiſt hedges. In gardens it is often a common weed, flowering in June and July. 2. C. *alpina*, Linn. Sp. Pl. Mart. Lam. Willd. Lam. pl. 16. fig. 2. Eng. Bot. 1057. (Solaniſolia circæa alpina, Bauh. Pin. 168. Moriſ. tab. 34. fig. ult.) Mountain enchantreſs nightſhade. "Stem aſcending; leaves heart-ſhaped, ſhining; calyx membranous." Dr. Smith. β. C. alpina, Flor. Dan. 256. Curtis Flor. Lond. Faſc. 3. tab. 3. (C. intermedia, Ehr. 101.) *Root* creeping. Whole plant leſs pubeſcent than the preceding ſpecies. *Stems* low, diffuſe at the baſe, with red joints. *Leaves* tender, of a pleaſant yellowiſh green colour, toothed-ſerrated; petioles membranous-angular. *Flowers* of a vivid red colour; racemes often numerous, ſhort, terminal and axillary; calyx membranous, white, with a red tip. Dr. Smith. A native of Sweden and other northern parts of Europe; of Scotland and Cumberland, &c. in the north, but not in the ſouth of England. The variety β is erect, about the ſize of C. lutetiana, in other reſpects reſembling the preſent ſpecies. A native of ſhady, but open woods, by the river ſide of Matlock in Derbyſhire. We have found it, but ſparingly, in ſimilar ſituations in the neighbourhood of Leeds.

CIRCÆUM, in *Ancient Geography*, *Irké*, a town of Aſia in the Colchide, ſeated on the left bank of the Phaſis, W.S.W. of the Tyndaris.

CIRCÆUM *Promontorium*. See CIRCEII.

CIRCAR, in *Geography*, a name given in Hindooſtan to a tract of country, which, according to the ſtatement of major Rennell, is not very diſſimilar to that of a county in England; few of the circars being of leſs extent than the largeſt Engliſh counties. The famous Acbar, in the 16th century, began by dividing Hindooſtan Proper into 11 ſoubahs or provinces, ſome of which were in extent equal to large European kingdoms; and the ſoubahs were again divided into circars, and theſe ſubdivided into purgunnahs, correſponding, as major Rennell ſuggeſts, to kingdoms, or viceroyalties, counties, and hundreds, in Engliſh terms. See SOUBAH.

CIRCARS, *Northern*, denote five circars or provinces, ſo denominated originally from their poſition in reſpect to Madras, on which they depend. Theſe Circars are Cicacole, Rajamundry, Ellore, Condapilly, which are in the poſſeſſion of the Engliſh; and Guntoor, which is in the hands of the Nizam. The firſt four occupy the ſea-coaſt from the Chilka lake on the confines of Cattack, to the northern bank of the Kiſtnah river; forming, comparatively, a long, narrow ſlip of country, 350 miles long, and from 20 to 75 wide. The nature of the country is ſuch, as to be eaſily defenſible againſt an Indian enemy; as it has a barrier of mountains and extenſive foreſts on one ſide, and the ſea on the other: the extremities only being open. Its greateſt defect is in point of relative ſituation to Bengal and Madras; it being 350 Britiſh miles from the firſt, and 250 from the latter: ſo that the troops deſtined to protect it cannot be reckoned on, for any preſſing ſervice that may ariſe at either preſidency. The Circars, in point of ſtrictneſs, appertain partly to Golconda (or the Deccan) and partly to Oriſſa; and are held of the Nizam, on condition of paying him a ſtipulated quit-rent. In conſequence of the wars which terminated, after much bloodſhed and aſſaſſination, in 1754, by fixing Mahomed Ally in the government of Arcot, and Salabidjung, ſon of the late Nizam-al-Muluch, in the ſoubahſhip of the Deccan, the Engliſh gained the point of eſtabliſhing their ſecurity, and their influence, in the Carnatic; and the French, in addition to the ſolid advantage of getting poſſeſſion of the northern circars, gained the ſplendid but uncertain privilege of influencing the councils of the Nizam, by attending his perſon with their army. This latter privilege was of ſhort duration; for while M. Buſſy, at the head of the French army, was at Sanore, in the weſtern quarter of the peninſula (in 1756) a quarrel with the miniſter of the ſoubah of the Deccan occaſioned the diſmiſſion of the French. They were then compelled to retreat through an enemy's country for near 300 miles, till they reached Hydrabad, where they fortified themſelves, and waited for reinforcements. At Hydrabad the quarrel was compromiſed; and the following year (1757) and part of the next were ſpent by M. Buſſy in reducing the refractory Rajahs, or Zemindars, in the northern circars, and in aſſiſting the ſoubah to execute his own plans. In the midſt of theſe tranſactions, M. Buſſy was ſuddenly recalled into the Carnatic; and the ſoubah was left at full liberty to accede to the propoſals of the Engliſh. The Circars, the fruits of M. Buſſy's wars and negotiations in the Deccan; and which had been obtained in 1753, yet remained with the French; but colonel Clive, at this time governor of Bengal, with that promptitude and deciſion which ſo ſtrongly marked his character, ſeized on them with a force from Bengal, in 1759; although they were defended by a much ſuperior force; and the French were deprived of reſources to carry on the war in the Carnatic. Thus the French not only loſt all their poſſeſſions in the Carnatic, but in every other part of India: ſo that their political exiſtence may be ſaid to have begun in 1749, and to have ended in 1761, by the capture of their principal ſettlement, Pondicherry. When the French took poſſeſſion of the five Circars in 1753, they were valued at about 43 lacks of rupees per annum. The Engliſh never poſſeſſed Guntoor, which was eſtimated at near 7 lacks of the above ſum; ſo that 36 lacks (about 360.000*l.*) ſhould be taken for the true value of the Engliſh poſſeſſions in the Circars. In 1784, they were reckoned to produce about that ſum. It would appear, that the Nizam, by retaining Guntoor, had more than an equivalent for the peſhcuſh or tribute, which is 5 lacks per annum. However, Guntoor has ſince been ceded to the Eaſt India company; and it is juſtly reckoned an important acceſſion. See Guntoor.

CIRCASSIA, a country of Aſia, bounded on the north by the river Don; on the eaſt by the Caſpian ſea, and the mouths of the Volga; on the ſouth by mount Caucaſus and the Black Sea; and on the weſt by part of the Black Sea and the lake of Azof. It was formerly governed by ſeveral independent princes; but ſince the convention of 1783, it is now almoſt wholly ſubject to Ruſſia, and included in the government of Caucaſus. See Caucasus and *province* of Caucasus. The Circaſſians, or, as they are called by the Ruſſians, Tcherkeſſians, are formed of the relics of the mingled ſwarm, uſually comprehended under the appellation of Alanians, who ſettled on the northern ſide of Caucaſus ſoon after the Yazamates. The Circaſſians, or races collaterally related to them, as for example, the Zichians, and Auchaſians, gradually took poſſeſſion of the ſouthern regions adjacent to the Cuban. During the empire of the Chazares, the Byzantine emperors appear to have exerciſed, or at leaſt to have claimed, a ſort of paramount ſupremacy over this nation, becauſe the Zichians were reckoned among their provinces. When the Ruſſians erected a ſtate upon the iſland and in the city of *Taman* (which ſee), the Zichians were tributary to them; but, after the Komanes or Polootzes had conquered the north-eaſtern part of the Cuban, they put the Circaſſian ſtems in poſſeſſion of the ſouthern and weſtern, and extended themſelves afterward continually farther and farther to the north. In 1277, the Zichians were compelled to yield to the victorious arms of Mangu Timur and Nogay. However, both they and the Circaſſians remained truly independent in the upper regions of the mountains. They were even, at that period, ſtill in poſſeſſion of the whole eaſtern coaſt of the ſea of Azof as far as the Don. They rendered themſelves maſters of the city of Kertſch in the Crimea, made frequent incurſions into that peninſula, and into other European countries, formed the baſis of the then riſing Caucaſian tribes, and founded in Egypt a famous dynaſty. At the cloſe of the 14th century, when the Zichians ſuffered much by the famous victories of the great Timur, and afterwards aſſerted their liberty with energy and effect againſt the Ottomans, the Circaſſians remained unſubdued. Although in the middle of the 16th century the czar Ivan II. reduced the Circaſſians under his dominion, it was only for a ſhort period; and the Circaſſians of Cuban maintained themſelves as well on the Don as on the Cuban. There they formed, in conjunction with the Ruſſians, the ſtate of the Don-Coſſacks; where they retained poſſeſſion of all the iſlands of the Lower Cuban, the whole of its ſouthern banks, and the regions contiguous to the Euxine. Theſe ſouthern people, however, were compelled, in the 17th century, to acknowledge the paramount lordſhip of the khan of the Crimea, although they were governed by beys of their own nation. The tribute which they paid to the khan conſiſted chiefly in beautiful youths and virgins for the ſupply of his Harem. At the commencement of the 18th century, the Circaſſians revolted againſt this humiliating tribute, and put themſelves under the protection of the Porte, without becoming ſubject or tributary to it. About the middle of this century, 29 Circaſſian ſtems, according to Peyſſonel's account, were under the khan of the Crimea, who could eaſily bring into the field 100,000 men. But few of theſe ſtems were really his ſubjects: the ſouth-eaſtern lived almoſt in an entire independence, or acknowledged only with reſervation the ſovereignty of the Crim. At the peace of 1774, ſome other diſtricts of the Circaſſians were ceded to the khan; but on the ſeizure of the Cuban in 1783, the ſtems of this people in ſubjection to the khan of the Crimea, fell to the Ruſſian empire. The ſeparation of the Aſiatic diſtricts, uſually comprehended under the general appellation of Circaſſia, was, on that occaſion, recogniſed to be made by the river of Cuban. Concerning the preſent ſtate and the population of the Ruſſian Circaſſians, little can be authentically aſcertained, as no enumeration has been hitherto inſtituted in thoſe parts. All the diſtricts and ſtems in the Cuban are properly Ruſſian ſubjects, inhabiting the iſlands of the Lower Cuban, the whole ſouthern ſhore of that river up to its ſource, and the regions bordering on the Euxine as far as Auchaſia. The Circaſſians in both the Great and Little Kabarda are reckoned only among the vaſſals of Ruſſia. The ſovereigns of that empire ſtyle themſelves, ſince the conqueſt of the Upper Kabarda by Ivan II. lords of the Kabardinian countries of the Circaſſians and mountain-princes. This ſeems not to have been a mere title, for though this conqueſt was afterwards loſt, yet the princes of the Great and Little Kabarda, ſeveral times between the years 1740 and 1750, took the oaths of fealty to Ruſſia.

The Circaſſians who inhabit the parts of mount Caucaſus more advanced than the Abaſſinians that occupy Great Abaſſa, and who have ſpread into the contiguous beautiful plain, whence they have expelled or ſubjugated the former natives, are repreſented by Pallas, in his "Journey into the Southern Departments of Ruſſia," as a warlike nation. They are, he ſays, a ſpecies of knights, obſerving a complete feudal ſyſtem among one another, and towards their ſubjects; and in this view of them, ſuppoſing that the chiefs and nobility alone conſtitute the nation, that their ſubjects are almoſt all ſlaves of conquered nations, who have adopted the language of their maſters, and as ſuch are mildly treated, and that a free courageous knighthood cannot endure a foreign yoke, without the greateſt repugnance; we may judge with greater indulgence concerning their ariſtocratical conſtitution, their conſtant wars, and their reſiſtance formerly againſt the khan of the Crimea, and now againſt Ruſſia. It is fortunate that their internal feuds, and the diviſion of the power of this heroic race among a number of petty chiefs, render them leſs formidable; and it were to be wiſhed, that, without impairing their bravery, they could be brought to be good vaſſals, and ſomewhat accuſtomed to order; in which caſe, they would turn out as reſolute light cavalry as ever took the field. The part of this nation which concerns Ruſſia, is that which is ſettled in and near the Caucaſian line, inhabiting, as we have already obſerved, the larger and ſmaller Kabarda. The Kabardinians hold themſelves to be of Arab origin; perhaps they are the remains of the armies formerly ſent by the khalifs againſt Caucaſus. Others deduce them from the Mamelukes. General tradition, confirmed by ſtill ſubſiſting names, ſhews that they formerly inhabited the Crimea. The nobles are divided into ancient noble knights and nobles of nobles.

The Circaſſians in general, and particularly the Kabardinians, live in villages, which they quit from time to time on account of the accumulation of filth, their inſecurity, or other inconveniencies. They carry with them their beſt wood for ſpars and wheel-wright's work, and burn the reſt. They then ſeek ſome other commodious ſpot. When they build at any diſtance from water, they conduct a canal by embankments from the neareſt brook, in which buſineſs they are as expert as the Crim Tartars. They build their habitations near together, in one or more circles or parallelograms; ſo that the area within conſtitutes the common ſpacious yard for cattle; this has only a ſingle gate, and is ſurrounded, and in ſome ſort defended, by the houſes. The men uſually dwell in a ſeparate apartment, and do not willingly appear with their wives in the preſence of ſtrangers. The Circaſſians are, generally ſpeaking, a handſome people. The men, particularly the chiefs, are commonly tall, ſlim, very ſlender above the hips, ſmall in their feet, and ſtout in their arms. They have for the moſt part a Roman and martial air, but in ſome a mixture of Nogai blood is viſible. The women are not all Circaſſian beauties, but they are generally well made, fair-complexioned, dark-haired, regular in their features, and among them are to be obſerved more beauties than frequently occur among an uncivilized people.

They are very cleanly in their villages and houſes, as alſo in their clothes and diet. It is a known fact, that a corſet, or broad belt of undreſſed leather, is ſewed (among more diſtinguiſhed perſons, it is fixed with ſilver claſps), from below the breaſts to the hips. This girdle muſt not be laid aſide till the wedding night, when the bridegroom himſelf removes it with a ſharp ſword, often at conſiderable hazard to the bride. For the ſake of their ſhape alſo, the girls are kept low, being ſupported only with a little milk and cake. According to the Circaſſian, and alſo to the Turkiſh ideas of beauty, a woman ſhould be drawn very ſmall over the hips, and have the belly projecting downwards.

The men alſo endeavour to render the waiſt exceſſively ſlender, by the belt to which the ſabre is appended. They have all very ſmall feet, from incloſing them as tight as poſſible in ſocks of morocco leather, which give them the air of dancers, and with which they ſit on horſeback.

The chiefs and knights have no buſineſs but war, pillage, and the chaſe. They live like gentlemen, ramble about, frequent carouſals, or concert freebooting ſchemes. The knights keep the people in order, and are in nothing bound to the chiefs or princes, except in military ſervice. The peaſants or ſubjects, who yield blind obedience to the princes and knights, and hold life and property at the will of the former, are tranſmitted by inheritance; but no inſtance has occurred of their being ſold. Theſe people, and the ſlaves taken in war, who afterward fall into the claſs of the commonalty, plough the land with large ploughs, feed the herds, carry wood, build the habitations, reap, and make hay, which in winter is commonly eaten on the ſpot. In harveſt they are aſſiſted by the women and grown-up girls, who are not kept ſo cloſe as among the Crim Tartars.

Among the peaſants, every man muſt mow and carry hay for three days, for the nobleman or prince; cut and carry wood three days; and deliver ſeven ſacks of millet for every ox that he poſſeſſes. A bridegroom of this claſs muſt alſo give two cows and two oxen to his lord. The inhabitants of the mountains, whom the Circaſſian princes have rendered tributary, give for each family a ſheep, or its value. Every one who has a flock, be it great or ſmall, muſt give a ſheep in ſummer, at the time of encampment, to the prince; for which the latter keeps open table.

In general, the prince, although he is bound by no laws, muſt endeavour to deſerve the love of his ſubjects, and their attachment in war by liberality, hoſpitality, and kindneſs. He may ennoble a deſerving ſubject. On occaſion of great undertakings, he aſſembles the nobles, and by them the deciſions of the aſſembly are notified to the people. The number of Circaſſians it is difficult to determine. Reckoning the tribes beyond the Cuban, they amount to a conſiderable power; which, conſidering their bravery and military ſpirit, would be dangerous, were it not divided among ſo many diſagreeing princes.

The two oppoſite cuſtoms of hoſpitality and the *lex talionis*, are held ſacred among the Circaſſian knighthood, and moſt other people of Caucaſus. The former is reduced to fixed principles; and every one who finds himſelf under their protection is perfectly ſecure againſt all moleſtation. The hoſt guards him with his own and his people's life, furniſhes him with an eſcort, is anſwerable for him to his kinſmen; and the murder of, or inſult towards the gueſt, is puniſhed as ſeverely as in the caſe of a relative. A ſtranger who puts himſelf under the protection of a woman, or can touch the breaſt of a woman with his mouth, were he an enemy, or even the murderer of a kinſman, is ſpared, and protected as if he were a member of the family.

The *lex talionis* is juſt as conſcientiouſly practiſed among the Circaſſians. The next heir, or neareſt in blood, even though at the time he be a child, muſt take vengeance either openly or by guile, for the murder of a kinſman, if he will not be expelled from ſociety. The price of blood is called *Thlil-Ueſa*. Princes, however, and nobles, accept no price, but require blood for blood.

The education of the children of the princes is calculated, from the earlieſt infancy, to ſtifle every feeling of affection. Sons and daughters are delivered on their birth to ſome nobleman, often not one of the richeſt. The parents, particularly the father, never ſee the boy till he is capable of bearing arms, nor the girl till after ſhe is married.

The origin of this cuſtom of committing the education of all male children to ſtrangers, in preference to parents, whilſt (as ſome ſay) females are brought up by the mothers; and alſo that which prohibits huſbands, under pain of infamy, from publicly converſing with their wives, ſo that the two ſexes are divided into two diſtinct communities, cannot be traced to any diſtant nation. But if we ſuppoſe them to exiſt at an early period in mount Caucaſus, they may, perhaps, in ſome meaſure, account for the fabulous deſcription of the Amazons and Gargarenſes, who are placed by ancient geographers in the country now occupied by the Circaſſians. See AMAZONS.

The Circaſſians practiſe agriculture, and particularly paſturage. They principally ſow millet, of which they not only make various preparations for food, but alſo a liquor which they call *hanthups*. They likewiſe cultivate maize, which, on journeys and expeditions, ſerves for aliment in caſe of need. They plant ſeveral garden vegetables. The women make a very ſtout yarn out of the wild hemp, but they have not the art of weaving linen cloth.

The care of horſes conſtitutes, as one may expect among roaming horſemen, the moſt important department of their rural economy. To this they attend with as much care and zeal as the Arabs. They aim not merely at beauty, but alſo at ſtrength, ability to endure hunger and fatigue, and ſpeed; ſince the ſucceſs of their expeditions depends on the quality of their horſes. Almoſt every princely and knightly family boaſts of a particular breed of horſes, and burns their mark upon the hips of the true bred foals. In this reſpect they are ſo conſcientious, that he who ſhould fix the mark of a noble race on an ordinary foal, muſt pay for the fraud with his life.

The language of the Circaſſians is common to them with the other neighbouring Tartars, although the chief people among them are not ignorant of the Ruſſian.

It appears from a vocabulary preſented to us of the languages or dialects of the Caucaſian nations, by Mr. G. Ellis in his "Memoir of a Map of the Countries comprehended between the Black Sea and the Caſpian" (1788), that many of the Circaſſian and Caucaſian words are nearly the ſame as thoſe of the uncivilized inhabitants of America. Hence thoſe who incline to the opinion of Hornius, and others, who have maintained, that America was originally peopled by colonies from Aſia, particularly from Scythia or Tartary, deduce an argument in favour of their opinion.

Their religion is Paganiſm; for though ſome of them were formerly Chriſtians, and others Mahometans, and they practiſe circumciſion, they have neither prieſt, alcoran, nor moſque, like other Mahometans. Every body here offers his own ſacrifice at pleaſure, for which, however, they have certain days, eſtabliſhed rather by cuſtom than by any poſitive command; their moſt ſolemn ſacrifice is offered at the death of their neareſt friends, upon which occaſion both men and women meet in the field, to be preſent at the offering, which is an he-goat; and having killed, they flay it, and ſtretch the ſkin with the head and horns on it, upon a croſs at the top of a long pole, placed commonly in a quickſet hedge (in order to keep the cattle from it), and near the place the ſacrifice is offered, by boiling and roaſting the fleſh, which they afterwards eat. When the feaſt is over, the men riſe, and having paid their adoration to the ſkin, and muttered over certain prayers, the women withdraw, and the men conclude the ceremony with drinking a great quantity of aqua-vitæ, and this generally ends in a quarrel before they part.

The Circaſſians have few manufactures. The points of their arrows are the only articles of iron, which they work up themſelves. They make, indeed, ſome very fine cloths, and felt for cloaks, which is ſingularly light and durable; and to theſe we may add a few articles of leather, embroidered houſings for horſes, &c. Their beautiful coats of mail are brought from Perſia, and their fire-arms from Kubeſcha. The principal traffic of the Circaſſians conſiſts in ſlaves, honey, wax, ſkins of cattle, deer, and tigers. They have no money, and their whole commerce is carried on by exchange.

CIRCE′. See the next article.

CIRCELLI, or Circello, Monte, a cape and promontory of Italy, near Naples, ſometimes erroneouſly deſcribed as an iſland, but connected with the continent by a neck of land. It is a high mountain, at the ſouthern extremity of the Pomptine marſhes in the Eccleſiaſtical ſtate, renowned in fable for having been the reſidence of the enchantreſs Circé, who transformed men into brutes, and whoſe connections with Ulyſſes are deſcribed by Homer in the 10th and 12th books of his Odyſſey.

The ancient *Circeii* included both a town and promontory ſituated in that part of Latium, which had belonged to the Volſci, and which lay nearly at an equal diſtance from Rome to the N.W. and Naples to the S.E. on the weſtern ſide of the mountain. The coaſt was ſubject to the laſhing of furious waves, and preſented a variety of ſteep rocks, on the moſt elevated of theſe was placed the temple of Circé, the daughter of the Sun. The port was ſurrounded by a long wall, and it had been formed into a lake ſituated on the weſt. Circeii, about 24 years before the expulſion of Tarquin, became a Roman colony. In the time of Cicero, the temple of Circé ſubſiſted. The outline of the fable is as follows: Ulyſſes, landing upon this promontory, ſends a party to explore the country. They arrive at the palace of Circé, who courteouſly invites them to enter; and all but Eurylochus comply. She ſets before them a mixture of meal, cheeſe, honey, and Pramnian wine; the ſame compoſition as Neſtor prepares for the wounded chiefs in the Iliad. With this ſhe mixes poiſonous drugs, and after they have all partaken of the refection, ſhe ſtrikes them with a rod, and they are inſtantly transformed into ſwine. In this part of the fable nothing has the appearance of intemperance or groſs ſenſuality. On the return of Eurylochus, however, who, not knowing the fate of his companions, concluded that they were all murdered, Ulyſſes bravely reſolves to ſet out alone, in order to explore the event. In the way, he is met by Hermes in the ſhape of a youth, who informs him of the nature and mode of Circé's enchantments; and preſenting him with a root, called "Moly," as a preſervative, directs him, on being touched with the rod, to draw his ſword and threaten Circé with death. "Then (ſays he) ſhe will invite you to her bed, and do not you on any account refuſe the offer, ſince it will conciliate her kindneſs; but firſt bind her with an oath not to plan any farther miſchief againſt you." Ulyſſes acts in all points as he was commanded. Ulyſſes ſtays a whole year with Circé, ſharing her bed, and making merry with her good cheer, without ever thinking of Ithaca, till his men remonſtrate with him, and urge his return. An ingenious writer ſuggeſts, that Homer, in the ſtory of Circé, had no other end in view, than in that of the Cyclops, the Læſtigons, and various others; namely, to gratify the paſſion for novelty and love of wonder belonging to all ages and all readers, by introducing into the travels of his hero, all thoſe extraordinary narrations, which he had learned from tradition, or the reports of mariners. This purpoſe, ſo natural in a poet of a rude age, will account, not only for the ſtrange matter intermixed with many of his fables, but for their being introduced at all. He who looks for any better reaſon for many things that he will find in the early writers, will only ſacrifice his own judgment to their reputation. Aikin's Letters to his Son, p. 62.

CIRCELLIONES. See Agonistici.

CIRCENSES *Ludi*, Circensian *games*, or *games of the* Circus, a general term under which were comprehended all combats exhibited in the Roman circus of what kind ſoever; whether on foot or horſeback, or in a car; wreſtling, or boxing; with ſwords, pikes, darts, or arrows; againſt men, or againſt beaſts; on the ground, or aboard veſſels.

There were few, except ſlaves, that gave the people this cruel pleaſure: it was an exerciſe that would have diſgraced people of any account. See the article Gladiators.

Some ſay the Circenſian games were ſo called from the Latin *circumenſes*; becauſe they were held in a place encompaſſed round with naked ſwords, that the combatants might not have an opportunity of eſcaping.

At firſt they are ſaid to have been exhibited on the brink of the river Tyber, and the ground encompaſſed toward the land with naked ſwords.

Moſt of the feaſts of the Romans were accompanied with Circenſian games; and the magiſtrates, or other officers of the republic, frequently preſented the people with them on other occaſions. The grand ones were held for five days, commencing on the 15th of September. See Circus.

CIRCERELLUS, in *Ichthyology*, a name uſed by ſome authors for a fiſh uſually called *ammodytes*, or the *ſand eel*.

CIRCESIUM, Circessus, or Cercusium, *Kerkiſich*, in *Geography*, a town of Aſia, in Meſopotamia, at the confluence of the Aboras, or, as Xenophon calls it, the Araxes, with the Euphrates. In the time of Diocleſian this town was ſtrongly fortified.

CIRCIA, in *Ornithology*. See Anas.

CIRCIDIUS, in *Ancient Geography*, a river of Corſica, the mouth of which is placed by Ptolemy on the weſtern coaſt of the iſland.

CIRCIGNANO, Niccolo, called *Pomarancio*, in *Biography*, an hiſtorical painter of conſiderable eminence, who was born at Pomarance, a ſmall town in the vicinity of Vol-terra in Tuſcany, about the year 1516. Vaſari ſpeaks of him as a young man of ability, but without informing us who was his maſter. He is conſidered one of the beſt of the artiſts employed by Gregory XIII. and Sixtus V. upon the extenſive but hurried performances in the Vatican. In his freſcoes in the cupola of the church of S. Pudenziana at Rome, he appears ſuperior to the manneriſts of his time. Many of his other works at Rome are mentioned by Baglione: amongſt the moſt eſteemed is a coloſſal figure of Chriſt giving the benediction, ſurrounded by angels; a freſco in the church of S. Giovanni e Paolo. His native city and Loretto poſſeſs other of his performances. He died in Rome at the age of 72, about 1588. Baglione. Lanzi, Storia Pittorica.

Circignano, Antonio, called *Pomerancio*, was the ſon of the preceding artiſt; but, beſides the inſtructions of his father, he received great benefit from the leſſons of Chriſtoforo Roncalli his countryman, one of the beſt artiſts of his time. Antonio Circignano is little known by his works at Rome; but Città di Caſtello, where he ſpent ſome of the beſt years of his life, poſſeſſes ſeveral of his pictures; one of which a conception, (*concezione*,) at the church of the Conventuali, ſeems an union of the ſtyle of Roncalli with that of Baroccio. He died, aged 60, in the pontificate of Urban VIII. Pilkington ſays he was born in 1560. Baglione. Lanzi, Storia Pittorica.

CIRCINALEA *Folia*. See Leaf.

CIRCINIUM, in *Ancient Geography*, a city of Aſia, in Magneſia, ſituated at the foot of mount Oſſa, near the lake Bœbis, between Sothuſſa and the Macedonian ſea.

CIRCITOR, in the *Ancient Military Diſcipline*, an officer among the Romans, who went the rounds, after having received his orders from a tribune to viſit the ſeveral poſts, and ſatisfy himſelf that the ſentinels had not quitted them nor fallen aſleep.

Circitor is alſo uſed to ſignify a hawker, or pedlar, who goes about from place to place to vend his goods.

CIRCIUM, in *Botany*. See Cirsium.

CIRCLE, the name of various *aſtronomical inſtruments*. It will probably appear a paradox to ſome of our readers, to be told, that aſtronomical *obſervations* were made, in various parts of the world, many centuries before aſtronomical *inſtruments* were invented. The obſervations, to which we allude, were ſuch as related to the riſings and ſettings of the ſtars in different latitudes and in different ſeaſons of the year; to the claſſing of cluſters of ſtars into imaginary figures, called in the Engliſh language conſtellations; to the reſpective aſcenſions and deſcenſions of the circumpolar ſtars; and to eclipſes of the ſun and moon, as well as to occultations of the ſtars and planets, or *wandering* ſtars, by the moon. Hence aroſe the terms *heliacal*, *coſmical*, and *achronical* riſings and ſettings of the ancient authors, and various other terms in aſtronomy, which are retained to this day. Theſe obſervations, made at firſt by ſhepherds and herdſmen, ſimple as they were, were not only ſerviceable in determining the ſeaſons ſuitable for the different operations in huſbandry, but afforded data for aſcertaining the lengths of the ſolar and lunar periods, with a degree of accuracy which aſtoniſhes the modern aſtronomer. Before we proceed to deſcribe the circular inſtruments uſed in aſtronomy and navigation at the preſent day, it may not be unintereſting to give a brief hiſtory of the inſtruments that preceded them.

The firſt inſtrument, probably, which was uſed as a meaſure of altitude, was the gnomon, many centuries after the Babylonians, the Egyptians, and the Chineſe had been accuſtomed to make celeſtial obſervations, ſuch as we have ſpoken of. The firſt mention, we believe, that is made of the term *hour*, as a portion of the day, occurs in our Bible, in the book of Daniel, chap. iii. verſe 6, under the reign of Nebuchadnezzar, about the year before Chriſt 600; and the Grecian hiſtorian Herodotus expreſsly ſays, that the Greeks learned the uſe of the pole, the gnomon, and the diviſion of the day into twelve parts from the Babylonians. Accordingly, Diogenes Laertius informs us, that Pherecydes ſet up a pole or dial in the iſland of Syra, one of the Cyclades, about the year before Chriſt 540, which, indeed, Anaximander had done previouſly, about the year before Chriſt 547, at Lacedæmon; and the Jews, in the reign of Ahaz, had known the uſe of a dial nearly 200 years before. The Roman dials, of courſe, were poſterior to theſe; the firſt that was ſet up at Rome, which was by Papirius Curſor, being, according to Pliny, (N.H. l.vii. c. 60.) about the year 461 of the building of the city, or 293 before Chriſt. The uſe of a gnomon, or ſtyle of a large dial, as an inſtrument for meaſuring altitudes of the ſun, aroſe from the circumſtance of an obſerved increaſe in the length of the ſolar ſhadow as the ſun's altitude decreaſed. Geometry by this time had begun to be greatly improved by Thales, Pythagoras, Hippocrates, Eudoxus, Euclid, Apollonius, Archimedes, and others; and aſtronomy was now cultivated in the ſchools, particularly by Eudoxus and Aratus. Plato alſo had learned in Egypt, that the ſolar year is $365\frac{1}{4}$ days; and Philolaus aſſerted the annual motion of the earth round the ſun, as did Hicetas the diurnal motion of the ſame; ſo that the obſervations which had been made ſome centuries before the Chriſtian æra, and the ſyſtems ſuggeſted by different philoſophers to explain the obſerved phenomena, muſt have diſpoſed the minds of all the early cultivators of ſcience, to avail themſelves of the uſe of an inſtrument, which afforded data for calculations, beyond what mere ocular obſervation could furniſh. The compariſon of the perpendicular height of a gnomon with the length of its meridian ſhadow, projected on a horizontal plane, ſimple as the obſervation was, afforded the means of aſcertaining the ſun's apparent meridian altitude on any day by means of the Pythagorean Theorem on the properties of the right-angled triangle. This obſervation, made on the days of the ſummer and winter ſolſtices ſucceſſively, determined the difference of the ſun's meridian altitudes on thoſe days, and conſequently the ſpace contained within the two tropics, which is juſt double the greateſt declination; hence the complement of the latitude of the place, or, which is the ſame thing, the complement of the pole's elevation, was determined with conſiderable accuracy. Thales, whoſe diſciple Pythagoras was, and who, Laertius ſays, was the real author of Euclid's 47th propoſition, uſually called the Pythagorean propoſition, was accuſtomed to meaſure the heights of the pyramids of Egypt by their ſhadow, and could foretel eclipſes; he was alſo the firſt who divided the celeſtial ſphere into zones by the introduction of five circles, *viz.* the arctic, the ſummer tropic, the equator, the winter tropic, and the antarctic circle. This diviſion of the heavenly regions into zones, divided by parallel circles, at a time when geometry was cultivated, naturally led to the taking of the latitudes and longitudes of the heavenly bodies; and it may be worthy of remark here, that the pyramids themſelves had their planes facing the eaſt, weſt, north, and ſouth points, which, therefore, might be uſed as inſtruments of obſervation. Anaximander, another diſciple of Thales, who, we have ſaid, invented the gnomon, wrote a treatiſe on the ſphere, and explained the obliquity of the zodiac; and, about 100 years after him, Anaxagoras, who ſtudied philoſophy for 30 years at Athens, wrote a book on the "Quadrature of the Circle." Thus, theſe philoſophers of what was called the Ionic ſect, may be ſaid not only to have laid the foundation of aſtronomy as a regular ſcience, but alſo, by referring the places of the heavenly bodies to certain ſuppoſed circles in the heavenly regions, to have ſuggeſted to future aſtronomers the moſt natural ſhape of an inſtrument that ſhould be beſt calculated to meaſure their relative angular diſtances: we do not, however, meet with any account of circular or other inſtruments uſed by any of the philoſophers of the Ionic or the Academic ſchools, until we arrive at the time of Hipparchus, who lived about 160 years before Chriſt. This aſtronomer collected the different obſervations that had been previouſly made; and made new ones by means of an inſtrument, called an *aſtrolabe*, which was a kind of armillary ſphere, calculated at once for being uſed in taking obſervations, and for illuſtrating the heavenly motions when aſcertained. This aſtronomer is ſaid to have been the firſt who attempted to count the ſtars, and to make a catalogue of them; and was alſo the firſt who made *ephemerides*, or calculations of the relative places of the heavenly bodies, which he did to include a ſpace of 600 years. Soon after Hipparchus, Eratoſthenes, the Alexandrian librarian, meaſured the length of the earth's radius by a compariſon of a gnomon at Syene in Upper Egypt with another at Alexandria, it having been obſerved that the former uſed to caſt no ſhadow on the day of the ſummer ſolſtice; this Eratoſthenes had alſo an aſtronomical inſtrument conſtructed ſimilar to that of Hipparchus, with which he made obſervations on the heavenly bodies.

We do not find any other mention of aſtronomical inſtruments until we come down to the reign of the Roman emperor Antoninus, when Claudius Ptolemæus, commonly called Ptolemy, wrote his "Almageſt," or famous book on aſtronomy, about the year of Chriſt 147, which ſcience he had learned in Egypt, though a native of Peluſium. In this work, which has alſo been called the "Great Syntax," and which is well known to aſtronomers, we find an account of another circular aſtronomical inſtrument for making celeſtial obſervations, deſcribed alſo by the name of *αστρολαβικον οργανον*, which, we underſtand, had only one large ring or plane graduated, and moſt likely was ſimilar to the aſtrolabe deſcribed in Bion's book on the "Conſtruction and principal Uſes of mathematical Inſtruments;" this inſtrument, according to Bion's deſcription, (ſee *Plate* I. *fig.* 1. of *Aſtronomical Inſtruments*,) like a common ring-dial, was made heavy, and arranged itſelf in ſuch a vertical plane when ſuſpended by a ſmall ring, that the points *o* and *o* of the graduated circle ſtood at oppoſite ends of a true horizontal line; and a diametrical bar, turning on a pin in the centre, carried two vanes, one at each end, through which the altitude of a heavenly body might be readily taken, in degrees and parts of a degree, as indicated by the fiducial edge of the diametrical bar. Sir George Shuckburgh, however, thinks that Ptolemy's aſtrolabe had two graduated circles placed at right angles. The ages of ignorance which ſucceeded Ptolemy produced no improvement on the aſtrolabe for more than fourteen centuries, and it is not eaſy to fix the exact date of the next ſucceeding inſtruments that owed their exiſtence to the revival of letters. The moſt obvious, and therefore probably the firſt, improvement in the aſtrolabe, was an enlargement of its radius, for the purpoſe of making the diviſions to be on a larger ſcale than the portable inſtrument at firſt had; this enlargement of the radius, of courſe, led to a reduction of the circle to a quadrant, which would naturally be ſuppoſed to be ſufficiently extenſive in its uſe, particularly for the purpoſe of taking altitudes, as they never exceed 90°. It does not appear, however, certain, when or by whom the plumb-line was introduced in the quadrant.

The introduction of the Indian, or Arabic numerals through Spain into England, muſt have contributed to a facility in reading the graduated diviſions of a circular, or quadrantal inſtrument. According to Dr. Wallis, the firſt figures of this ſhape, which were noticed in England, were on a chimney-piece at Helmdon in Northamptonſhire, in conjunction with the Roman characters, thus, M° 133, meaning 1133, which numerals fix their own date. Another ſtep, towards the improvement of inſtruments of obſervation, was the introduction of optical glaſſes, and of optical inſtruments, which were made by the famous Franciſcan friar, Roger Bacon, who was born in 1214. He talks of making ſmall things appear large, and of bringing diſtant things near him by his inſtruments, ſo that he muſt at leaſt have made Microſcopes, if not, as ſome ſuppoſe, Teleſcopes alſo. It will not be deemed foreign to our preſent purpoſe to notice here that Paul the Venetian (ſee Coſtard's hiſtory of Aſtronomy, p. 65.) introduced the uſe of the mariner's compaſs, borrowed, as it is ſaid, from the Chineſe, in the year 1260; though it was not till 1300 that John Goia, a Neapolitan, the reputed inventor, introduced its uſe in navigating the Mediterranean. We are not aſſured, indeed, that the directive power of the magnet had any circular or other graduated inſtrumental appendage, as its variation from the true pole was not diſcovered till Chriſtopher Columbus, the illuſtrious adventurer of Genoa, made this diſcovery in his voyage to the Weſt Indies, on the 3d of Auguſt, 1492. The magnet's attractive power, however, had been previouſly known to the ancient Greeks. The next maker of aſtronomical inſtruments that we find ſpoken of in hiſtory, was John Muller, who, being born at Mons Regius in France, in 1436, was therefore called Regiomontanus; this illuſtrious ſcholar and aſtronomer, after having learned the doctrine of the ſphere at Leipſic and Vienna, ſet about learning the Greek language, on purpoſe that he might make an epitome of Ptolemy's Almageſt, or Great Syntax, which was written in that language; in which labour he was aſſiſted by Purbach; and when, during the war between Matthias king of Hungary and the Bohemians, he retired to Nurembergh, he met with Bernard Walther, and other men of a mechanical turn, who aſſiſted him in conſtructing aſtronomical inſtruments. The firſt attempt was to make rules of tin for obſerving the altitudes of the ſun, moon, and planets, but particularly of the ſun; whether theſe rules were made in the form of a ſector, or in the form of a ſliding croſs, we are not informed. The ſecond inſtrument made by Regiomontanus and his aſſiſtants was a rectangular, or aſtronomical radius, for meaſuring the angular diſtances of the planets; the third, by the ſame mechanician, was an aſtrolabe, either armillary, like that of Hipparchus, or planiſpheric, like Ptolemy's; and laſtly, ſome minor inſtruments were conſtructed by him, ſuch as the *torquet*, the *meteoroſcope* of Ptolemy, and others of mere curioſity. This author eſtabliſhed a printing-office at Nurembergh, and as he was the inventor of decimal arithmetic, we muſt ſuppoſe that his method of graduating his inſtruments, whatever it was, was adapted for decimal calculations.

A poſthumous treatiſe by Regiomontanus on the ſubject of aſtronomical inſtruments is preſerved in the Britiſh Muſeum, which is, perhaps, the only copy in the kingdom; its title is, "Scripta clariſſimi Mathematici M. Joannis Regiomontani de Torqueto, Aſtrolabio armillari, Regulâ magnâ Ptolemaicâ, Baculoque Aſtronomico," &c. This treatiſe, which is in folio, was printed at Nurembergh in 1544. The torquet, which was a kind of portable equatorial,

rial, is alſo deſcribed in Bailly's "Aſtronomie Moderne," tome i. p. 687, and before either of the others by Apian in a ſcarce folio book, which has for its title "Introductio Geographica Petri Apiani in doctiſſimas Verneri Annotationes, &c. cui recens jam Operâ P. Apiani acceſſit Torcuetum Inſtrumentum pulcherrimum ſane et utiliſſimum. Ingolſtadii anno 1533."

Regiomontanus's deſcription of Ptolemy's armillary aſtrolabe may be ſeen in Weidler's "Hiſtoria Aſtronomiæ," 4to. 1741.

About two centuries and a half after Regiomontanus, we find the celebrated Copernicus ſtill uſing an aſtrolabe, his knowledge of which firſt gave him a taſte for the ſtudy of aſtronomy, and conſequently was the primary incident to which we are indebted for the introduction of our Copernican ſyſtem, in which the ſyſtems of Philolaus and Hicetas are united. This celebrated aſtronomer of Thorn, in Pruſſia, wiſhing for tables preferable to thoſe previouſly made by Ptolemy and Alphonſus, had a quadrant erected and fixed in the meridian line above the plane of the horizon about the year 1507, from which we may date the origin of regular obſervatories. This quadrant, of which we know not what were the exact dimenſions, took altitudes of the ſun by means of a cylindrical gnomon, or pin ſtuck in the central hole, the ſhadow of which, falling on the limb of the inſtrument, meaſured the greateſt and leaſt meridian altitudes of this luminary at the two ſolſtices, and thereby aſcertained the diſtance between the tropics and the height of the pole with conſiderable accuracy. But the inſtrument with which the altitudes of the heavenly bodies in general were taken by Copernicus, was a parallactical inſtrument made of fir, the limb of which, we are told, was ſubdivided into 1414 equal parts, juſt included in the quadrantal arc, that was contained between two legs of each four cubits long, which legs were reſpectively divided into 1000 parts, ſimilar in magnitude to the ſubdiviſions of the arc, according to Benj. Martin's account, in his "Biographia Philoſophica;" but if the ſubdiviſions were of ſimilar dimenſions on the arc and legs of the inſtrument, as is ſaid, there muſt have been 7854 on the former, with 1000 on the latter, to form an exact quadrantal arc. The angle ſubtended by each ſpace in the 1414 ſubdiviſions of the limb muſt have been $\frac{90^\circ}{1414} = 3' \, 49''.137$, &c. which quantity might induce one to ſuppoſe, that the circle had not been hitherto divided into exact degrees and minutes on an aſtronomical inſtrument.

Tycho Brahe, who was born about 73 years after Copernicus, and who is well known as the inventor of the Tychonic, a kind of Ptolemai-copernic ſyſtem of the planetary motions, had a more expenſive collection of aſtronomical inſtruments than any one who preceded him. His obſervatory in the iſle of Huen in the Sound, founded by Frederic II. of Denmark, was called "Uranibourg" (heavenly habitation), and had the firſt ſtone laid on the 8th of Auguſt, 1576. In his "Aſtronomiæ Inſtauratæ Mechanica," this author has deſcribed four inſtruments by the names of *armillæ, zodiacales*, and *equatoriæ*, varying from 4½ to 10 feet in diameter, which were divided into degrees and minutes, and ſome of them even to 15 and 10 ſeconds. The towers in which theſe inſtruments were placed, had moveable roofs; and, what is worthy of remark, the axis of the ten-feet inſtrument was tapering and hollow, in order to have ſtrength without increaſed weight, which conſtruction our modern inſtrument-makers have adopted. The graduations of his inſtruments were into equal ſpaces of 10' each, and the intermediate minutes were aſcertained by triangular diagonals formed of ſtraight lines of ten equidiſtant dotted ſpaces, inſtead of parallel continued lines.

As Tycho Brahe cultivated alſo chemiſtry and metallurgy occaſionally, it is very probable that his inſtruments were of better metal than the inſtruments of Copernicus, particularly when we take into conſideration the circumſtance of his having devoted nearly his whole life to aſtronomy, and purſuits ſubſervient to this noble ſcience, and alſo that he had ſeveral pupils or aſſiſtants learning to make celeſtial obſervations in Uranibourg; indeed, it is ſaid in the original account, that the *conſtans axis* was made *e chalybe*.

About the beginning of the 16th century, when nautical aſtronomy had begun to be cultivated, a ſpirit for making diſcoveries, beyond what Columbus had made, ſpread itſelf over the different kingdoms of Europe; among theſe adventurers we find the names of Americus Veſpucius, John and Sebaſtian Cabot, John Ponce de Leon, Cortez, Saavedra Guznam, Mendoza, Solo, Gonſalvo, Pizarro, &c. on the continent; and in England, ſir Martin Frobiſher, ſir Francis Drake, Mr. John Davis, &c.; the laſt of whom we ſhall ſhortly have occaſion to mention again. During the ſixteenth century, quadrants, ſectors, fore-ſtaffs, and back-ſtaffs, began to be made of various dimenſions, and on various conſtructions, both for aſtronomical and nautical purpoſes, but when, or by whom, the plumb-line was firſt made a part of the aſtronomical quadrant, is a matter not eaſily aſcertained at this diſtance of time: the graduations at firſt were pointed out by contact of a fiducial edge of the index, or were cut by a fine thread uſed as the line of the plumb, as ſeen in *Plate* I. *fig.* 4.; but this mode of reading an obſervation left much to conjecture, however ſmall the ſubdiviſions might be on the limb of the inſtrument. The firſt important improvement in the method of reading an obſerved angle, was that of Peter Nonius, or Nunez, a native of Portugal, born in 1497, which he deſcribed in his "Treatiſe on the Twilight," publiſhed in 1542. The contrivance was this; 45 concentric circles were deſcribed on a broad limb of the quadrant, and divided into ſpaces differing from one another by unity only in regular ſucceſſion, beginning with 90, and ending with 46; ſo that the edge of the plumb-line, when reſting on any particular point on the limb of the inſtrument, was certain to be contiguous to ſome one dividing mark in one of the 45 circles; which was an ingenious thought, but more plauſible in theory than uſeful in practice; for the dividing of 45 circles into equal ſpaces of different numbers, out of which nine are prime numbers, was a laborious taſk to be performed with the requiſite accuracy; and again, when the obſervation was read off, an arithmetical operation was neceſſary to reduce the obſervation to degrees, or parts of the largeſt circle; which operation was neceſſarily proportioned differently for each ſeparate circle. But perfection is not uſually attained at the firſt attempt in the conſtruction of any new inſtrument, or new method of performing inſtrumental operations; the concentric circles of Nonius led the mechanician to the diagonal ſcale, which was formed ſucceſſively by curved and ſtraight lines. In the year 1573, the "Scalæ Mathematicæ" of Thomas Digges, eſq. was publiſhed in London, in which is contained the method of making diagonal ſcales: the tranſition from Nonius's ſcale to the diagonal ſcale, with equidiſtant parallel curves, was eaſy; and it is ſaid, was firſt effected by an ingenious workman of the name of Richard Chanſeler. The diagonal ſcale, however, of either the curvilinear or rectilinear kind, was not well calculated for affording a very accurate reading of any obſervation, by reaſon of the difficulty of aſcertaining the exact interſecting point of the ſcale, which a thread or edge of the index exactly covered, where the ſlope of the diagonal

diagonal line did not deviate much from a radial line. Jacobus Curtis had a method of making ſcales for aſtronomical inſtruments, which was publiſhed by Clavius in 1586, at Rome. This method, like that of Nonius, conſiſted of concentric arcs, each differing in ſize by 1′ from the next contiguous: there were 39 of theſe concentric arcs, each divided by biſection into 128 equal parts, beginning with an arc of 90°, and ending with one of 128°. But, like Nonius's, this ſcale required an arithmetical reduction to degrees, though it had the advantage of being free from prime numbers. In or about the year 1590, captain John Davis, whom we have already named, contrived an inſtrument for taking altitudes, which conſiſted of two concentric contiguous arcs, one larger than the other, and three vanes; (ſee *Plate* I. *fig.* 2.). One vane was placed at the centre, and was called the horizon vane; another to ſlide on the arc of 60° of the ſmall radius, and to receive the rays of the ſun, which was therefore called the ſhade vane; and the third was made to ſlide on the arc of 30° of the long radius, for the eye to look through towards the horizon vane, and was thence called the ſight vane. In uſing this inſtrument, the back was turned towards the ſun; which circumſtance gave the name of back ſtaff alſo to the inſtrument, which far exceeded any nautical inſtrument that had preceded, both in accuracy and convenience. (See the article QUADRANT).

About the ſame time that Davis's quadrant was brought into uſe, we find another very ſimilar inſtrument, called "Elton's Quadrant," made uſe of both at ſea and on ſhore. This differs from the former principally, as it has its index levelled by a ſpirit level, which renders it uſeful where there is no good horizon to be ſeen. Its deſcription may be ſeen in No. 423. of the "Philoſophical Tranſactions," and in "Bion's Book," p. 274. See QUADRANT, and *Plate* I. *fig.* 8.

It is not quite certain at what exact period the inſtrument called the *fore-ſtaff* or *croſs-ſtaff*, (*Plate* I. *fig.* 3.), was uſed firſt in nautical aſtronomy, but as Bion calls the back-ſtaff an Engliſh inſtrument, we may conclude it was contrived on the continent; the diviſions are laid down on a long arm in the form of a tangent line, and three croſs-pieces of unequal lengths ſlide on this arm ſeparately to the diſtance that allows the eye, placed at the extreme end of the arm, to ſee the horizon below and the heavenly object above the croſs-piece uſed; the ſmalleſt ſliding croſs-piece will meaſure as far as 30°, the next in ſize 60°, and the largeſt 90°, when placed at the interior end of the divided ſcale. This inſtrument, when well made, was very convenient at ſea, but was incapable of having the diagonal ſcale applied, as the diviſions were unequal: it was capable of meaſuring angular diſtances as well as altitudes.

Another inſtrument uſed in navigation and aſtronomy was the nocturnal, (*Plate* I. *fig.* 6.) which conſiſted of a handle, an index with ſights, and two circular plates revolving on the ſame central pin, ſo divided as to be capable of adjuſtment for the right aſcenſion of ſome given circumpolar ſtar, as compared with the pole-ſtar on any day of the year; its uſe was, to find the hour, and to take the altitude and depreſſion of the pole-ſtar at any place, and conſequently to determine thereby the latitude. Its exact date is not, perhaps, well known.

About the end of the 16th century, Edward Wright, of Caius college, Cambridge, in whoſe time the fore-ſtaff or croſs-ſtaff was uſed, introduced the ſea-rings for determining the variation of the magnetic needle, which inſtrument, no doubt, was the origin of our azimuth compaſs, as it is ſaid that the altitude of the ſun and hour of the day could be determined by it. The ſame ingenious mathematician made a ſix-foot aſtronomical quadrant better than any that had been made in England, and rectified with it the declinations of the ſtars, as given in the former catalogues; which labour was performed in the years 1594, 95, 96, and 97; he alſo made a ſea-quadrant that would take altitudes by either a forward or backward obſervation, and that would determine the latitude by the obſerved height of the pole-ſtar, even out of the meridian, which muſt have been an ingenious contrivance.

After the invention of logarithms by baron Napier in 1614, calculations began to be abridged, and numerical proportions began to be performed by logarithmic ſcales. The firſt of theſe was by profeſſor Gunter, of Oxford, who, in the year 1618, contrived alſo a quadrant, bearing his name, which having a ſtereographic projection of the ſphere on its plane conſidered as the equinoctial, aſcertained the hour as well as azimuth, altitude, declination, and place of the ſun, by an obſervation without ſubſequent calculation, and theſe with ſome degree of accuracy.

Contemporary with profeſſor Gunter, was the celebrated Galileo of Italy, who, having heard of a certain glaſs in Holland, that would ſhew objects at a diſtance diſtinctly, ſet about contriving the dioptric teleſcope, in which he ſucceeded; and we find Chriſtopher Scheiner uſing one moveable on a polar axis in the year 1620 (*vide Roſa Urſina*); this diſcovery led ultimately to conſiderable improvements in aſtronomical inſtruments, though the unequal refrangibility of the different coloured rays of light prevented its being conſtructed with much power, and at the ſame time of a convenient length, for many years afterwards.

The invention of the micrometer, or mechaniſm in the eye-piece of a teleſcope, for meaſuring very minute angles, ſoon followed the invention of the teleſcope itſelf, and contributed greatly to the accuracy of obſervations, taken by the help of that inſtrument. It has been generally ſuppoſed that Monſ. Auzout, a Frenchman, was the author of this invention, in the year 1666, but according to Coſtard, an Engliſh gentleman of the name of Gaſcoigne was the real inventor, as appears by a letter written by himſelf, in 1641, which is ſtill extant in the library of the Earl of Maccleſfield. Gaſcoigne was ſlain near York in the civil wars in the year 1644.

In 1658, John Collins, an eminent mathematician of the county of Oxford, publiſhed a pamphlet, entitled "The Sector of a Quadrant," in which are deſcribed four different quadrantal inſtruments, but that which is called Collins's or Sutton's quadrant, contains a ſtereographic projection of one quarter of the ſphere, between the tropics on the plane of the ecliptic, agreeably to the latitude of London, the eye being ſuppoſed to be placed in its north pole: the uſe of this quadrant is very ſimilar to that of Gunter, from which the idea was no doubt borrowed.

Another very important improvement in aſtronomical and nautical inſtruments, was the divided ſcale at the end of the index, contrived by Peter Vernier, a gentleman of Franche Comté, and deſcribed in a ſmall tract, called "La conſtruction, l'uſage, & les proprietes du Quadrant Noveau de Mathematique, &c." which was publiſhed at Bruſſels in 1631. As this contrivance will be particularly deſcribed in its proper place, it may ſuffice to ſay here, that when the limb of the inſtrument is very equally divided by nice ſtrokes into halves, thirds, or fourths of a degree, an arc containing a given number of thoſe diviſions is laid on a circle deſcribed on the end of the index contiguous to the divided limb, which equal arc is divided into the ſame number of ſpaces, as its like arc on the limb, with the difference of *one*; ſo that if the limb contains 19 or 21 thirds, the index or rather that portion of it which ſubtends preciſely the ſame ſectoral arc, muſt contain 20 ſpaces, then when No. 0 on the index is put to any line on the limb, ſo as exactly to coincide, No. 1 of the former will not exactly coincide with the next ſucceeding line of the latter by $\frac{1}{20}$ of a ſpace, and No. 2 on the index will be $\frac{2}{20}$ from an exact coincidence, and ſo on till the end of the ſcale on the index, where there will be a ſecond coincidence; but whenever No. 1 does not coincide, there is only one coincidence, which may fall at any number of lines from 1 to 20 on the Vernier; but we have ſaid the limb is divided into thirds of a degree, when the ſcale has 20 diviſions, therefore $\frac{1}{20}$ of $\frac{1}{3} = \frac{1}{60}$ of a degree $= 1'$. When the diviſions of the limb are halves of degrees, the ſcale has 30 diviſions covering exactly 29 or 31 on the limb; and when they are quarters, 15 on the ſcale muſt juſt cover 14 or 16 on the limb. This ſcale is called a *Vernier* from the inventor's name, but is frequently, though very improperly, even by inſtrument-makers themſelves, called a *Nonius*, from which it is quite a different thing: by means of a Vernier a very ſmall circle may be graduated ſo as to ſhew *minutes* of altitude or of angular diſtance.

According to Joannes Baptiſta Morinus, Joannes Ferrerius, an ingenious workman, contrived a kind of circular diagonals, which, if continued, would paſs from the limb to the centre of an inſtrument, but to avoid trouble, he laid 60 of theſe on the index, which interſected ſtraight lines drawn from the centre in ſuch a way that theſe ſtraight degree lines marked the minutes by their interſections with the curves of the index. The account was publiſhed in 1634, but this method was not found ſo good as that of Vernier, and therefore was diſcontinued.

Notwithſtanding teleſcopes, as we have ſaid, were neceſſarily very long, to obtain much power, in order to be free from a diſcolouration in the eye-piece, yet we learn that ſo early as the time of Dr. Robert Hooke, certainly one of the greateſt mechanicians of his own, or perhaps of any other age, teleſcopic ſights were applied to the aſtronomical quadrant, as his well known diſpute with Hevelius of Dantzic will teſtify. Hevelius's Cometographia, which induced the diſpute, was publiſhed in 1668, which will fix the date pretty nearly of the teleſcopic ſights. It is ſomewhat extraordinary, that the diſpute alluded to terminated with the public opinion in favour of plain ſights, in preference to teleſcopic ones, as to the accuracy of obſervations made reſpectively with each; though Dr. Hooke contended that Hevelius could not meaſure a ſmaller ſpace in the heavens than *a minute* by plain ſights, whereas he could meaſure to the accuracy of *a ſecond*, with a radius of a ſpan long. This degree of accuracy in Dr. Hooke's obſervations, if really effected, one might ſuppoſe, left his ſucceſſors little more to do, but to copy his method of conſtructing inſtruments, and of obſerving by them; and our reflection upon his aſſertion would have led us to infer that he muſt have meaſured his *ſpan* with very long fingers, had we not previouſly known that his perſon was of very ſhort ſtature: his unwillingneſs to allow a competitor in mechanical inventions may in ſome meaſure account for the greatneſs of his pretenſions. Doctor Hooke had moreover a zenith ſector with a teleſcope of 36 feet focal length, fitted up with plumb lines in his apartments at Greſham college, which had a micrometer in its eye-piece, and we ſuſpect that this was the inſtrument with which he meaſured to the accuracy of *ſeconds*.

We have now arrived at a period in the hiſtory of aſtronomical inſtruments which is truly important. The introduction of pendulum clocks, of the vernier, and of the teleſcope, with a micrometrical eye-piece, together with a fine plumb-line, had become valuable additions to the ſimple ſector or quadrant; and in the year 1660, Huygens brought into England the art of grinding and poliſhing glaſſes ſuitable for teleſcopes: in the ſame year the Royal Society of London was founded by Charles II.; in 1670 the Royal Obſervatory at Paris was begun, to which Caſſini was appointed in the following year; and on the 10th of Auguſt of the year 1675 the firſt ſtone was laid of the Royal Obſervatory at Greenwich, to which fortunately the celebrated Flamſtead or Flamſteed was appointed the following year. Theſe inſtitutions of courſe produced a demand for good inſtruments, and, what is ſomewhat remarkable, the firſt man of eminence in this way, Geo. Graham, was born in a village in Cumberland, (which county has ſince given birth to many of the moſt eminent mechanicians), in 1675, the very year in which the obſervatory itſelf was founded. The new aſtronomer royal obſerved, as might be expected, with inſtruments of a large radius nicely divided, and furniſhed with teleſcopic ſights. One of thoſe inſtruments was a large ſector or ſextant, conſtructed, as has been ſaid, by a Mr. Abraham Sharp, the aſſiſtant to the aſtronomer royal, whoſe ſkill as a mathematician rendered him worthy of his ſituation, and we are told in Dr. R. Smith's Optics, that a quadrant, ſimilar to thoſe of Tycho Brahe and Hevelius, was fixed in the meridian by a ſolid wall, whence it was called a *mural arch*, and was, we underſtand, made by Flamſteed himſelf and his aſſiſtant.

Doctor Edward Halley, who had been fixed upon to go over to Dantzic in the year 1679, to ſettle the diſpute between Doctor Hooke and Hevelius, which we have before mentioned, and who in the year 1713, ſucceeded Sir Hans Sloane as Secretary to the Royal Society, was appointed to the ſituation of aſtronomer royal, at the death of Flamſteed, in the year 1719, when he was nearly 65 years old, in which ſituation he continued 18 years. Doctor Smith ſays that Halley made uſe of a meridian teleſcope, and a pendulum clock for determining the right aſcenſions of the ſtars before the great mural arch by George Graham was made for the obſervatory; the teleſcope in queſtion is particularly deſcribed (Smith's Optics, p. 321. and ſeq.) as having a tranſverſe axis of an ell in length, and a tube of $5\frac{1}{2}$ feet, which had croſs hairs in the eye-piece with proper adjuſtments, a frame with the Y ſupports, and a ſpirit level for levelling the axis; in ſhort it was what is now denominated a tranſit inſtrument, and probably was the ſame which Evans mentions in his Tour as being ſtill at Flamſteed houſe, with the teleſcope fixed near one end of the axis. Graham's great mural arch is alſo particularly deſcribed by the ſame author, which conſiſts of iron bars firmly joined together, and a braſs arc of 90°, divided by a beam compaſs, with a degree of accuracy that far exceeded any thing that had been before attempted. Beſides the arc of 90°, there is another quadrantal arc divided into 96 equal parts, as a check on any inequality that might be ſuppoſed to exiſt in the graduated arc of 90°. The particulars of the conſtruction of this inſtrument, of which the radius of one qudrantal arc was 96.85, and of the other 95.8 inches, together with the method of dividing the limb, and of making the centre work, &c. are treated of from page 332 to page 341 of Smith's Optics, in the latter part of which account it is ſaid, that Siſſon of the Strand made a ſimilar mural arch for Colin Campbell, eſq. to be uſed in Jamaica.

The micrometers at this time uſed, began to be differently conſtructed: Romer or Roëmer at Paris, who was contemporary with Flamſteed and Huygens, and who had a tranſit inſtrument in 1700, contrived a piece with ten ſquares, called a reticulum put in the body of a microſcope, as we underſtand, where the focus of the eye-glaſs meets the magnified image, which ſquares were placed oppoſite the graduations of the divided limb of an inſtrument, and acted probably as a kind of Vernier. Huygens propoſed parallel ſtraight-edged braſs plates to ſlide and to include the meaſured object between them; the diſtance of which plates was afterwards meaſured by a ſcale and compaſſes:—Caſſini obſerved by four parallel hairs placed in the focus of the eye-piece, and made adjuſtable for collimation.—Before we part with Dr. Smith, whoſe book will long be admired, we beg leave to obſerve that he miſtakes the name of the Vernier, which Graham's quadrant had, and miſ-names it a Nonius, as various authors have done ſince, no doubt, on the ſtrength of his authority. It was during the life of Dr. Halley that Mr. Roger Cotes contrived an equal altitude inſtrument to adjuſt the pendulum clock by, which ſir Iſaac Newton preſented to Trinity college, Cambridge; this inſtrument conſiſts of a teleſcope leaning on an inclined gibbet-piece, that revolves on an upright axis placed in pivot holes above and below, and kept perpendicular by a ſuſpended fine plumb-line, which, revolving with the upright axis, detects its want of perpendicularity in any point of its revolution. This inſtrument, which does not ſeem to have come into general uſe, is likewiſe deſcribed by Dr. Smith (p. 327 to p. 331).

It was alſo during the preſidency of Dr. Halley at Greenwich, that the firſt achromatic or colourleſs teleſcope was invented, though not generally uſed, nor even known by that name, till Mr. John Dollond afterwards took out a patent for the invention, and brought the execution of it to great perfection. So along ago as the year 1729, Cheſter More Hall eſq. of More Hall, in Eſſex, conſidering the different humours of the eye, was led to infer, that they were ſo arranged as to correct the variable refrangibility of the different rays of light, which idea probably was ſuggeſted by ſir Iſaac Newton's experiments on optical glaſſes. He then conceived that if he could meet with tranſparent ſubſtances poſſeſſing the ſame peculiar properties as he ſuppoſed the humours of the eye to poſſeſs, he could make an object-glaſs that would unite all the colours in its focus. After ſeveral experiments with different kinds of glaſs, he ſucceeded, in the year 1733, in completing object-glaſſes of the deſired conſtruction, which bore an aperture of 2½ inches, with only a 20 inch tube; and we are informed that one of theſe original object-glaſſes is ſtill in the poſſeſſion of a clergyman of the name of Smith, who lives in Charlotte-ſtreet, Rathbone-place, which object-glaſs, on examination by ſeveral ſcientific gentlemen, has been found to poſſeſs the achromatic property; and in 1754, Mr. Aſcough, optician on Ludgate-hill, was in poſſeſſion of one of Mr. Hall's teleſcopes of the achromatic kind. Indeed, when it was allowed at the trial at Weſtminſter Hall, reſpecting the patent for making achromatic teleſcopes, that Mr. Hall was the original inventor, lord Mansfield, who did not deny the proof of the fact, obſerved, that "it was not the perſon that locked up his invention in his ſcrutoire that ought to profit by a patent for ſuch an invention, but he who brought it forth for the benefit of the public."

The ſame ideas reſpecting an object-glaſs had, it appears, occurred to the celebrated Euler and other foreigners, but no one is ſo clearly entitled to the honour of the invention as Mr. Hall, nor did any one ſucceed in practice ſo well as Dollond, who therefore was entitled to his portion of the honour of an improvement in optical inſtruments, which, together with the compound or achromatic eye-glaſs, has contributed very much to the nicety with which obſervations are made and read off by modern inſtruments of the different conſtructions.

Dr. Halley was ſucceeded by Dr. Bradley in the year 1741, for whom Graham made a ſector of 10°, bearing a Vernier with a ſcrew of adjuſtment, and a teleſcope with another Vernier ſeparately moveable, (ſee *Plate* I. *fig.* 5.); the uſe of this inſtrument was to take the *difference* of the right aſcenſion and declination of a planet or comet, and of a known ſtar, and conſequently the right aſcenſion and declination of the wandering body itſelf, by a cheap and ſimple contrivance. The inſtrument turned on a long axis, and was ſo contrived, that both the bodies that were compared together, might be ſeen paſſing the micrometer of the teleſcope without altering the elevation more than 10°. Dr. Bradley, we find, was the inventor of the ſcrew-micrometer, and alſo of a kind of triangular micrometer, adjuſtable by a circular motion given to it by a ſectoral rack and endleſs ſcrew, the uſe of which was to take declinations; but this ſecond mechaniſm is not adopted in ſubſequent inſtruments. When the Royal Society made their annual viſit to Dr. Bradley to inſpect his inſtruments in 1748, he complained of wanting new ones; in conſequence of which complaint, his majeſty ordered 1000*l.* to be expended in furniſhing a proper ſupply, which enabled the aſtronomer-royal to procure not only the ſector we have juſt mentioned, but alſo a large mural arch of braſs of eight feet radius made by Bird, which is now in uſe, and which is too well known to aſtronomers to need further notice till we come to the proper place for deſcribing it particularly.

While theſe improvements were going on in the Engliſh inſtruments of obſervation, Peter Horrebow publiſhed a pamphlet, in 4to. called "Baſis Aſtronomiæ, ſive Aſtronomiæ Pars Mechanica," Hauniæ 1735, in which a *meridian circle* is deſcribed, to which was attached an optical tube with Romer's *reticulum* of ten ſquares for reading off the diviſions on the limb, and which had been intended by the inventor for a quadrant. We find, notwithſtanding this early notice of a circle, that La Caille made his catalogue of ſouthern ſtars from obſervations made with a *ſector* at the Cape of Good Hope between the years 1750 and 1754.

The Engliſh tranſit-inſtrument was by and bye made portable, and the improved modern manner of grinding the tube, that contains the ſpirits, on the interior ſurface, has rendered the bubble capable of indicating not only minutes of a degree by its run, but in many inſtances ſeconds; the manner alſo in which the croſs and parallel hairs are enlightened by the reflection of light entering the end of the axis from a diagonal mirror placed in the body of the tube, renders the uſe very convenient at all elevations; and, laſtly, the diagonal eye-piece for high altitudes, and a graduated circle with a ſpirit level at the end of the axis, to aſcertain the elevations proper for given ſtars, together with the various other adjuſtments, leave little more to be expected, or even wiſhed for, as an improvement of this inſtrument, notwithſtanding the Society of Arts at the Adelphi have repeatedly advertiſed a reward, among their propoſed annual premiums, for an *improvement* in the *portable tranſit-inſtrument.*

The invention of catoptric or reflecting teleſcopes may here alſo be mentioned among the improvements made in aſtronomical inſtruments. Mr. Short was probably the firſt who brought theſe to any degree of perfection, and his deſcription of various circles united with a catoptric teleſcope, as deſcribed in the Philoſophical Tranſactions of London in 1789, laid the foundation of the *equatorial inſtrument*, as afterwards improved by Ramſden, Nairne, and the Dollonds, about the year 1770 or ſoon after, (vide the Phil.

Tranſ. 1771); ſince which time the achromatic teleſcope, being lighter, has had the preference, except for the purpoſe of ſtar-gazing, where the comparative brightneſs and magnitudes of the ſtars are the principal objects of obſervation. Of this kind of inſtruments Dr. Herſchel's far exceed in power any others that have been made.

With reſpect to the comparative accuracy of the inſtruments hitherto made for obſervatories, we beg leave to tranſcribe ſir George Shuckburgh's words from his account of the equatorial inſtrument, publiſhed in the Philoſophical Tranſactions of London in the year 1793, who ſays "that from the time of Hipparchus and Ptolemy, before and at the commencement of the Chriſtian æra, to the age of Walther and Copernicus, in the beginning of the 16th century, few obſervations can be depended on, to within leſs than 5, 8, or perhaps even 10 minutes; thoſe of Tycho Brahe, indeed, that princely promoter of aſtronomy, to within 1 minute. The errors of Hevelius's large ſextant of ſix feet radius, towards the middle of the laſt (17th) century, might amount to 15 or 20 ſeconds; Flamſtead's ſextant, to 10 or 12 ſeconds; and laſtly, thoſe of Mr. Graham's mural quadrant of eight feet radius, with which Dr. Bradley made ſo many obſervations from 1742, might amount to 7 or 8 ſeconds.

The *nautical* inſtruments of obſervation hitherto made were, however, by no means well calculated for taking altitudes or angular diſtances during the different motions of a ſhip under way: the great diſcovery that has proved moſt permanently uſeful in a voyage, was that which pointed out the uſe of a *mirror* as attached to the limb of an inſtrument. A metallic mirror was known to the ancient Greeks and Romans, and was made ſometimes of ſilver, ſometimes of a compoſition of copper and tin ("ſtanno & ære miſtis," Plin. lib. xxxiii. cap. 9.) and ſometimes of a poliſhed opaque ſtone, or of coloured glaſs; and the knowledge of the reflecting property of glaſs with a metal in contact with the back ſurface, if it was not known to the Sidonian mirror-makers mentioned by Pliny, when he ſpeaks of glaſs mirrors, was known to Alexander, the reputed author of the "Problemata;" for he expreſsly ſays, "*Διατι τα ὑελινα κατοπτρα λαμπουσιν αγαν; ὁτι ενδοθεν αυτα χριουσι κασσιτερω, πεφυκε δ᾽αυτου η φυσις διαυγης, και τη ὑελῳ αναμιγνυμενη, λαμπρα ουσα, πλειον διαυγαζεται,*" &c. which may be tranſlated thus: "Why do the glaſs-mirrors ſhine ſo much? Becauſe they anoint them with tin, the nature of which partakes of a pellucid property, and being joined to, or mixed with, the glaſs that is tranſparent, becomes more ſhining," &c. We do not introduce this quotation for the ſake of its reaſoning, but to ſhew that glaſs mirrors coated with tin, were known when Alexander wrote the "Problemata," but whether it was Alexander Aphrodiſias of the third century, or Alexander Trallianus of the ſixth century according to others, we pretend not to determine; and that the art was preſerved is clear from the writings of John Peckham, or Peccam, an Engliſh Franciſcan monk, who wrote his "Johannis Piſani Perſpectiva communis" in 1279, in which are mentioned various kinds of mirrors, and among others, ſteel mirrors and mirrors of glaſs, covered on the back with lead, which lead Vincentius Bellovacenſis ſays (Specul. Natur. ii. 78. p. 129.) was poured over the glaſs-plate while hot; ſo that our amalgam of tin-foil and mercury is an improvement on the ancient method of making the mirror. The firſt idea of uſing a mirror in a nautical inſtrument, it ſhould ſeem from Dr. Sprat's "Hiſtory of the Royal Society," originated with Dr. Hooke, and, according to the doctor's poſthumous works, an inſtrument of this kind was actually made for obſervations at ſea, in which the eye ſaw at once two objects ſituated at a diſtance from each other, but brought together by reflection of one of them; in this inſtrument, however, there was but one reflection, and it was not till ſir Iſaac Newton took up the ſubject, that an inſtrument, ſuch as is repreſented in *Plate* I. *fig.* 7, with two reflections was contrived, which conſtruction this prince of mathematicians communicated to his friend Dr. Halley, in a paper that was found after the doctor's death by Mr. Jones, and given to the Royal Society of London, in whoſe Philoſophical Tranſactions it was publiſhed in the year 1742. In the mean time John Hadley eſquire, a friend of ſir Iſaac Newton, had ſomehow become acquainted with the ſame principle of a double reflection, as had alſo Mr. Godfrey of Pennſylvania, both of which latter gentlemen have been honoured with the reputation of being the inventors of the reflecting octant, which bears the name of Hadley's quadrant, becauſe, though actually only the eighth part of a circle, it meaſures 90° by reaſon of the reflected ray having double the velocity of the incident ray, as coming from the obſerved object. The peculiar advantage of Hadley's octant over all the preceding inſtruments uſed at ſea, conſiſts in its being capable of uſe during the toſſing of a ſhip under way; and the appendages of teleſcopic ſights, dark-glaſſes to take off the glare of the ſun, and a Vernier's ſcale, have rendered it ſo complete, that, when well made and perfectly divided, no better inſtrument for taking altitudes at ſea can reaſonably be deſired, particularly when a tangent-ſcrew of adjuſtment for quick and ſlow motions and a reading lens are ſuperadded.

But excellent as Hadley's quadrant is for taking altitudes when divided in the beſt manner, it is not competent to one very eſſential purpoſe of nautical aſtronomy: it will not meaſure an angle of any kind of more than 90°. When the tables of the ſolar and lunar motions were preſented to the lords of the admiralty in the year 1755 by Tobias Mayer, of Gottingen, and when a reward of 3000 *l.* was afterwards given by the Britiſh parliament to the celebrated author, the method of finding the longitude of a ſhip or place by meaſuring the moon's diſtance from the ſun or from a ſtar, at firſt ſuggeſted by Gemma Friſius, was now propoſed to be put in practice; but this method required that angular diſtances ſhould be accurately meaſured; we ſay *accurately*, becauſe an error of *one minute* of ſpace in taking an obſervation of the moon's diſtance, which would not materially affect the determination of a latitude from an obſerved altitude, will, at a mean rate of the moon's motion, produce an error of about 25′ in longitude, as aſcertained by the lunar method, the moon and ſtar being ſuppoſed to be both in or near the equator. Mayer, whoſe anxiety to promote the lunar method muſt have been equal to that of any other man, not excepting doctor Maſkelyne himſelf, who undertook the calculations of the Nautical Almanac for this purpoſe, was well aware of the celebrity of the Engliſh inſtrument-makers, ſuch as Bird, Ramſden, Siſſon, Troughton, &c. and therefore contrived a new inſtrument, which was made from his directions by Bird, to take angles of any magnitude within 160°, and with ſuperior accuracy; this author very properly judged that there might be three principal cauſes of inaccuracy in the ordinary octant, of whatever radius, notwithſtanding they were divided by very ſuperior workmen; one of which errors might be an inequality among the ſubdiviſions; a ſecond, the want of exactitude in the total magnitude of the divided arc; and the third, an error in the meaſure ariſing out of the eccentricity of the point round which the index turned, as it regarded the graduated ſector of the limb. Theſe three ſources of error were to be guarded againſt, but particularly the firſt, in the conſtruction of a new inſtrument; our author's thor's idea was a happy one; he availed himſelf of all the ingenious contrivances that Hadley's octant poſſeſſed, extended its limb to a circle, agreeably to the original conſtruction of the aſtrolabe, and meaſured his angle many times over on different portions of the circumference; after which he divided the whole amount by the number of obſervations for the mean quantity of the obſerved angle, which method included the corrections for all the ſources of error to which he could conceive the octant liable. As we ſhall give a perſpective drawing of the original inſtrument made by Bird, and uſed by admiral Campbell, we ſhall defer our further remarks on it till we come to our particular deſcription.

Admiral Campbell, however, having found the repetition of his obſervations with a large and heavy inſtrument troubleſome, diſpenſed with the original principle, and having found, as he ſuppoſed, one-third part of the circle better divided than either of the other two, made uſe of that only for ſingle obſervations, and reported ſo favourably of his method of uſing the third part of a circle only, that ſextants on Hadley's principle came immediately into uſe inſtead of reflecting circles, from this peculiar circumſtance, which we here mention, becauſe it has been generally aſſerted, upon ſuppoſition only, that circles did not precede, but followed reflecting ſextants; even Dr. Mackay has fallen into this error, when he ſays that the circular inſtrument "was propoſed, with a view to correct the errors to which a ſextant is liable." (Theory and Practice of finding the Longitude, vol. i. p. 65.)

Chevalier de Borda, of Paris, ſoon noticed, among others, that the two indices of profeſſor Mayer's circle, which carried, one the central mirror, and the other the teleſcope and horizon-glaſs, required to be both moved in ſucceſſion at each obſervation, ſo as to render two operations indiſpenſable for aſcertaining one ſimple meaſure of an angle; after ſome conſideration, he hit upon an improvement, by means of which the double of any angle could be as readily meaſured as Mayer's ſingle angle, while yet the principle of the repetition with one reading off at laſt was retained, and the mean angle was aſcertained by dividing the whole amount by double the number of obſervations, ſuppoſing them to have been all double angles. This invention ſhortened the proceſs of repeating the obſervations, and will be alſo deſcribed at full length hereafter.

But Mayer's and Borda's reflecting and repeating circles were both ſubject to great inconvenience in uſe, partly from the tediouſneſs of aſcertaining the exact time, which the mean of all the obſervations was to be put down for, and partly from the unſteadineſs and other objections, occaſioned by two indices ſeparately moveable, and the frequent eſtimations by the eye of the coincidence of the direct and reflected objects at each obſervation; their principal property being to diminiſh the errors of diviſion of a bad inſtrument, and to render it capable of uſe, when it could not be depended on for taking a ſimple obſervation. It has fallen to the lot of Mr. Ed. Troughton, whoſe nautical and aſtronomical inſtruments are known, and highly valued all over the world on account of their accuracy, to make a very eſſential improvement on the foregoing reflecting circles, in 1796, without being ſubject to theſe and ſimilar objections, which will hereafter be mentioned; he has retained the principle of meaſuring an angle to the right and left of Zero, when the inſtrument is properly ſet, and inſtead of repeating the obſervation round the different portions of the limb, to do away the errors of eccentricity and of imperfect diviſions, he uſes three Verniers at 120° diſtance from each other, which ſeparately meaſure each a double angle; ſo that at one obſervation taken backward and forward, the average of ſix different ſextants is obtained without the leaſt trouble or liability to miſtake the inſtant of obſervation; for fixing one of the Verniers fixes them all till their meaſures are ſucceſſively read off, which may be an hour, or even many hours after the inſtant of the obſervation has been noted. The conſtruction and uſe of this very perfect inſtrument will be deſcribed more particularly in its place, which will be the more intereſting, as its powers and peculiarities have never been heretofore laid before the public in a regular deſcription.

About the year 1800, Joſeph de Mendoza Rios Eſq. F.R.S. the author of the collection of Nautical Tables, which we had occaſion to mention in reſpectful terms under our article CHRONOMETER, and who has for ſome time ſhewn a great deſire to promote the intereſts of navigation, (being himſelf a captain in the ſervice), invented an ingenious method of transferring the motions of both the indices of Borda's reflecting circle, into one reading by what he terms a *flying nonius*, or more properly ſpeaking, a *flying Vernier*, by means of which the velocity of repeating an angle with Borda's circle is doubled. This inſtrument is deſcribed in the Philoſophical Tranſactions of London for the year 1801. The conſtruction of Borda's circle, however, being unfit to receive the propoſed improvement, the thing was found not to anſwer in practice, but ſhews well enough the *principle*, which was at that time the chief deſign of the author. Subſequently to the above period, an union of the conceived principle with Troughton's conſtruction was found to anſwer a much better purpoſe; for by this union, not only is the repeating or multiplying property reſumed, but the alternate motion of the index is tranſformed into a continued motion, ſo that the whole amount of the croſſed obſervations is read off at laſt by two ſeparate Verniers. This being a great improvement of Mendoza's original reflecting circle, and not having been any where publiſhed, ſhall be deſcribed in its turn after Troughton's, to which it is a relative.

While theſe improvements have been going on in the fabrication of nautical inſtruments, correſponding improvements have alſo been made in inſtruments appropriated to obſervatories; the original circle, which had long ago been commuted for the aſtronomical quadrant, ſextant, or ſector, was again brought into uſe, and for the ſame reaſons that the nautical circle was revived after the aſtrolabe had been laid aſide. As it is our intention particularly to deſcribe in ſeparate ſections the principal circular inſtruments uſed in practical aſtronomy, as well as the principal nautical circles, it would be ſuperfluous to give here more than a brief hiſtorical notice of each.

We may go back to the year 1768, when Le Duc de Chaulnes publiſhed a work, which we ſuppoſe may have ſuggeſted to the Engliſh inſtrument-makers, ſome notion of the uſe of a microſcope and micrometer uſed in conjunction to read off the ſubdiviſions of the circular limb of a large inſtrument; the work is entitled, "Deſcription d'un Microſcope et de differens Micrometres deſtinés à meſurer des parties circulaires ou droites avec la plus grande preciſion, 1768, à Paris." We have not the work before us, and therefore are unable to ſtate, in what particulars the propoſed apparatus differed from that previouſly propoſed by Romer by the name of a *reticulum* or *reticule*. When the late Jeſſe Ramſden, whoſe eminence as an inſtrument-maker will never be forgotten, was applied to, about the year 1785, to make an inſtrument for meaſuring horizontal angles with more preciſion than the ordinary theodolite is capable of, he adopted the plan of reading off by microſcopes the ſubdiviſions of his large circular inſtrument, which was uſed in the trigonometrical ſurvey, made for the purpoſe of meaſuring the linear diſtance from the two obſervatories of Greenwich and Paris, under the direction of general Roy.

Profeſſor Vince has deſcribed this inſtrument in his practical aſtronomy, (p. 170.) The line on the French ſide was meaſured by the help of a repeating inſtrument without reflection, contrived by the Chevalier de Borda, which we propoſe to deſcribe more fully preſently.

But Ramſden was not ſatisfied with applying the new method of reading off by microſcopes, which he could do repeatedly within the accuracy of *one ſecond* of ſpace, to horizontal angles only, but in a large circular inſtrument, which he finiſhed for Piazzi of Palermo in 1789, to be placed in his obſervatory, the ſame mode of meaſuring this very minute portion of a degree, was adopted with complete ſucceſs in a vertical circle, as will be ſeen in our ſubjoined account of this expenſive inſtrument.

Nor was Mr. Ramſden the only Engliſh maker of aſtronomical inſtruments, who has conſtructed aſtronomical *circles* or circular inſtruments, on the plan propoſed by the Duc de Chaulnes; Mr. Ed. Troughton, and Mr. Wm. Cary have ſucceded in ſimilar attempts, and we can venture to affirm, that their inſtruments have not been equalled in excellence, by thoſe of any foreign maker whatever; of the veracity of which aſſertion it will be conſidered as a ſufficient proof, that all the beſt obſervatories on the continent are furniſhed with Engliſh inſtruments, and chiefly if not entirely by thoſe three makers, including Berge, Mr. Ramſden's ſucceſſor, under his name.

Thus have we given ſuch a ſketch of the riſe and progreſs of aſtronomical and nautical inſtruments, particularly circles, as will enable the reader, we preſume, to appreciate the value of each improvement, and to underſtand the uſes and originality of the different parts of the inſtruments of which we have thought it right to ſubjoin appropriate deſcriptions.

The German reflecting and repeating CIRCLE, *by Tobias Mayer of Gottingen.*

After having peruſed the Latin deſcription of the circle of Tobias Mayer, as publiſhed by him in his "Tabulæ Motuum Solis et Lunæ," Londini, 1770, and compared it with the inſtrument itſelf, (No. 9.) as originally made by Bird for the uſe of admiral Campbell, we found that the Author's plate and deſcription are defective, inaſmuch as ſome of the appendages found neceſſary by the maker are omitted; we therefore cauſed an original drawing to be taken in perſpective, which we now come to deſcribe, and to which we have put Mayer's original large letters of reference, and ſome of the ſmall ones as far as they would go; we propoſe alſo to deſcribe the parts of the inſtrument, and their uſes nearly in the ſame order in which their author has deſcribed them, that his ideas may be the better preſerved. *Fig.* 1. *of Plate* II. of *Aſtronomical inſtruments*, is a repreſentation of the inſtrument in an entire ſtate; it conſiſts principally of three parts with their appendages; namely, the graduated circle A, the radial bar C, and the teleſcope on the radial bar G; the inventor propoſed the circle to be of 8 inches radius, which we find is juſt 8.7 from the divided circle, and 9 to the circumference; this meaſure of 8 inches was fixed upon, becauſe it was ſuppoſed by Mayer that a larger would make the inſtrument too heavy, and that a ſmaller could not be divided accurately enough to guard againſt an error, in the meaſurement of a lunar diſtance of 3′, correſponding to about 1° 14½′ of determined longitude, notwithſtanding the addition of a vernier; a ſuppoſition which, our pocket box ſextants ſhew, was widely erroneous; as the inſtrument was intended to meaſure angles by reflection, like Hadley's octant, uſually called quadrant, it was at firſt propoſed that the whole limb of the circle ſhould be graduated into 720 parts inſtead of 360°, becauſe the reflecting inſtruments meaſure a whole degree by *halves* marked on their limbs, and figured as *wholes*, but Bird thought proper to put on only 360°, each of which is ſubdivided into *three*, and reads with a vernier of 20 ſpaces, covering 19 on the limb, ſo that the quantity read off requires to be doubled to bring it into exact degrees and minutes of reflected meaſurement. The centre work is ſimilar to that of Hadley's quadrant, except that the radial bars C and G, to each of which a vernier is put at *h* and *k* reſpectively, move ſeparately. The bar G grows wide enough before it comes to *g* to admit a large circular hole, the centre of which is properly its centre of motion; which is alſo the caſe with the bar C: the bar G prolonged beyond the centre a little way carries a ſquare piece of ground and poliſhed glaſs *b*, of which the lower half is ſilvered and kept faſt in a little braſs frame, adjuſtable for perpendicularity by ſcrews below; on the ſame bar is alſo carried the teleſcope B, in two pair of jointed little ſupports *f* and *f* ſcrewed to the bar G, ſo moveable like an ordinary parallel ruler, in a longitudinal direction, that when the ſaid jointed ſupports are perpendicular to the plane of the bar G, no part of the glaſs *b* can be ſeen, but the part which is not ſilvered; but when the teleſcope is puſhed nearer to or drawn further from the ſaid glaſs, the line of collimation of the teleſcope approaches the bar G, and its field of view takes in alſo the ſilvered portion of the ſmall glaſs; and thus any portion or nearly the whole of this glaſs may be readily taken in by the eye at the end of the teleſcope. This contrivance was not in the original ſketch, but was no doubt added by the maker, and has another convenience beſides its uſe in the adjuſtment juſt mentioned, which is, that by the teleſcope's approaching the bar G when puſhed forwards, a more ſhallow box will ſuffice for packing the inſtrument than muſt neceſſarily have been uſed if no ſuch motion of the ſupports *f* and *f* had been there. In the focus of the eye-piece there are three fine wires, two parallel at ſome diſtance on each ſide of the centre of the field of view, and one at right angles to the other two cutting the exact centre; the tube is 10 inches long, and the magnifying power juſt *four*, with a field of view of 2° 15′; the object glaſs is of the achromatic kind, and the eye-glaſs being a ſingle lens inverts the object, which is of no conſequence in celeſtial obſervations.

The radial bar C which carries the index *k* has the large central mirror attached to it, and has adjuſtable ſcrews for perpendicularity like thoſe of glaſs *b*, and is in every reſpect like the index bar of a Hadley's quadrant; it is placed above the plane of the bar G, and, as has been ſaid, moves ſeparately from the teleſcope. The piece *d* near K is a holding piece of metal claſping the limb in ſuch a way, that, when its fixing ſcrew, the head of which is a milled nut at *d*, is faſt, it fixes the bar C immoveably, by means of the tangent ſcrew *i i* which is tapped into a little ball at the outer end of this bar. The tangent ſcrew has two milled nuts as heads at its oppoſite end, by either of which it may be turned, as convenience may require, and, when the piece *d* is ſcrewed faſt to the limb, the tangent-ſcrew is moreover uſed to adjuſt the bar C and its mirror, till the real object, and object by reflection exactly coincide: at the end of the bar G, under the eye-piece of the teleſcope, is a ſimilar tangent ſcrew and fixing apparatus, the whole of which cannot be ſeen in the figure; but when the reader is told that the milled nut at *e*, is exactly ſimilar to the one which has been deſcribed at *d*, the portion out of ſight will eaſily be apprehended; there is however a ſecond fixing ſcrew below, as well as the one *e* above, which may ſometimes be more convenient to uſe, or which for the ſake of greater ſecurity may be uſed along with the other. *Fig.* 2. is a dark glaſs in a frame which may be placed, when the ſun is one of the obſerved objects, parallel and near to the mirror *c* by its croſs *n*, the edges of which are ſloped, ſliding into a correſponding groove behind the mirror *c* among the ſcrews of adjuſtment; this coloured glaſs is for the reflected ſun, and turns on a horizontal joint at *o*, and therefore may at any time be turned aſide, without being removed from the groove, and leſt the deepneſs of the colour of one glaſs ſhould not ſuit under all circumſtances, a ſecond and a third, each of a ſhade lighter colour, and in frames exactly ſimilar to *fig.* 2. may be put on inſtead, one of which has moreover a vertical joint near the horizontal one, by which it may be turned back entirely out of ſight of the teleſcope. Beſides theſe dark glaſſes, there is one in a ſmall tube which ſlips over the eye-piece of the teleſcope, and guards the eye from the ſun's rays when ſeen by direct viſion. *Fig.* 3. is a microſcope borne by a clamp of ivory with a ſpring below at P, which ſlips upon the limb at any point of it, and aſſiſts in reading the coincidence of the vernier with ſome dividing line on the limb; there is one to each vernier; theſe microſcopes would have been better placed on the bar C, that carries the vernier, if the reading had been wanted at every obſervation, but as the reading is only required to be made once, after half a dozen obſervations ſucceſſively made, it was thought better to have them detached. The circle is made firm by ſix radial arms braced below by long bars ſcrewed edgewiſe to their inferior planes, by ſcrews going from above, ſome of the heads of which are ſeen. As a ſupport for this inſtrument, a long tube of braſs of great ſtrength is ſcrewed into a thick plate, borne by a heavy ring, attached to the interior ends of the croſs arms; this long ſupport has a ball E and ſocket, which allow the plane of the inſtrument to be elevated to any angle with the horizontal line, and which fix the poſition by being tightened with a vertical ſcrew within the tube carrying a cup of preſſure that is raiſed as the ſcrew is turned; the ſcrew has alſo a ſmall wheel attached to it which is actuated by an horizontal endleſs ſcrew, bearing the ring F by which it is turned, ſo that one turn of the ring F moves the wheel within the tube the ſpace of one tooth, and as the thick arbour of the wheel is that which has the vertical ſcrew on its circumference, and carries the cup of preſſure, it is not difficult to conceive that the ball may be looſened or fixed in the ſocket, accordingly as the ring F is turned forwards or backwards by hand.—The inventor intended a ſtaff to bear on the ground, but Bird preferred a belt for the end to reſt on like a ſtandard belt, and the tube contains a ſtick that will draw out and fix at any convenient length to go into a hole in the belt.

In Hadley's quadrant there is an adjuſtment to be made for the paralleliſm of the two mirrors, when the point *o* of the vernier is at *o* on the limb; this adjuſtment is here not neceſſarily on any particular degree on the limb; but, what ſeems to be a condition in this inſtrument, the two mirrors are required to be put parallel, when the two verniers are ſo far removed from each other, as to include between them the greateſt angle that is ever intended to be meaſured by them, a degree or two over or under does not at all affect the operations; on examining the inſtrument at preſent under our eye, we find 73° 38′ contained between the points of commencement in each vernier, ſo that the actual meaſure of this angle, when the object has ſuffered two reflections, will be 147° 16′, which is the greateſt angle that the inſtrument will meaſure in its preſent ſtate, as the points *o* and *o* of the two verniers coincide when the bars C and G are in contact, one of the verniers being an interior, and the other an exterior one. In our figure the diſtance between the verniers is 60 full diviſions, or 120°, which our draftſman thought was a good poſition for exhibiting all the different parts of the inſtrument, conſequently the mirrors are not parallel in their preſent poſition, but will become ſo when the teleſcope is carried forwards, in the order of the figures, till its vernier indicates 73° 38′ on the limb, which quantity we have ſaid meaſures 147° 16′.

The mode of uſing this inſtrument may be explained thus:—Let the mirrors be placed parallel in the firſt place, while the vernier *k* of the arm C reſts fixed at *o*, or 360° on the limb, which may be done moſt accurately by moving the teleſcope and its vernier firſt to 73° 38′ nearly, and fixing it, and then by making the ſun, moon or ſtar, the laſt of which is beſt, as ſeen by reflection, exactly to coincide with the ſame as ſeen through the unſilvered part of the glaſs by direct viſion, and there fix it by the ſcrew *e*; and if the two mirrors are ſo adjuſted, as to be perpendicular to the plane of the inſtrument, the real body and its image will not be at one ſide of one another, either perpendicularly or horizontally; but if they ſhould be ſo, the mirrors muſt be ſet right by the adjuſting ſcrews, and then the inſtrument will be fit for taking an obſervation; we will ſuppoſe that the angular diſtance between ſome known ſtar and the moon be required to be aſcertained; in this caſe the lower end of the ſupport D is made to reſt in one of the holes of the belt, and the ball is ſo adjuſted in the ſocket, that the plane of the inſtrument may paſs through both the objects; in this ſituation the right hand body is viewed through the teleſcope, and the vernier *k* being ſet at liberty, the bar C is brought by an uniformly ſlow motion towards the teleſcope ſo far, that the object ſeen by reflection, when followed by a proper motion of the body, and of the entire inſtrument, comes very nearly in contact with the ſecond body ſeen by direct viſion, there the ſcrew *d* muſt fix the bar C and its vernier, which are now moved, the remaining quantity backward or forward by the tangent-ſcrew *i i*, till one of the moon's limbs and the ſtar are in exact contact; theſe two operations of fixing the mirrors parallel, and of effecting the contact of the two bodies afterwards, conſtitute what is called a *ſingle obſervation*, and if the vernier *k* were now examined, the angle indicated, which we will ſuppoſe to be 30° 0′, would be half of the true diſtance, as the inſtrument is graduated, if the graduation were perfect; but if Mayer's ſuppoſition be allowed, that there is a poſſibility of an error of 3′ plus or minus in this ſingle obſervation from imperfect graduation, then ſuch ſingle obſervation ought not to be depended upon; the ſame proceſs is conſequently repeated, that is, the vernier *k* remaining fixed as at firſt, and the time being noted of the inſtant of the firſt contact, the teleſcope is again made to advance, till the mirrors are parallel, as examined by a ſtar's coincidence with its reflected image, and is then fixed by the ſcrew *e*, the tangent-ſcrew being again uſed if neceſſary for the exactitude of the coincidence, which is the firſt operation of the ſecond obſervation; in the next place, the bar C, with its large mirror and vernier *k*, is again carried ſlowly and uniformly, as before deſcribed, till a ſecond contact of the ſtar with the ſame limb of the moon is effected, and then this bar is again fixed as before, and the tangent-ſcrew completes the exactneſs of the contact, which is called the ſecond operation of the *ſecond obſervation*, which obſervation is here completed, as ſoon as the inſtant of the contact is noted down; now ſhould the angle be read off by the vernier *k*, it will indicate 60°, or a meaſure of 120°; but ſuppoſe a poſitive error of 3′ to exiſt, the amount of two obſerved angular diſtances will on this ſuppoſition be 120° 3′, which, divided by 2, the number of obſervations, will make the angle 60° 1′ 30″, inſtead of 60° 3′, which it would have been with the ſame error in one obſervation; hence two obſervations diminiſh the error of graduation one half; but ſix repetitions of the two operations, *i. e.* ſix obſervations will diminiſh the ſaid original error ſix times, and reduce it to 30″, which is the advantage peculiar to the inſtrument: whenever it is found beſt to view the left hand body, and to carry its image to the left hand body, the vernier *k* muſt be fixed at Zero, and the teleſcope muſt be moved, and vernier *h* uſed in reading the angle, which is juſt the reverſe of the motion deſcribed. When any number of obſervations is fixed upon to be taken, the times of contact muſt as often be noted down, and then the mean time is taken as the inſtant of contact correſponding to the mean angular diſtance, which is obtained by dividing the total arc paſſed through, as read off at laſt, by the number of obſervations or contacts; the readings of all the intermediate obſervations being of no importance, otherwiſe than as we have uſed them to explain the effect of the repeating proceſs. It may be neceſſary to obſerve, that all the obſervations of a ſtar's angular diſtance from the moon, ſhould be completed within half an hour, or at moſt an hour, otherwiſe the inequality of the moon's hourly motion muſt neceſſarily be taken into the account, which would be a troubleſome correction. By this method of diminiſhing the errors of graduation, by a repetition of the obſervations taken all round the circular limb, it is eaſy to ſee that an error of one whole degree may be reduced to a minute at ſixty repetitions, whatever may be the magnitude of the obſerved angle.

Hitherto we have ſuppoſed angular diſtances only neceſſary to be meaſured by this inſtrument, for doing which indeed it was originally invented, but altitudes may be taken quite as well, and with the ſame advantage, for the ball will turn in the ſocket, ſo as to give a vertical poſition to the plane of the circle, or it may be held without the ſupport like a quadrant, and the contact of a heavenly body with the horizon is made, as well as with the moon's limb, after the firſt operation of placing the mirrors parallel has been performed; likewiſe a repetition of the obſervations may be carried to any number; but as the variation in the altitude of any body is not ſo regular as the variation in the angular diſtance between two bodies, a repetition of the altitudes with the correſponding times, unleſs made in rapid ſucceſſion, will not give a mean altitude with its correſponding time, and as the meridian or greateſt altitude is that which is moſt frequently wanted in navigation, for the ſake of the ſimplicity of the ſubſequent calculation of the latitude thereby, the mean of a number of altitudes before and after apparent noon, will give the greateſt or true meridian altitude too little. In the deſcription which we have ſo far given of Mayer's circle, and of its uſe, we have confined ourſelves to the reading of the vernier *k*, which indeed was all that admiral Campbell uſed, but it is evident that the vernier *h* may alſo be uſed with advantage, for the diſtance between the verniers is a conſtant angle, in this inſtrument, of 73° 38′, or rather of its double, 147° 16′, and the reading may as well be made by this vernier as the other, if this conſtant angle be ſubtracted from the angle indicated; for the ſake of greater accuracy therefore, it is adviſable to read the whole amount of the repeated angles, from both verniers, as the author intended, and then having deducted the conſtant angle from the latter reading, they ought to agree in quantity, but if there is any difference, the mean between the two muſt be taken, as the true amount to be divided by the number of obſervations, and the mean angle thus obtained will be aſcertained as it were by two ſeparate inſtruments, both uſed on the repeating principle. Beſides the inſtrument before us, there were others made, particularly one for captain, afterwards lord Howe, but we have not been informed whether, like admiral Campbell, he compromiſed the repeating principle for the beſt ſextant of the circular limb, to be uſed as a Hadley's ſextant, or whether he perſevered in uſing it according to the original intention, notwithſtanding the inconvenience of the operations during the repetitions.

The inſtrument at preſent before us, we obſerve, has been divided by biſections, and not by an engine, as is now the cuſtom in dividing inſtruments of ſmall radius, for the occult dividing dots and biſections are ſtill viſible by a magnifying glaſs in the original circle within the graduations transferred therefrom, that are intended to be permanent: on examining the limb all round with a microſcope, by the two verniers, and alſo by examining the included conſtant angle on different portions of the circle, we have not detected more than a minute of error in the graduations, ſo that had Mayer been aware of ſuch accuracy in the diviſions inſerted by a beam compaſs, he probably would never have ſet about his contrivance, which was invented on a ſuppoſition that there muſt exiſt an error of at leaſt 3′, which he propoſed to diminiſh to 30″ by ſix repetitions of an obſervation of the moon's angular diſtance from the ſun, or a known ſtar. The errors which we detected lie chiefly in the ſemicircle numbered from 180 to 360; in the firſt third part of the degree 181, there is about 1′ too much, which is the caſe with one of the third parts of both 264 and 277; but as the contiguous ſubdiviſions are proportionably too ſmall, the errors are corrected within the degree ſpace, alſo the degree 279 has a third part too ſmall by 1′, which is given to its contiguous ſubdiviſions. The dividing lines on the limb are thicker than neceſſary, we think, and meaſure more than a minute each, ſo that the greateſt error does not exceed the thickneſs of the dividing ſtroke on any part of the whole limb.

The verniers too have each of them one ſpace larger than the reſt by about half of a minute, and what is ſomewhat remarkable, it is one of the end ones in both that is too large but in both the whole length of the ſcale of 20 is exactly proportioned to the 19 thirds of a double degree, when compared all round the limb, except in the particular degree ſpaces which we have above noticed, and ſome few others where the error is within a minute.

It may be proper to mention, before we diſmiſs this account, that there is a contrivance in the inſtrument we are deſcribing, introduced by Bird, for giving the large central mirror a circular motion on the arm C, by means of a fine ſcrew *o o* actuating the circular piece of metal *p* which bears the mirror, and which has very fine concave indentations, like thoſe of a milled head, on its circumference; but as this motion, which was originally intended to adjuſt for the exact quantity of the conſtant angle contained between the verniers when the mirrors are parallel, is calculated to render the large mirror unſteady, we conſider the addition as being of no real ſervice, but on the contrary rather detrimental, provided the central mirror be placed in ſuch an angle at firſt, with reſpect to the radial line of bar C as will allow the inſtrument to meaſure an angle ſufficiently large for the purpoſe required. We have adjuſted the conſtant angle to exactly 75 large diviſions, or 150°, in which ſtate it is now fixed and ſuffered to remain, as being more convenient than an angle conſiſting of degrees and minutes.

The inventor propoſed a kind of metallic gage by which to fix the conſtant angle, when once aſcertained, without an operation for determining by a heavenly body the exact paralleliſm of the two mirrors, but the inſtrument-maker knowing that no gage could be depended upon in all degrees of temperature, did not make it a part of the appendages.

The French reflecting and repeating CIRCLE, *by the Chevalier de Borda of Paris.*

In the year 1787, the Chevalier de Borda, publiſhed at Paris a pamphlet entitled "Deſcription et Uſage du Cercle de Reflexion," in which is contained a particular account of his improvement on Mayer's circle, together with the uſes of a circle of his improved conſtruction, and the dimenſions of its different parts, which had occupied him twelve years in perfecting. The objections which he ſtated to the uſe of Mayer's circle were; that one obſervation required two operations; that the adjuſtment for the paralleliſm of the two mirrors was uſually made by viewing the horizon at ſea, and was very often productive of error, on account of the direct and reflected line being difficult to bring into exact coincidence; that a repetition of this kind of verification is very tedious in practice; that it is difficult to make a circle ſo exact, but that the paralleliſm of the central mirror, in reſpect of perpendicularity to the plane of the circle, ſhall have a deviation in different parts of the limb, when the paralleliſm with reſpect to the horizontal poſitions of the two mirrors is well adjuſted; and laſtly, that a great number of ſingle angles thus meaſured by double operations, is very embarraſſing to ſeamen. For theſe reaſons, which were all real objections, the Chevalier contrived his reflecting circle, that, in the firſt place, entirely diſpenſed with the adjuſtment for the paralleliſm of the mirrors; that in the next place meaſured two angles at two operations, after the inſtrument was previouſly ſet for paralleliſm and to zero; and laſtly, that was capable of being uſed on the repeating principle as well as Mayer's inſtrument.

We have been ſo fortunate as to gain a temporary poſſeſſion of one of Borda's reflecting circles made by Lenoir of Paris, of which we have had an original perſpective drawing taken, ſuch as we flatter ourſelves will be readily apprehended by thoſe readers, who have peruſed our account of Mayer's with attention.—*Fig.* 4. *of Plate* II. *of Aſtronomical Inſtruments*, repreſents Borda's improved reflecting circle, No. 56, nearly in the ſame poſition as Mayer's which is placed over it, and conſiſts of the ſame parts ſomewhat differently made and placed with reſpect to each other; we have therefore put the ſame letters of reference to both, which will enable us to ſhorten our deſcription of the preſent inſtrument, as well as aſſiſt the reader where to find the parts referred to.

The circle A in this inſtrument is much ſmaller than in the preceding one, being only 5.3 inches radius from the graduated circle of the limb, and is therefore ſufficiently portable by the ſhort handle D, without a ball and ſocket or belt; it is divided into 720 larger diviſions, which by reaſon of the reflection of the mirror at the centre are read off as ſo many degrees; and each of theſe diviſions, which in future we ſhall conſider as degrees, are ſubdived into three ſmaller ſpaces of 20′ each; two verniers *k* and *h*, of 20 ſpaces each on the ends of the bars C and G, reſpectively, cover juſt 19 of the ſaid ſubdiviſions of the limb, as is the caſe with Mayer's, from which it differs no otherwiſe, than as the degrees are here ſingle degrees juſt as they are meaſured by reflection. The limb appears to be engine-divided; for we cannot diſcover any original dots or biſections of a beam-compaſs. The teleſcope carried by the bar G is ſhorter than Mayer's, and the ſmall glaſs *b*, half ſilvered and half plain, is removed from the centre to as near the circumference of the circle as can be with convenience, which poſition requires the bar G to be prolonged quite acroſs the circle, to the plane of which it is held cloſe by an attached piece behind the ſmall glaſs, which goes under the extreme edge of the circle. This ſituation of the ſmall glaſs conſtitutes the principal improvement in this inſtrument, ſimple as the cauſe may appear at firſt ſight; for an incident ray of light may now be received by the large central mirror, from either the right or the left hand ſide of the ſmall glaſs, which glaſs together with its frame, according to Mayer's conſtruction intercepted the light coming from the left, and allowed only the light coming from the right to fall on the central mirror; and it is owing to this circumſtance that Mayer's circle is capable of meaſuring only a ſingle angle at two operations, as we have deſcribed, whereas Borda's circle will meaſure a double one with equal eaſe and expedition, as will be explained preſently. The teleſcope B in this inſtrument is borne by two cocks *f f* ſcrewed to the bar G out of ſight; theſe cocks have each an oblong aperture contiguous to the 24 dividing lines figured from *o* in the middle to 12 both up and down, which diviſions are indicated by a line, marked on the ſolid piece of braſs which ſlides in the aperture of each cock, and is tapped to receive the thread of the ſcrew *l f*, the head *l* of which is a milled nut over each cock, the ſliding pieces bearing the lines of indication are faſt to the tube of the teleſcope, which therefore they ſupport; the line of ſight may be adjuſted by theſe ſcrews, not only to be parallel to the plane of the circle, but to a point at any height in the glaſs *b*, borne by the bar G, either in the plane or ſilvered part of its ſurface. This mechaniſm therefore is inſtead of the jointed frames *f f* in Mayer's circle.—There are three pairs of dark glaſſes *m*, ſuch as are ſeen at *m* in *fig.* 5. varying in their ſhades of colour; any pair of which may be uſed as circumſtances may require; one of each pair is fixed in a ſocket by a thumb ſcrew at *m*, and the other at *n*, when the angle to be meaſured is pretty large; but as the frame of the glaſs at *n* will intercept the incident ray, when a ſmall angle between 5° 20′ and 34° to the left is meaſured; another ſet of dark glaſſes *o*. *fig.* 5, may be ſubſtituted for thoſe at *n*, to be fixed cloſe to the mirror of the bar C, by the two thumb-ſcrews, which appear contiguous to this central mirror at *o* in *fig.* 4. When a pair of the dark glaſſes *m* are uſed, they muſt both be of ſimilar ſhades of colour, that the coloured rays of reflection, and thoſe of direct viſion may require the ſame focal adjuſtment of the eye glaſs of the teleſcope; but as the rays incident on the central mirror, have to paſs twice through the dark glaſſes *o*, when any one of them is uſed, theſe glaſſes are only of half as deep a ſhade of colour as their reſpective correſponding ones *m* are; the double paſſage producing the effect of doubling the ſhade of colour. If the glaſſes *m* were placed exactly parallel to the glaſs *b*, there would be a ſecond reflection of the image of any object, viewed through the teleſcope, and ſeen through the unſilvered or upper part of this glaſs; to prevent which effect, the dark glaſſes ſtand inclined in a ſmall angle from true paralleliſm, with reſpect to the glaſs *b*, which poſition deflects the ſuperfluous faint image we have juſt mentioned, and prevents its entering the object end of the teleſcope.

The teleſcope itſelf is ſix inches long and magnifies three times, with a field of view of 5° 40′, of which the quantity contained between the parallel hairs or wires of the eye-piece, is exactly 2°; it is not of the achromatic kind, and inverts the object: the glaſſes are a ſingle object glaſs, an amplifier, and a ſingle plano-convex lens as an eye-glaſs; the two laſt are put in the oppoſite ends of an interior tube, which contains the two parallel wires; ſo that the wires may be placed either horizontally or vertically by turning this interior tube a quarter round.

The clamps for the verniers of this inſtrument appear to be each conſiſting of one piece, as ſeen in *fig.* 4, but as they are more ſteady than thoſe of Mayer's inſtrument, we have thought it might be acceptable to the reader to have a view of the parts of the mechaniſm ſhown ſeparately, which, therefore, we have done in *fig.* 6. The piece *a f*, which has the vernier ſcale on it, is ſcrewed by four ſmall ſcrews, the heads of which are ſeen upon the forked end of the bar C, and has an oblong ſlit through it at *a*; *b e i* is the tangent-ſcrew, with the milled head *i*, tapped with a detached piece *b*, which carries an oblong ſpring under and parallel to the axis of the ſcrew, to cover the oblong hole *a*, and to create ſome friction ſo as to produce ſteadineſs of motion in the piece *b*, when the ſcrew turns; at *e* is another piece attached to the axis of the ſcrew, in ſuch a way that it will not ſlide along it by either a backward or a forward motion, but yet will allow the axis of the ſcrew to revolve; this piece *e* is inſerted into a hole *f* in the vernier piece, and kept faſt by a ſcrew underneath, not ſeen; and *b* has alſo its projecting part inſerted into the oblong aperture *a*, and is attached at its lower extremity to the piece *c c*, by a ſcrew entering below this piece *c c*, ſo that the tangent-ſcrew will move the piece *c c* along with the piece *b*, as far as the aperture *a* will allow the projecting piece of *b* to move, the ſcrew itſelf in the mean time keeping its poſition on the vernier piece *a f*; the piece *c c* has a ſquare ſided oblong groove on its inferior ſurface, a ſection of which may be ſeen near the right hand *c*; into this groove the croſs piece *g h* is bedded, which carries the tranſverſe ſpring *h* on its end, and the fixing ſcrew *d* entering into the left-hand hole of *c c*, which is tapped, fixes the pieces *c c* and *g h* cloſe together, when the ſcrew is turned one way about, but allows them to ſeparate when turned the other way; the piece *b*, therefore, the piece *c c*, and the piece *g h*, together with the ſcrew *d*, are all moveable as one piece along the aperture *a* by the tangent-ſcrew *i*, while the piece *a f* of the vernier remains fixed to the bar C; but if the compound piece *b*, *c c*, and *g h*, be made faſt to the limb, which is interpoſed between the end *h* of the piece *g h* below C, and the vernier piece *a f*, then the tangent-ſcrew *i* will be obliged to move, and will carry the vernier with it, which is actually the caſe in taking an obſervation, when the fixing ſcrew *d* has fixed the ſaid compound piece, which altogether may be called the clamping piece, while the exactitude of a coincidence is finally effected by the ſlow motion of the tangent-ſcrew. The other vernier on the arm G differs from this in its mechaniſm for clamping, no otherwiſe than as the bar G has only one prong of the fork to attach the vernier to.

Fig. 7 is a piece of thin braſs, made black on both ſurfaces, called a *ventelle*, which has a ſmall triangular hole through it, and which fits the ſocket *m* behind the glaſs *b* in *fig.* 4, to limit the quantity of light admitted directly through the unſilvered part of the glaſs, which it will regulate by ſliding up and down the ſocket; it is chiefly uſed for terreſtrial objects, to make the image as diſtinct as the object itſelf, which is an advantage not poſſeſſed by Mayer's circle. *Fig.* 8 is a bent piece of braſs equal in height to the centre of the central mirror from the plane of the circle; there are two of thoſe pieces which are called *viſeurs*, and which are placed at diametrically oppoſite ſides of the plane of the limb for examining the perpendicularity of the index mirror, the height of one viſeur, ſeen by reflection, being compared to the height of the other ſeen directly. Theſe pieces may be conſidered as ſuperfluous, becauſe the extreme edge of the limb itſelf, ſeen both by reflection and direct viſion, will do as well, and with leſs trouble in the uſual way. *Fig.* 9 is a key with a milled nut at one end, and a ſquare hole at the other for receiving the ſquare ends of the ſcrews which verify the mirrors.

We have ſaid that Borda's circle will meaſure the double of an angular diſtance, contained between two terreſtrial or celeſtial bodies; it now remains for us to explain the manner in which this is done. On examination, we find that the conſtant angle contained between the verniers, when the mirrors are exactly parallel, is 167° 35′ in the inſtrument before us; inſtead of looking at the right hand object, and of bringing the index *k* of bar C towards vernier *h* of bar G, or teleſcope, in taking an obſervation, (which would be the mode if a ſingle angle only were wanted to be aſcertained,) when the vernier *k* is at zero, the teleſcope, according to Borda's method, muſt be directed in the firſt place to the left hand object, which muſt have its image brought to coincide with the right hand object ſeen directly, by carrying the teleſcope outward from the vernier *k*, which operation will enlarge the conſtant angle of 167° 35′, by the quantity of the ſimple angle to be aſcertained; ſuppoſe this to be 30°, then 197° 35′ will be the diſtance of the verniers when the image of the left hand body is in contact with the real body to the right; this we call the firſt operation, by which the ſimple angle might be obtained by ſubtracting the conſtant angle from the angle now indicated by the vernier of the teleſcope, but ſuch notice is diſregarded as not being neceſſary; the teleſcope, being now clamped to the limb by the fixing ſcrew, while the contact remains perfect, the bar C of vernier *k* is next moved by the ſecond operation toward the teleſcope, which carries the image back again to the original ſituation, where, if the motion of the vernier *k* were ſtopped, the glaſſes would be again parallel, and the index of bar C would ſhow 30°, on our former ſuppoſition; but inſtead of ſtopping here the vernier *k* croſſes the point of paralleliſm, and diminiſhes the conſtant angle by approaching the teleſcope, till the image of the right hand object is found in contact in its turn with the left hand body; in this ſituation the vernier *k* has meaſured the obſerved angle twice over, and will be found to ſtand at 60°; for, firſt, the former contact effected by moving the teleſcope, in the firſt inſtance, is undone, by placing the objects in their original ſituation, as the vernier *k* paſſes the point of paralleliſm in moving from the right of that point, and, ſecondly, a new contact is made, by taking the image of the other object, and carrying it to the left hand ſide of the point of paralleliſm, hence the whole of the two operations is called the *croſſed obſervation*, and takes in the angle twice over; once to the right and once to the left of the paralleliſm of the two mirrors. From this account of the croſſed obſervation, it is eaſy to conceive, that it is of no importance to fix the mirrors parallel in the middle of it, becauſe if there were an error of a minute, or even of a degree, in adjuſting for paralleliſm at the middle of this double angle, plus or minus, the ſecond half of the ſaid double angle would be juſt as much wrong in the oppoſite extreme, that is, would afford an exact correction; hence there is no need of waiting for adjuſtment of paralleliſm at all; but the index may be made to paſs the point of paralleliſm in a croſſed obſervation without the leaſt notice taken of it, which is the peculiar advantage of this inſtrument. During this explanation of the principle of Borda's circle for meaſuring double angles, we have ſaid nothing of the repeating principle; but the proceſs we have deſcribed may be repeated any number of times, and the amount, as in Mayer's circle, may be read off at once on vernier *k*, or on vernier *h*, diminiſhed by the conſtant included angle, which, in the preſent inſtrument, we have ſaid is 167° 35′; or what is ſtill better, a mean of both may be taken, to be divided by double the number of croſſed obſervations, and the quotient will be the true corrected angle reſulting from the different obſervations.

This method is, however, adapted more particularly to terreſtrial objects, where it is generally a matter of indifference which of the two objects has its reflected image carried to the other object, ſo far as relates to the diſtinctneſs of the image; but in celeſtial obſervations, for which the inſtrument was more particularly intended, it is well known to nautical aſtronomers, that it is preferable to bring the reflected image of the more luminous body into contact with the leſs luminous body itſelf ſeen directly, whether the former be ſituated to the right or left of the other; it is alſo equally well known, that to effect this purpoſe, even with a Hadley's octant or ſextant, the plane of the inſtrument muſt frequently be turned towards the ground, in order to catch that body to the left which would be caught to the right, if the ſame plane were towards the ſky; hence, the reflecting circle muſt have its poſition alſo inverted, by being turned over on the teleſcope as an axis half round, in one of the alternate operations; for, to have the advantage of a luminous reflected image, it is neceſſary that either the leading or following operation of a croſſed obſervation ſhould place the inſtrument in the inverted poſition, as the caſe may require; the reſult, however, is the ſame, whether the inverſion be uſed or not, when both the image of the firſt, and the real body of the ſecond object are both ſufficiently diſtinct in the field of view of the teleſcope. It may appear at firſt ſight, that, becauſe inverſion makes a motion of either vernier from the right become a motion from the left, that the reading of the limb will thereby be affected; but when it is conſidered that the figures of the limb itſelf are reverſed by inverſion, no difference will be found to take place; for provided, for inſtance, the vernier *k* at Zero be brought towards the teleſcope at the point of paralleliſm by a motion from the right, when the diviſions are above, and from the left, when the diviſions are below, facing the ground, when a horizontal angle is meaſured, in both caſes the effect is a leſſening of the angle included between the two verniers, the quantity of which is read by that vernier which has been moved. If, therefore, the object to the left be the brighter object of the two, the firſt or preparatory operation, in which the vernier of the teleſcope moves, and in which the image comes from the left hand object, muſt be performed with the graduated face upward, and muſt be the ſecond operation, where vernier *k* moves after inverſion, or with the ſame face down; but if the right hand object be the more luminous, the inverſion muſt take place in the firſt inſtance, and the ſubſequent portion of the croſſed obſervation muſt be performed with the diviſions and ſcales upwards; a little practice is all that is neceſſary to render this proceſs familiar, whenever both the objects are ſufficiently diſtinct. The adjuſtments for perpendicularity of the mirrors are the ſame as in Mayer's, and the principal objections to the preſent conſtruction will be ſtated in our account of the Engliſh reflecting circle, that owes its origin to thoſe objections; which, therefore, we ſhall deſcribe the next, though out of its order of time.

There is, however, an adjuſtment of the index-mirror mentioned by Borda, which, we think, is worthy of obſervation here, as it is an adjuſtment probably too much neglected by many makers of octants and ſextants, to which inſtruments it is equally applicable, and as it is of importance in directing the maker's choice of a proper mirror. The adjuſtment is that which detects the want of uniformity in the thickneſs of the ſilvered glaſs that compoſes the mirror at the centre, which is eſſential to be noticed, for if the ſlip of glaſs is thicker at one end than at the other, it will form a kind of priſm, and a deflection of the rays of light will take place, more or leſs, in their ſecond paſſage from the back or reflecting ſurface of the glaſs, which deflection may be plus or minus with reſpect to the true reflected angle, accordingly as the thick end of the mirror is contiguous to or remote from the end of the teleſcope. Let us call the end of the ſilvered ſlip of glaſs next the teleſcope *a*, and its oppoſite end *b*, then the uniformity of the glaſs compoſing the mirror, in regard to its thickneſs at the reſpective ends, is thus propoſed to be aſcertained.

When the two mirrors are made both parallel to the plane of the limb, meaſure a large horizontal angle of about 120°, as contained between two remote and diſtinct terreſtrial objects by a ſeries of croſſed obſervations, and mark down an accurate mean for the true angle, when the end *a* of the mirror is towards the teleſcope; then take the mirror carefully out of its frame, (we are here addreſſing ourſelves to the maker) and place it again with the end *b* towards the teleſcope, and examine that both the mirrors be again perpendicular to the plane of the limb as before, which they muſt be before a ſecond ſeries of croſſed obſervations, ſimilar both in kind and number to the former ſeries, be taken; take now the mean of the ſecond ſeries, and note it down alſo, and the difference between thoſe two means, if nicely obtained, will be double the error of undue refrangibility of the glaſs of which the index mirror is compoſed, half of which muſt be allowed for in every obſervation taken with the inſtrument with the ſaid mirror; but as the error is proportionable to the angle obſerved, the quantity of it to be applied depends on the ſaid angle, and is a variable quantity; for aſcertaining which, under different circumſtances, Borda has given a table in his pamphlet, which may be uſed with advantage, where great accuracy is required, and when the error in queſtion is conſiderable; but we ſhould recommend in preference that a more perfect mirror be ſubſtituted in this caſe, ſuch as may be found on trial to require no correction, which the beſt inſtrument-makers will always take care to do. In the ſame pamphlet are contained various other uſeful tables, one of which, in particular, muſt be neceſſary, when meridian altitudes are taken by a ſeries of croſſed obſervations, inaſmuch as it gives the variations of altitudes a little before and after the meridian paſſages of the heavenly bodies, and, conſequently, aſſiſts in aſcertaining the greateſt altitudes, which a mean of the obſervations taken before and after the meridian paſſage would not of itſelf give truly. There is alſo another table of corrections for a deviation of the plane, in which the contact is obſerved, which may ſometimes be neceſſary, but it is better that the due rectification of the two mirrors ſhould ſuperſede the uſe of this table alſo.

The Engliſh reflecting CIRCLE, *by Troughton of London.*

We come now to treat of the reflecting circle as an Engliſh inſtrument, for as Bird, in conſtructing the firſt, gave it no diſtinguiſhing feature, it muſt hitherto be conſidered as a foreign production. Our countryman Troughton had formerly much experience in making the circle of Borda, and had marked with attention the inaccuracy and inconvenience of that conſtruction; nay, had long turned his mind towards its improvement before in the year 1796 he produced his firſt ſpecimen.

The ſcientific men, and inſtrument makers of France, have long gone hand in hand in improving and recommending the circle of Borda; almoſt indeed to the total excluſion of the octant and ſextant in the maritime ſervice of that country; but the ſucceſs of the Engliſh conſtruction has hitherto been left wholly to the exertions of the individual who propoſed it.

The circle of Borda, as before deſcribed, is objectionable chiefly in the following reſpects.

Firſt. The two indices revolve round the centre upon bearings only equal to their own thickneſs, and want conſequently that ſteadineſs which is derived from a long axis, to aſſure the glaſſes and teleſcope to reverſe in the ſame plane through every portion of the circle:

Secondly. The teleſcope being raiſed and lowered by two ſcrews, the motions of which are neceſſarily ſhewn by dividing lines, cannot be acted on without much loſs of time in looking at thoſe diviſions: for if one of them be ſcrewed up or down the leaſt quantity more than the other, the obſervations will be rendered inaccurate; the teleſcope thereby being drawn from its parallel poſition. In a well-contrived inſtrument, this adjuſtment, the uſe of which is to render the brightneſs of the objects apparently equal, ſhould be performed with the greateſt facility, in order to keep pace with the fleeting variations of brightneſs in thoſe objects:

Thirdly. The darkening glaſſes are awkwardly applied; indeed the conſtitution of the inſtrument ſcarcely admits of a better application; they take up too much time to exchange them as the brightneſs of objects varies, and are therefore liable to the objection ſtated juſt above. Thoſe dark glaſſes which are uſed in the ſmall angles are moreover objectionable, becauſe their poſition is ſuch as in a great meaſure diminiſhes the diſtinctneſs of the objects:

Fourthly. Above all, the want of a handle on the upper ſide renders the obſervation in the inverted poſition of the inſtrument almoſt impracticable. Every obſerver, who has much uſed the former conſtructions, muſt have felt this want; but it fell to the lot of the author of the Engliſh conſtruction to contrive and apply the remedy. Good obſervers, for want of this handle, have ſeldom availed themſelves of the properties of either Mayer's or Borda's inventions, and of courſe have degraded the circle to a rank below the common octant:

Fifthly. A moſt embarraſſing thing in the uſe of Borda's circle, which renders it almoſt uſeleſs in the night, is, the neceſſity of making a previous obſervation, from which to compute nearly the points of the limb where the indices will reſt at every ſtage during the continued operation of repeating the angle. Some years ago the inventor of the Engliſh circle found a remedy for this inconvenience, by attaching a divided arc to one of the indices, having two ſtops ſliding thereon; theſe ſtops being ſet to the apparent angle, the progreſs of the two indices will be alternately arreſted thereby at the two relative poſitions of the indices, where the objects will appear near each other in the field of view. By this ſimple contrivance a ſet of obſervations may be managed in the dark.

Sixthly. The correction of the error of eccentricity is not certain in all caſes; if the index which gives the angle has only traverſed one third round the limb, whatever has been the number of obſervations, the mean obſervation may have nearly the whole of the error belonging to the meaſured angles charged upon it. On this index's getting quite round the limb the correction will be perfect; but proceeding further than a complete circle regenerates the error. It is true this kind of error diminiſhes at any given point of the limb, as the number of repetitions are increaſed; but is never perfectly corrected but at complete revolutions.

Theſe are the imperfections of Borda's circle, which being built upon the fabric of Mayer's, a form ill ſuited to receive his invention, ſubjected it to error and inconvenience, and reſerved it for the honour of an Engliſh artiſt to give full effect to one of the happieſt thoughts that ever led to the improvement of any inſtrument.

Plate III. of *Aſtronomical Inſtruments* exhibits perſpective drawings of Troughton's circle. *Fig.* 1 ſhews the face or divided ſide of the circle, and fig. 2 the back, or ſide of the glaſſes and teleſcope. In both of theſe views of the Inſtrument the form of the croſs-bar frame, and its connection with the ſtrong circular border, is too plainly exhibited to require a particular reference. This form of the body of the inſtrument was found by experiment to reſiſt the preſſure of the weight in every poſition, and to aſſure a coincidence of the image and body of the two objects to be obſerved at all angles when held by the different handles, and from trial of many other figures was the only one that did ſo.

In the middle of the frame is fixed a hollow centre, A, upwards of two inches long, having its flaunch or broad baſe contiguous to the back of the frame; in this the axis revolves freely: at one end of the axis is fixed the index, and at the other end the index-glaſs, both firmly united thereto; this is the only central motion in this inſtrument, and being the axis from which the circular plane is generated, the firſt objection to the former conſtruction of the reflecting circle is thereby obviated.

On the back, or ſide of the glaſſes, is erected a kind of ſecondary frame, BB, removed from the principal frame a diſtance equal to the lower end of the hollow centre: theſe frames are united by five equi-diſtant pillars. Below the ſecondary frame all the glaſſes appear; and the diſtance below the frames affords a relief for the darkening glaſſes to be turned down round a joint as in the ſextants and octants. This contrivance corrects the third mentioned defect. The ſame ſecondary frame allows a length of barrel, C, in which is effected a contrivance for raiſing or lowering the teleſcope, even while the obſerver is looking at his objects, and without the leaſt danger of deranging the paralleliſm of the line of collimation with reſpect to this plane of the circle. Thus the ſecond evil is prevented.

D is a handle on the divided ſide, but fixed to the inſtrument on the ſide of the glaſſes; it is attached to a braſs tube, which, being bent over the edge of the circle, allows the index to revolve freely: but as in ſome poſitions of the index the bent tube would cover the limb at the point where the obſervation muſt be read off, it is readily removed by taking out the finger-ſcrew, *d*. E ſhews another handle on the back, or ſide of the glaſſes, one end of which enters the centre pillar, A, as a ſteady pin, and is ſcrewed faſt to the frame at one of the principal croſſing places of the bars. Moreover, a cock, *c c c*, on the ſide of the glaſſes and above them, receives another handle, F, the poſition of which is vertical with reſpect to the plane of the circle; it alſo applies to the handle, D, and in both ſituations occupies the line of the axis. This handle is very convenient when the line of poſition of the objects to be obſerved is horizontal, or nearly ſo; and when applied on the lower ſide affords the beſt hold of the inſtrument while an obſervation is read off. Thus this inſtrument preſents to the obſerver in every poſſible poſition a convenient hold for either hand, and therefore removes the fourth, or chief inconvenience of Borda's circle.

The fifth objection cannot here occur, as the index does not proceed along the limb as in Borda's; it only ſteps forward and backward nearly to the ſame parts of the arc, during a ſeries of obſervations; therefore there is no need to calculate or make a preliminary obſervation. The index G has three branches at equal diſtances, each having a vernier: by theſe verniers, if they are all read, the eccentricity or error of the centre will in every ſight be perfectly corrected, which in former conſtructions is uncertain, as has been ſhewn in the ſixth objection. By reading the three branches of the index, the ſimple errors of diviſion are meant to be reduced to a quantity not worth notice; for as every obſervation ſhould be taken both backwards and forwards, every angle will be meaſured on ſix different and diſtant parts of the limb, and the greateſt error of the diviſions, by taking a mean, will be reduced to a ſixth part of its ſimple value. The contrivance of the three verniers was intended as a ſubſtitute for repeating; but it muſt be obſerved, that as there is a bare poſſibility that the ſix readings may be all + or all −, this method of reducing the errors reſts only upon probability, whereas that of repeating is a certain one.

Other parts, common to all circles of this claſs, are *a*, the index-glaſs; *b* the horizon-glaſs; *c* one of the glaſſes for darkening the reflected object; *e* one of thoſe for darkening the object ſeen directly; of both theſe there is a frame of three; *f* is the uſual apparatus for faſt and ſlow motion; and *g* one of the teleſcopes; *h* is the microſcope, with its illuminating reflector for reading off the parts of the divided limb, for which purpoſe it ſhifts from one branch of the index to another. The limb is divided all round into 720 parts, which may be called degrees, which they meaſure, but are numbered only from the point of paralleliſm of the glaſſes, or the place where the index ſtands in the annexed figures, each way to 160°, that being the largeſt angle that can be meaſured by this inſtrument. The verniers ſubdivide down to 20″, which on a diameter of 10 inches is judged fully ſufficient for the ſeaman's uſe; but ſome of larger dimenſions for obſervatories have been divided as low as 10″.

The teleſcope is here fixed near one edge of the circle, and the horizon-glaſs near the oppoſite edge, which, admitting the rays of light to fall upon the index-glaſs, both to the right and left of the horizon glaſs, conſtitutes the peculiar invention of Borda, and affords the means in the Engliſh conſtruction alſo of obſerving angles on both ſides of Zero. But as this has been explained in the foregoing inſtrument, it would be ſuperfluous to ſay more about it in this place.

A journaliſt, who is one of the ableſt aſtronomers of the continent of Europe, has ridiculed the Engliſh conſtruction under the appellation of *eunuch* (what we call *repeating* they call *multiplying*); but as it has really multiplied in kind to a family little ſhort of 200, the baron's pun ſeems but indifferently pointed. That aſtronomer, however, in a more ſerious mood, has thought proper to ſay that Troughton's conſtruction has deprived the reflecting circle of every improvement; but this being no place for controverſy, we leave the charge to the ſagacity and candour of the Engliſh reader.

In a compariſon of the Engliſh circle with the former ones, the want of repeating is the only ground that a critic can ſtand on: and it would be weakneſs to endeavour to depreciate the value of that invention; but if to acquire it, a ſacrifice were made, either of accuracy or convenience, to a greater extent than the gain, it would be more than weakneſs; it would be folly to perſevere in it. When Mayer propoſed the repeating circle, the ſtate of the art of dividing was ſo rude, that all muſt have conſidered the repeating property as a moſt valuable diſcovery; nay, it may perhaps yet be valuable in every other nation except England; but here the dividing-engine has been ſo well applied, that the ſmalleſt inſtruments, with reſpect to the graduation, may be conſidered as nearly perfect.

We ſhall deſcribe the adjuſtments of this inſtrument beſt by copying the practical inſtructions uſually diſtributed with it, which are as follow, *viz.*

Prepare the inſtrument for obſervation by ſcrewing the teleſcope into its place, adjuſting the drawer to focus, and making the wires parallel to the plane, exactly as you do with a ſextant; alſo, ſet the index forwards to the rough diſtance of the ſun and moon, or moon and ſtar; and, holding the circle by the ſhort handle, direct the teleſcope to the fainter object, and make the contact in the uſual way. Now read off the degree, minute, and ſecond, by that branch of the index to which the tangent ſcrew is attached; alſo, the minute and ſecond ſhewn by the other two branches; theſe give the diſtance taken on the three different ſextants; but as yet it is only to be conſidered as half an obſervation; what remains to be done, is to complete the whole circle by meaſuring that angle on the other three ſextants. Therefore, ſet the index backward nearly to the ſame diſtance, and reverſe the plane of the inſtrument by holding it by the oppoſite handle, and make the contact as above, and read off as before what is ſhewn on the three ſeveral branches of the index. The mean of all ſix is the true apparent diſtance, correſponding to the mean of the two times at which the obſervations were made.

When the objects are ſeen very diſtinctly, ſo that no doubt whatever remains about the contact in both ſights being perfect, the above may ſafely be relied on as a complete ſet; but if, from the hazineſs of the air, too much motion, or any other cauſe, the obſervations have been rendered doubtful, it will be adviſable to make more; and if at ſuch times ſo many readings ſhould be deemed troubleſome, ſix obſervations and ſix readings may be conducted in the manner following. Take three ſucceſſive ſights forwards, exactly as is done with a ſextant, only take care to read them off on different branches of the index; alſo make three obſervations backward, uſing the ſame caution; a mean of theſe will be the diſtance required. When the number of ſights taken forward and backward are unequal, a mean between the means of theſe taken backward and theſe taken forward will be the true angle.

It need hardly be mentioned, that the ſhades, or dark glaſſes apply, like thoſe of a ſextant, for making the objects nearly of the ſame brightneſs; but it muſt be inſiſted on, that the teleſcope ſhould on every occaſion be raiſed or lowered by its proper ſcrew for making them perfectly ſo.

The foregoing inſtructions for taking diſtances apply equally for taking altitudes by the ſea, or artificial horizon, they being no more than diſtances taken in a vertical plane. Meridian altitudes cannot however be taken both backward and forward the ſame day, becauſe there is not time; all therefore that can be done, is to obſerve the altitude one way, and uſe the index-error; but even here you have a mean of that altitude, and this error, taken on three different ſextants. Both at ſea and land, where the obſerver is ſtationary, the meridian altitude ſhould be obſerved forward one day and backward the next, and ſo on alternately from day to day; the mean of the latitudes, deduced ſeverally from ſuch obſervations, will be the true latitude; but in theſe there ſhould be no application of index-error, for that being conſtant, the reſult would in ſome meaſure be vitiated thereby.

When both the reflected image and direct object require to be darkened, as is the caſe when the ſun's diameter is meaſured, and when his altitude is taken with an artificial horizon, the attached dark-glaſſes ought not to be uſed;

inſtead of them, thoſe which apply to the eye-end of the teleſcope will anſwer much better, the former having their errors magnified by the power of the teleſcope, will, in proportion to this power, and thoſe errors, be leſs diſtinct than the latter.

In taking diſtances, when the poſition does not vary from the vertical above thirty or forty degrees, the handles which are attached to the circle are generally moſt conveniently uſed; but in thoſe which incline more to the horizontal, that handle which ſcrews into a cock on one ſide, and into the crooked handle on the other, will be found more applicable.

When the crooked handle happens to be in the way of reading one of the branches of the index, it muſt be removed for the time, by taking out the finger-ſcrew which faſtens it to the body of the circle.

If it ſhould happen that two of the readings agree with each other very well, and that the third differs from them, the diſcordant one muſt not on any account be omitted, but a fair mean muſt always be taken.

It ſhould be ſtated, that when the angle is about thirty degrees, neither a diſtance of the ſun and moon, nor an altitude of the ſun with the ſea-horizon, can be taken backward, becauſe the dark-glaſſes at that angle prevent the reflected rays of light from falling on the index-glaſs; whence it becomes neceſſary, when the angle to be taken is quite unknown, to obſerve forward firſt, where the whole range is without interruption; whereas, in the backward obſervation, you will loſe ſight of the reflected image about that angle. But in ſuch diſtances where the ſun is out of the queſtion, and when his altitude is taken with an artificial horizon, the ſhade being applied to the end of the teleſcope, that angle may be meaſured nearly as well as any other; for the rays incident on the index-glaſs will paſs through the tranſparent half of the horizon-glaſs, without much diminution of their brightneſs.

The advantages of this inſtrument when compared with the ſextant, are chiefly theſe; the obſervations for finding the index error are rendered uſeleſs, all knowledge of that being put out of the queſtion, by obſerving both forwards and backwards. By the ſame means the errors of the dark glaſſes are alſo corrected; for, if they increaſe the angle one way, they muſt diminiſh it the other way by the ſame quantity. This method alſo perfectly corrects the errors of the horizon glaſs, and thoſe of the index-glaſs very nearly. But what is ſtill of more conſequence, the error of the centre is perfectly corrected, by reading the three branches of the index; while this property combined with that of obſerving both ways, probably reduces the errors of dividing to one-ſixth part of their ſimple value. Moreover, angles may be meaſured as far as one hundred and fifty degrees, conſequently the ſun's double altitude may be obſerved when his diſtance from the zenith is not leſs than fifteen degrees; at which altitude, the head of the obſerver begins to intercept the rays of the light incident on the artificial horizon; and, of courſe, if a greater angle could be meaſured it would be of no uſe in this reſpect.

This inſtrument in common with the ſextant, requires three adjuſtments; firſt, the index-glaſs muſt be made perpendicular to the plane of the circle; this being done by the maker, and not liable to alter, has no direct means applied to the purpoſe; it is known to be right when by looking into the index-glaſs, you ſee that part of the limb which is next you reflected in contact with the oppoſite ſide of the limb, as one continued arc of a circle; on the contrary, when the arc appears broken, where the reflected and direct parts of the limb meet, it is a proof that it wants to be rectified. The ſecond adjuſtment is, to make the horizon-glaſs perpendicular: this is performed by a capſtan-ſcrew at the lower end of the frame of that glaſs; and is known to be right, when, by a ſweep with the index, the reflected image of any object will paſs exactly over, or cover the image of that object ſeen directly. The third adjuſtment is for making the line of collimation parallel to the plane of the circle: this is performed by two ſmall ſcrews, which alſo faſten the collar into which the teleſcope ſcrews, to the upright ſtem on which it is mounted; this is known to be right, when the ſun and moon having a diſtance of one hundred and thirty degrees or more, with their limbs brought in contact juſt at the outſide of that wire which is next to the circle; remain the ſame juſt at the outſide of the other wire; their being ſo in both ſituations is the proof of adjuſtment.

The inſtrument by the preſent maker which we obtained a temporary poſſeſſion of for examination, has been ſome time in uſe at ſea; we have examined the readings by all the three verniers, at the ends and middle of every half ſign with great care, by the help of a microſcope with an illuminating reflector, and did not detect a difference between any two readings of more than 40″, which is much leſs than we expected, notwithſtanding the nicety with which we previouſly knew this maker's inſtruments have long been divided by an engine belonging to himſelf; for when we conſider that the three-armed piece of the verniers may be liable to have an eccentricity, as it reſpects the circle, the difference we have mentioned may be taken as the whole amount ariſing from the eccentricity of the vernier bars and of the inequality of the diviſions taken together.

Mr. Troughton, we have ſeen, has adopted three verniers to effect the correction of eccentricity, which have each 20 ſpaces equal to 21 on the limb, and which we have ſaid perfectly correct this error; but as captain Mendoza has aſſerted in his paper contained in the "Philoſophical Tranſactions of London for the year 1801," that two verniers placed oppoſite one another correct the eccentricity better than any other number, nay, that "a greater number ought not in any caſe to be uſed;" and alſo as we find that Borda has preferred *four* verniers in his repeating circle without reflection, which we ſhall ſhortly deſcribe; we feel it incumbent on us, after what we have ſaid, to prove the accuracy of three verniers for correcting the eccentricity of their poſition, and alſo to ſhew the probability there is of their correcting moreover the inequalities in the diviſions of the divided circle. We thought it would be of importance to have the reaſons of Mr. Troughton himſelf for having preferred three verniers to any other number, and therefore we wrote to him on the ſubject; to which inquiry his reply was nearly in theſe words, which we think worthy of public notice; viz. "The eccentricity of a circular inſtrument ſuppoſes the diviſions to be in a true circle, but that the index revolves round a centre at a diſtance from that which the diviſions of the circle radiate from. Now it is plain that two oppoſite indices will correct this kind of error perfectly; and it is equally true, though not ſo obvious, that three indices will do the ſame."

If we ſuppoſe a circle to be compreſſed on one ſide, and elongated on the other, *i. e.* transformed into an ellipſe, but having the index revolving round a point biſected by both the long and ſhort diameters; in this caſe oppoſite readings ſhew no error, and therefore correct none, notwithſtanding the end and ſide diviſions are altered by the compreſſion, becauſe the alternations correſpond at the oppoſite ends of any diameter; but three verniers, though they do not afford an exact mathematical correction, yet approximate extremely near to it.

If the inſtrument were both elliptical and eccentric, like the orbit of a planet, oppoſite readings would correct that part of the error which ariſes from the eccentricity, but would leave the elliptical error uncorrected; but three equidiſtant readings would entirely correct that part of the error which ariſes from eccentricity, and would alſo approximate towards the correction of the elliptical error likewiſe. Four readings at right angles to each other do no more than two oppoſite ones, but do the ſame thing twice over; nor are ſix better than three for the ſame reaſon. I have not tried five readings, but I dare ſay they will correct for eccentricity, (which I fancy every number, odd or even, greater than unity, will do), but I have no doubt of their falling ſhort of correcting the elliptical error ſo well as three do."

We have no need, however, to reſt the proof merely on the authority of this quotation, the compariſon is capable of geometrical demonſtration ſo far as relates to the eccentricity only, and with reſpect to the inequality of the diviſions, or what is here called the elliptic error, the tables of the planetary orbits will afford the means of comparing the errors alſo which ariſe from a ſcale of diviſions analogous to the equated daily motions of a planet, which Mr. Troughton has alluded to in his letter in conſequence of our having firſt ſuggeſted the analogy between the eccentric index of a graduated circle and the radius vector of a planet's orbit.

Let *fig.* 1 of *Plate* IV. of *Aſtronomical Inſtruments* repreſent a graduated circle with two oppoſite verniers; let *a* be the centre of this circle, and *b* the point out of the centre, round which the bar of the two verniers revolves; and let the diametrical line 0° 180° paſs through the points *a* and *b*; now it is evident, that if this line repreſents the bar of the verniers, one being at 0° and the other at 180°, there will be no error ſhewn; the ſame would be the caſe if the bar were reverſed; but ſuppoſe the end now at 0° to move forwards to *c*, round the eccentric point *b*, and the end at 180° to *d*; in this new ſituation it is equally evident, that the circle would not be biſected into two equal halves; for the ſemi-circle, *ced*, would be leſs than the ſemi-circle *dfc*, by the two ſmall arcs *gc* and *dh*; again, it is equally clear that the point *c* of the vernier bar would be too forward by the arc *gc*, and the end *d* too backward by the arc *dh*, which is ſimilar and equal to the former: therefore, in this poſition of the oppoſite verniers, it is evident that the + error *gc* is an exact balance for the — error *dh*; this evidence reſults from the nature of the figure, for as the four angles 0° *ag*, 0° *bc*, 180° *bd*, and 180° *ah*, are all reſpectively equal to each other, and the dotted diametrical line *hg* parallel to the line *dc*, the arcs *gc* and *hd* are neceſſarily equal to each other, the one poſitive and the other negative, as they are ſituated with reſpect to the index-bar *dc*.

Again, ſuppoſe the end *c* of the index-bar carried forwards to *e*, at right angles to its original ſituation, here the demonſtration is equally true, and the error is a maximum, the arc 90° *e* being the poſitive error, and *f* 270° the negative one, which two are as before equal to each other; and in the ſame way it may be proved, that the two oppoſite errors will correct one another in any other ſituation of the eccentric bar of the verniers, where the errors in the ſemi-circle to the right of 0° will be all poſitive, and thoſe in the ſemi-circle to the left will be all negative, ſuppoſing the verniers to move agreeably to the diviſions in the direction of 0° 90° 180° and 270°.

Let us now try what three verniers will do in correcting the errors of eccentricity.

In *fig.* 2 of the ſame *Plate*, let 1, 2, and 3, repreſent the three verniers revolving round the eccentric point *b*, as before, at 120° diſtance from each other, and let No. 1 ſtand at 180° of the circle, then the other two verniers will ſtand at equal diſtances at each ſide of the point 0°, namely at 60° and at 300° of the graduated circle; in which ſituation No. 1 has no error, but No. 2 has a minus error of the arc 2 *f*, and No. 3 exactly a ſimilar plus error *e* 3, on account of the dotted lines *af* and *ae* being parallel to the lines *b* 2 and *b* 3, repreſenting the two arms of the verniers 2 and 3; the correction is therefore complete.

Secondly, let the arms of the verniers be placed as in figure 3, where the errors are the greateſt poſſible, by reaſon of the arm 1, or arm of the poſitive correction, being at right angles to the line 0° 180° paſſing through the centre and alſo the eccentric point *b*; as Mr. Troughton very juſtly ſaid, the correction here is not ſo obvious; it is, however, demonſtrably juſt. What we have to prove is, that the poſitive arc 90° 1 is equal to the ſum of the two negative arcs 2 *f* and 3 *e*: the proof may be had thus; from the centre *a* demit the ſmall perpendicular *ad*, which will be equal to the chord of the ſmall arc 3 *e*, alſo demit the perpendicular *bc* from the eccentric point *b*, which will be the length of the chord of arc 2 *f*; *ba* is of itſelf the chord of the poſitive arc 90° 1: now, in the firſt place, we have given in the ſmall right-angled triangle *abc*, right-angled at *c*, the angle at *a* equal 30° (120° — 90°) to determine the ſide *bc*, which, if we make *ab* = radius, will be the ſine of 30°; likewiſe in the ſimilar right-angled triangle *abd*, right-angled at *d*, we have the angle at *b* given equal 30° (alſo 120° — 90°) to determine the ſide *ad*; but by reaſon of the ſimilarity of the two triangles, which have a common hypothenuſe, the ſide *ad* is alſo the ſine of the angle *abd* to the ſame radius, and therefore equal to the ſide *bc* of the former triangle; hence the ſum of the two ſines of 30° each ought to be equal to radius, if the correction be perfect; but the ſine of any angle doubled is the chord line of double that angle, therefore double the ſine of 30° is equal to the chord of 60°, which is always equal to radius in any circle; conſequently the correction in this poſition of the verniers is alſo perfect.

Thirdly, let us ſuppoſe the poſition of the verniers to be as in *fig.* 4, ſuch, that No. 1 ſtands halfway between 90° and 180°, *viz.* at 135°; then No. 2 will be at 255°, and No. 3 at 15°; ſo that the errors of No. 3 and 1 will be plus, and that of No. 2 minus; in this poſition we have firſt the three angles of the triangle *abe* given to determine the relative magnitudes of the ſides, of which *be*, equal the chord of 1 *f*, is wanted; the angle *fa* 180° (= 1 *b* 180°) is known to be 45°, conſequently the angle *abe*, its complement, is alſo 45°, and if the line, *ab*, be made radius, the required line *be* is the ſine of 45°; alſo in the triangle *abd*, right-angled at *d*, the angle at *b* is 15° (= 180° — 120° + 45°), and the ſide *ad* is the ſine of 15° to the ſame radius *ab*; likewiſe in the right-angled triangle *abc*, with the right angle at *c*, the angle at *a* is given = 75°, (= 120° — 45°) and the required ſide *bc* is its ſine, equal to the chord of the negative arc 2 *g*, which is taken as a balance to the two poſitive arcs *f* 1 and *h* 3. If now we take from a table of natural ſines the three determined quantities, we ſhall have

Nat. ſine of 45°	-	-	+ 7071068
Nat. ſine of 15°	-	-	+ 2588190
			+ 9659258
Nat. ſine of 75°	-	-	— 9659258
		Uncorrected error	0000000

Hence the correction is here likewiſe perfect; and the method we have laſt uſed is equally applicable to any other poſition of the verniers that can be given them in the circle; *i. e.* the natural ſines of the angular diſtances from the neareſt points 0° or 180°, put down with their proper ſigns, will always be found to afford as perfect a correction for the ſimple eccentricity of the indices, as if two only had been uſed. But Mr. Troughton has ſaid that his three verniers approximate, moreover, very nearly to the correction of the inequalities of the diviſions, or what may, by analogy, be called the elliptic error, where we ſuppoſe the diviſions gradually increaſing and decreaſing alternately in magnitude to and from certain points in the circle; this ſource of errors, being a contingent one, cannot ſo well be exemplified in a ſtate ſeparate from the errors of eccentricity: we may, however, take a caſe in which both ſources of error exiſt together, and try how three verniers will ſucceed in correcting both at the ſame time.

For this purpoſe we propoſe to avail ourſelves of the orbit of a planet with ſmall eccentricity; ſuch, for inſtance, as that of Venus, where the eccentricity is only $\frac{1}{142}$ part of radius; the form of which orbit, therefore, does not ſenſibly vary from an eccentric circle. According to the elliptic hypotheſis of biſhop Ward, if a body ſhould move equably in one focus of an ellipſe, an eye fixed in the other focus would view it moving unequably very nearly according to the laws of true planetary motion; ſo much ſo, indeed, that where the eccentricity is ſmall, it may be taken as exactly ſo, without ſenſible error: but the diſtance between the two foci of an ellipſe is equal to double the eccentricity; therefore a ſingle index moving round a point out of the centre of a circle will have a ſeries of errors alternately increaſing and decreaſing in quantity, exactly like the *equation of the centre* of a planetary orbit, excepting that the ſcale of errors will be only *one half*, at each point of the eccentric circle, what they would have been if the index had moved round a point at double the diſtance of the quantity expreſſed by the circle's eccentricity. Hence, if we take the ſcale of equations of Venus, as calculated by Dr. Halley, they will afford the ready means of trying the effect of three verniers uſed in a circle with an eccentricity equal to *twice* that of Venus's orbit; namely, in which the eccentricity is $\frac{1}{71}$ of radius; and in which the diviſions alternately increaſe and decreaſe like the diurnal ſpaces in a planet's orbit.

We have taken the trouble of arranging the table of Dr. Halley, which contains the mean anomaly and correſponding equations of Venus, in ſuch a way, that when No. 1. of the three verniers ſtands at any degree of diſtance from the aphelion point (or end of a line paſſing through the eccentric point) in Column 1. No. 2. of the verniers will then be at the proper degree in Col. 2. 120° forwards; and alſo No. 3. of the verniers will be at its proper number in the ſame horizontal line in Col. 3. 240° forwards; likewiſe the equations ſtanding in the ſame line in the ſecond ſet of three columns, marked alſo 1, 2, and 3, agreeably to their correſponding diſtances, will be the correſponding *errors* of the reſpective verniers in that ſituation; two of which errors will be — and one +, or two + and one — always: then if the three errors, which we have called equations, be added together, in ſuch a way that their ſigns may counteract one another algebraically, the remaining portion, if any, is the quantity of the uncorrected error, which we have inſerted in the laſt column, where it will appear that in no one point round the circle is there an uncorrected error of more than 2″; and what may be conſidered as a proof of the truth of our arrangement, and alſo of the calculations, the + and — errors, being each in the whole amount 33″, annihilate one another.

CIRCLE.

Angular Diſtances from the Aphelion Point.			Correſponding Equations for Eccentricity of $\frac{1}{71}$ of Radius.			Errors uncorrected by 3 Verniers.
Verniers.						
1	2	3	1	2	3	
0°	120°	240°	−0′ 0″	−41′ 45″	+41′ 45″	0′ 0″
1	121	241	0 50	41 19	42 9	0 0
2	122	242	1 40	40 53	42 33	0 0
3	123	243	2 30	40 26	42 56	0 0
4	124	244	3 20	39 59	43 18	−0 1
5	125	245	4 10	39 31	43 39	0 2
6	126	246	4 59	39 2	43 59	0 2
7	127	247	5 48	38 32	44 19	0 1
8	128	248	6 37	38 1	44 38	0 0
9	129	249	7 26	37 30	44 56	0 0
10	130	250	8 15	36 58	45 14	+0 1
11	131	251	9 5	36 26	45 30	−0 1
12	132	252	9 54	35 52	45 46	0 0
13	133	253	10 43	35 19	46 1	0 1
14	134	254	11 31	34 44	46 15	0 0
15	135	255	12 19	33 9	46 28	0 0
16	136	256	13 7	33 34	46 40	0 0
17	137	257	13 55	32 57	46 51	0 1
18	138	258	14 42	32 19	47 2	+0 1
19	139	259	15 30	31 42	47 11	−0 1
20	140	260	16 17	31 3	47 20	0 0
21	141	261	17 4	30 24	47 27	0 1
22	142	262	17 50	29 45	47 34	0 1
23	143	263	18 36	29 5	47 41	0 0
24	144	264	19 22	28 25	47 46	0 1
25	145	265	20 7	27 44	47 50	0 1
26	146	266	20 52	27 2	47 54	0 0
27	147	267	21 37	26 20	47 57	0 0
28	148	268	22 22	25 37	47 59	0 0
29	149	269	23 6	24 54	48 0	0 0
30	150	270	23 50	24 10	48 0	0 0
31	151	271	24 33	23 26	47 59	0 0
32	152	272	25 15	22 42	47 58	+0 1
33	153	273	25 57	21 57	47 55	0 1
34	154	274	26 39	21 12	47 52	0 1
35	155	275	27 20	20 27	47 47	0 0
36	156	276	28 1	19 41	47 42	0 0
37	157	277	28 41	18 55	47 35	−0 1
38	158	278	29 21	18 7	47 28	0 0
39	159	279	30 0	17 20	47 20	0 0
40	160	280	30 39	16 33	47 12	0 0
41	161	281	31 17	15 45	47 3	+0 1
42	162	282	31 54	14 57	46 53	0 2
43	163	283	32 31	14 9	46 41	0 1
44	164	284	33 8	13 20	46 29	0 1
45	165	285	33 44	12 32	46 16	0 0
46	166	286	34 19	11 43	46 2	0 0
47	167	287	34 53	10 54	45 48	0 1
48	168	288	35 27	10 4	45 32	0 1
49	169	289	36 1	9 14	45 16	0 1
50	170	290	36 33	8 24	44 58	0 1
51	171	291	37 5	7 34	44 40	0 1
52	172	292	37 37	6 44	44 21	0 0
53	173	293	38 8	5 54	44 1	−0 1
54	174	294	38 38	5 3	43 41	0 0
55	175	295	39 7	4 12	43 20	+0 1
56	176	296	39 36	3 22	42 58	0 0
57	177	297	40 4	2 31	42 35	0 0
58	178	298	40 31	1 41	42 12	0 0
59	179	299	40 58	0 51	41 48	−0 1
60	180	300	41 24	0 0	41 24	0 0
			Carried forward			

Angular Diſtances from the Aphelion Point.			Correſponding Equations for Eccentricity of $\frac{1}{71}$ of Radius.			Errors uncorrected by 3 Verniers.
Verniers.						
1	2	3	1	2	3	
			Brought forward			
61°	181°	301°	−41 48″	+ 51″	+40′ 58″	+0′ 1″
62	182	302	42 12	1 41	40 31	0 0
63	183	303	42 35	2 31	40 4	0 0
64	184	304	42 58	3 22	39 36	0 0
65	185	305	43 20	4 12	39 7	0 1
66	186	306	43 41	5 3	38 38	0 0
67	187	307	44 1	5 54	38 8	0 1
68	188	308	44 21	6 44	37 37	0 0
69	189	309	44 40	7 34	37 5	−0 1
70	190	310	44 58	8 24	36 33	0 1
71	191	311	45 16	9 14	36 1	0 1
72	192	312	45 32	10 4	35 27	0 1
73	193	313	45 48	10 54	34 53	+0 1
74	194	314	46 2	11 43	34 19	0 0
75	195	315	46 16	12 32	33 44	0 0
76	196	316	46 29	13 20	33 8	−0 1
77	197	317	46 41	14 9	32 31	0 1
78	198	318	46 53	14 57	31 54	0 2
79	199	319	47 3	15 45	31 17	0 1
80	200	320	47 12	16 33	30 39	0 0
81	201	321	47 20	17 20	30 0	0 0
82	202	322	47 28	18 7	29 21	0 0
83	203	323	47 35	18 55	28 41	+0 1
84	204	324	47 42	19 41	28 1	0 0
85	205	325	47 47	20 27	27 20	0 0
86	206	326	47 52	21 12	26 39	−0 1
87	207	327	47 55	21 57	25 57	0 1
88	208	328	47 58	22 42	25 15	0 1
89	209	329	47 59	23 26	24 33	0 0
90	210	330	48 0	24 10	23 50	0 0
91	211	331	48 0	24 54	23 6	0 0
92	212	332	47 59	25 37	22 22	0 0
93	213	333	47 57	26 20	21 37	0 0
94	214	334	47 54	27 2	20 52	0 0
95	215	335	47 50	27 44	20 7	+0 1
96	216	336	47 46	28 25	19 22	0 1
97	217	337	47 41	29 5	18 36	0 0
98	218	338	47 34	29 45	17 50	0 1
99	219	339	47 27	30 24	17 4	0 1
100	220	340	47 20	31 3	16 17	0 0
101	221	341	47 11	31 42	15 30	0 1
102	222	342	47 2	32 19	14 42	−0 1
103	223	343	46 51	32 57	13 55	+0 1
104	224	344	46 40	33 33	13 7	0 0
105	225	345	46 28	34 9	12 19	0 0
106	226	346	46 15	34 44	11 31	0 0
107	227	347	46 1	35 19	10 43	0 1
108	228	348	45 46	35 52	9 54	0 0
109	229	349	45 30	36 26	9 5	0 1
110	230	350	45 14	36 58	8 15	−0 1
111	231	351	44 56	37 30	7 26	0 0
112	232	352	44 38	38 1	6 37	0 0
113	233	353	44 19	38 32	5 48	+0 1
114	234	354	43 59	39 2	4 59	0 2
115	235	355	43 39	39 31	4 10	0 2
116	236	356	43 18	39 59	3 20	0 1
117	237	357	42 56	40 26	2 30	0 0
118	238	358	42 33	40 53	1 40	0 0
119	239	359	42 9	41 19	0 50	0 0
120	240	360	41 45	41 45	0 0	0 0
						+0 33 −0 33
						0 0

The conſtruction and uſe of this table will be very obvious when we have exemplified one poſition of the verniers. Suppoſe the principal vernier, which has got the tangent-ſcrew, to be made to reſt at 20° (which is 40° in the circle, as it is divided into 720°), and ſuppoſe that it be required to know the three reſpective errors of the three verniers? Look at 20° in Col. 1. of angular diſtances, and there will be in the ſame line the diſtances of the other two verniers 140° and 260°, and in the columns 1, 2, and 3 of equations, there are — 16′ 17″ — 31′ 3″ and + 47′ 20″; but the ſum of the *minus* quantities is equal to the *plus* quantity, therefore the poſitive error of the third vernier exactly balances the amount of the negative errors of the firſt and ſecond verniers; conſequently the correction is perfect, and in the laſt column are a couple of ciphers.

Again, ſuppoſe the firſt vernier ſtanding at (the double of) 40° with an equation of — 30′ 39″, then the ſecond will reſt at (the double of) 160°, with an equation of — 16′ 33″, and the laſt vernier will reſt at (the double of) 280°, with an equation of + 47′ 12″, which ſum is exactly a balance for the amount of the other two negative ſums, and the uncorrected error is, as before, nothing.

The few very minute errors which appear in the laſt column may be attributed, perhaps, to a want of perfect accuracy in the computation of the table, which is not carried to decimal parts of a ſecond, rather than to a want of accuracy in the mode of applying the verniers; becauſe the change from plus to minus, and back again, would not have been ſo frequent, if the errors had been owing to the mode of detection.

When two verniers only are uſed, it is equally eaſy to aſcertain from the table the correſponding equations and relative uncorrected errors; thus at 20°, as before, which is read 40° on the inſtrument, by reaſon of the reflection of the mirrors, the equation is — 16′ 17″; and at 20° + 180° = 200°, it is + 16′ 33″, ſo that the uncorrected error is + 16″; thus we find that the correction with only two verniers is not perfect at any other points of the eccentric circle, except at 0°, 90°, 180°, and 270°. At 45° this uncorrected error is a maximum, *viz.* 25″ with $\frac{1}{71}$ of eccentricity, but it gradually decreaſes both ways to 0° and 90°; the ſame obſervation is true of the points 135°, 225°, and 315°, which are each 45° diſtant from the beginnings of the other three quadrants reſpectively; ſo that on the whole the ſcale of uncorrected errors with two verniers aſcends four times to a maximum, and deſcends as often during the whole circuit; which is a ſufficient proof that two verniers are by no means ſo accurate as three for the elliptic error, in our planetary trial; and as four verniers correct only as two pair of oppoſite verniers, they are alſo inferior in accuracy to three, where the correction appears as perfect as could be wiſhed.

We are free to confeſs, however, that accurate as three verniers are for all caſes of eccentricity and unequal diviſions which are at all likely to occur in the conſtruction of an inſtrument, yet there is a limit beyond which their accuracy ceaſes: for inſtance, if we ſuppoſe the eccentricity and radius of an eccentric circle as 4 to 10, which would have a ſet of equations equal to thoſe of Mercury's orbit, including the eccentric and large elliptic errors, the maximum of uncorrected error, when three verniers are uſed, would be as much as 46′, but when two only are uſed, it would be very nearly 6°, which diſparity ſhews ſtill more clearly the advantage that three verniers have over two, even in an extreme caſe. This mode of aſcertaining the preference to be given to a certain number of verniers, is, we believe, an original one; which is our apology for its introduction here at full length.

The reflecting circle which we have examined has a circle of ſolid ſilver let into, or, we believe, melted into a groove in the braſs limb, which renders the diviſions diſtinctly viſible through the microſcope, though they are too delicately made for the naked eye to read. The ſtrokes appear not to be more than one-third of the thickneſs of thoſe which we have had occaſion to examine before in Mayer's, and particularly in Borda's circle. There are three teleſcopic tubes for viewing an object, one for celeſtial purpoſes that has two powers, and a couple of croſs hairs or wires in each; a ſecond, which does not invert, for terreſtrial objects; and a third, which is only a ſimple tube, for confining the line of ſight. The parts appear to be all as ſteady and perfect after uſe, as they were when the inſtrument was new. After the conſideration which we have here given to the conſtruction of Troughton's reflecting circle, we ſhould be guilty of a ſpecies of ſcepticiſm, if we heſitated to pronounce it the beſt inſtrument that has hitherto been made for taking the lunar obſervations accurately, and for the other purpoſes of nautical aſtronomy. When this inſtrument is uſed on ſhore, the maker packs up an artificial horizon of quickſilver, and a claw-foot ſtand, as a ſupport, which ſcrews into the cock inſtead of the handle, and relieves the obſerver greatly when angular diſtances are meaſured.

The reflecting and doubly-multiplying CIRCLE, *by Joſeph de Mendoza Rios, Eſq. F.R.S.*

We have already given a brief notice of captain Mendoza's improved circle, and have ſaid that it is different from the one which he publiſhed in the Philoſophical Tranſactions of London in the year 1801, the account of which was copied into Mr. Nicholſon's Journal (vol. i. 8vo. ſeries); we ſhall therefore, without further preface, proceed to deſcribe its preſent conſtruction and manner of being uſed.

In all the circles which preceded the preſent one, there was but one principal circular plane which held the graduations indicated by the verniers of the index-bars, but here are three principal circular parts, two moveable round a common centre, and one concentrically fixed; alſo, what will be conſidered as a further peculiarity, the bar which bears the central mirror, and which has uſually the vernier, or one of the verniers where there are more than one, has here no vernier attached to it, but is uſed to convey the verniers and a circle of 360° alternately to the right and left of their original ſituation, by a vibratory motion ſomewhat analogous to the motion of a pendulum rod, alternately laying hold on one and letting go the other, during a ſeries of croſſed obſervations. *Fig.* 5 of *Plate* IV. is a repreſentation of one ſide of the doubly-multiplying circle, in which the frame, the diſpoſition of the glaſſes, and the application of the handles, are preciſely like thoſe of Troughton's circle, juſt deſcribed, and therefore need not be again explained. C is the fixed circle, uſually called the limb of the inſtrument, over which is placed a ſecond circle D, and alſo over that a third one E; the two latter of which move freely and ſeparately round the centre of the inſtrument; above the laſt circle E the index F has its ſituation, and carries at the low end of its axis the index-mirror, which being at preſent at the under-ſide cannot be ſeen in the figure. The fixed circle C has its inferior ſurface divided to the right and left into two ſets of diviſions as far as 140°, like two ſeparate ſextants, their reſpective zeros commencing not at the ſame point, but at the diſtance from one another of the breadth of the index, ſo that one of them touches one edge of the index when the other touches the other at the divided part of the limb; on theſe two portions of the circular limb ſlide two ſimilar ſtops, *a* and *a*, which may be made to remain in any given points. The index-mirror and horizon-mirror are juſt parallel to each other when the end of the index F occupies the ſituation between the two zeros; and as it is generally known pretty nearly what the angular diſtance of two heavenly bodies is when a lunar obſervation is made, theſe ſtops may be ſlided along the right and left diviſions of the limb reſpectively till their inner edges ſtand on the ſuppoſed degree of angular diſtance from their zeros reſpectively, in which ſituations they will ſerve as guides, in the night particularly, for fixing the index alternately, in a croſſed obſervation, in order to find the places of ſucceſſive contact more conveniently than they could be found without ſome ſuch rough guide; nor will theſe ſtops be ſerviceable for the firſt croſſed obſervation only, but for every ſubſequent one; ſeeing the ſucceſſive obſervations require not the index to have any other than alternate, backward and forward motions between the two ſtops, how often ſoever repeated. The circle D is nicely divided into 360° and their ſubdiviſions, and the adjoining circle E carries two verniers, A and B, diametrically oppoſite each other, which read off to 10″. On the index F is the uſual tangent-ſcrew for procuring a ſlow motion when the index-bar is clamped to the limb, which clamping is effected by the action of a ſmall lever *c*. There are, moreover, four other clamps with fixing-ſcrews that have milled heads, which may be called dead-clamps, and which open by means of their own ſprings when their fixing-ſcrews are turned back, but lay hold of their reſpective moveable circles when acted on by the finger or fixing-ſcrews. The clamps *d* and *g* are attached faſt to the fixed circle C at oppoſite ſides, and the clamps *e* and *f* are attached to and carried by the index F; the clamps *d* and *f* clamp the upper circle E to the limb; and *e* and *g* clamp the lower one D. Alſo when an obſervation with the motion of the index and its mirror to the left, *f* and *g* muſt both be faſt, but *d* and *e* both looſe; on the contrary, when the motion of the index is to the right, *d* and *e* muſt be faſt, and *f* and *g* looſe. The heads of the clamps *d* and *e* have each a protuberance or knob, by which they may be eaſily diſtinguiſhed in the dark from thoſe on the other ſide. In making an obſervation with an inſtrument of this conſtruction, which appears more complex than it really is, the reader may now conceive, that when the clamp of the index has ſeized one of the two moveable circles and carried it to the ſtop on the right, where it is depoſited and clamped faſt, and then has taken up the other and brought it back to the left the ſame diſtance, before it is depoſited in its turn, which two alternate motions complete two croſſed obſervations, one to the right and the other to the left, the verniers have departed from their original ſituations, with reſpect to a given point on the divided contiguous circles, juſt as many degrees as are equal to two croſſed obſervations, or four ſimple angular diſtances; for the verniers moved from the original point, which we will ſuppoſe to have been zero, one half, and again zero of the divided circle moved from the vernier, by a motion in a contrary direction, the other half.

The minutiæ attending the taking of a ſeries of croſſed obſervations may be thus explained more fully; in the firſt place ſlide the ſtops to the reputed angle to be meaſured, which we will ſuppoſe to be 50°, as read on the under ſide of the fixed circle C, and fix them there, one at each ſide of their reſpective zeros; let the index for the preſent remain at the point of paralleliſm, which we have ſaid is between the two zeros on the inferior ſurface of the fixed circle; in the next place arrange the two moveable circles ſo that vernier A of the circle E may be beyond the neareſt ſtop, and may have its zero coincident with zero of the circle D divided into 360°, in which ſituation fix the two clamps *e* and *f* of the index, and carry it with a quick motion to touch the ſtop on the right, and having fixed it by the lever *c*, complete the contact by the tangent-ſcrew of ſlow motion, and the inſtrument is then in a ſtate of rectification, if the glaſſes are truly placed, for beginning a ſeries of croſſed obſervations; for as both the clamps *e* and *f* of the index were made faſt while it was at the point of paralleliſm, when the index moved to the right it brought both the moveable circles along with it, without altering the reſpective poſitions of vernier A and zero of D. The index has firſt to move from right to left as ſeen in the figure, therefore the clamps *d* and *e* muſt be both looſe, and alſo that of the lever *c*, and the clamps *f* and *g* faſt; but *f* is a clamp of E the vernier circle, and *g* one of D, the graduated circle; therefore when the index moves the whole ſpace of a croſſed obſervation to the ſtop on the left, it leaves the graduated circle D behind faſt, and takes the verniers along with it; ſuppoſe the ſecond contact to be completed by the tangent-ſcrew again as before, then the vernier will read off in this ſituation 100° more or leſs, the amount of the croſſed obſervation; but the whole circle is divided into only 360° inſtead of 720°, as Borda's is, the obſerved angle may conſequently, though a croſſed obſervation, be conſidered as the ſimple angular diſtance taken as a mean of two ſucceſſive ſimple angular diſtances, if there had been 720° in the circle, agreeably to the diviſion of an Hadley's octant or ſextant; but it is not neceſſary to read off yet. Change now the ſtate of all the clamps by faſtening *d* and *e*, and looſening *f* and *g*, and carry the index back again to the ſtop on the right; during this motion of the index the verniers being fixed by *d* will remain behind, and the graduated circle D being clamped by *e* to the index, will now, in its turn, move along with it the exact ſpace of the ſecond croſſed obſervation, and the vernier A will read off 200° more or leſs, which is four times the angle required to be meaſured; and this quadruple of the angle has been obtained by two croſſed obſervations made alternately to the left and to the right, without any uſeleſs motion of the index; which reſult at this ſtage of the ſeries of croſſed obſervations explains the reaſon why the inſtrument is called not only a reflecting but alſo a doubly-multiplying circle, for we have ſeen that it doubles the ſimple angle required to be meaſured at each croſſed obſervation taken both backwards and forwards any number of times. The quadruple angle however is read off, as being only double, by reaſon, as we have before ſeen, of the circle having only 360°. This proceſs of alternately fixing and releaſing the two pair of clamps, and of moving the index as many times alternately back and forwards between the ſtops, and ending with as many exact contacts by the help of the tangent-ſcrew, will give a final reſult, as read by the vernier A, which divided by the number of croſſed obſervations uſed, excluſive of the angle of primary rectification, will give as a quotient the true diſtance ſought, which diſtance will be the more accurate the greater the number of croſſed obſervations. Should the ſecond vernier B be alſo read off, the mean of the two reſults will be ſtill more accurate, inaſmuch as not only the inequalities of ſimple diviſion will be partly corrected, but alſo the eccentricity of the divided circle D completely, if there ſhould happen to be any. Of courſe the mean of the times muſt be taken in the uſe of this inſtrument as well as in Mayer's and Borda's, but as the expedition with which a ſeries of obſervations may be made, will be much greater in uſing this inſtrument, noting the times of the firſt and laſt contact may be ſufficient, when the obſerver is expert and has no interruption; but perhaps it will be the ſafeſt method to mark down the times of each ſucceſſive contact. If the errors of eccentricity and of unequal diviſions had not been ſo perfectly corrected by Troughton's three verniers, and if inſtruments were not now divided with an almoſt incredible degree of accuracy, we ſhould have felt diſpoſed ſtrongly to recommend Mr. Mendoza's inſtrument in preference to any other one for meaſuring large angles accurately; particularly if we could perſuade ourſelves that the alternate clamping and unclamping, many times repeated, did not in ſome degree affect the accuracy of the readings; but under the circumſtances in which this inſtrument is produced, we leave to the public and to future experience the determination how far it may be put in competition with its predeceſſor, or claim a preference over it. At all events, Mr. Mendoza deſerves well of the public for this as well as for former labours to benefit the intereſts of navigation.

Aſtronomical Circle *by the late Jeſſe Ramſden.*

Profeſſor Gieuſeppe Piazzi, the celebrated aſtronomer of Palermo, who firſt diſcovered the new planet which bears his name, publiſhed a work in two folio volumes in the Italian language, the title of which is "Della Specola Aſtronomica," &c. in which work the author has given a very minute account of all the different parts of Ramſden's firſt aſtronomical circle, as made for him, that is capable of taking altitudes and azimuths at the ſame time, and alſo of being uſed as a tranſit inſtrument occaſionally when placed in the meridian. It would render our account of this inſtrument too long, if we were here to make and introduce a tranſlation of Piazzi's deſcription of all the minutiæ of the different parts and ſections at full length; but we ſhould hold ourſelves wanting in reſpect to the memory of an excellent inſtrument maker, if we did not give a deſcription at ſome length of an inſtrument, which though probably not the beſt that has been made, yet was the firſt of ſuch conſiderable extent, and has in its conſtruction an union of various contrivances, many of which were at the time original.

Mr. Piazzi informs us, that Ramſden twice undertook the taſk of conſtructing the aſtronomical circle, and as often abandoned it; but at length in January, in the year 1788, he entered on the buſineſs in earneſt, and completed his labour in Auguſt 1789. The whole inſtrument, which is repreſented in perſpective in *Plate* V. of *Aſtronomical Inſtruments*, may be divided into ſix principal parts, with their appendages; 1. the vertical axis, and azimuth circle; 2. the ſuperior ſupport of the vertical axis; 3. the inferior ſupport of the ſame; 4. the baluſtrade; 5. the achromatic teleſcope, and vertical circle; and 6. the three microſcopes with their micrometers in the foci of their eye-pieces. For the ſake of order we will give an account of the parts nearly in this ſucceſſion accompanied by occaſional remarks.

The vertical axis of Ramſden's circle is compoſed of various parts, which revolve together, and which may be conſidered, when firmly united, as one piece; at the lower end is a cone T inverted, the ſmalleſt diameter of which is five inches, where it is attached to the azimuth or horizontal circle with ten conical radii, and the greateſt diameter is 14.2, where it is fixed to the oblong ſtage of braſs A; which ſtage is further ſtrengthened by gibbet pieces, at the four corners. The azimuth circle is three feet in diameter, divided into 180° twice over, and each of the degrees again into ten ſubdiviſions of 6′ each. The extreme inferior end of the axis, below the azimuth circle, is a ſmall cone of hard ſteel. On the ſtage A are faſtened four ſtrong braſs pillars, each $6\frac{1}{2}$ feet long and $3\frac{1}{2}$ inches in diameter, deſignated by the letters C C C C, and placed near the corners of the ſtage A, which is 25.3 inches by 16.8. Above the ſuperior ends of theſe four pillars, is another ſtage B of ſimilar dimenſions, in the centre of which is a tube ſtanding up, which conſtitutes the upper pivot of the axis: at each ſide of the central tube of this upper ſtage is an opening cut, which nearly divides the ſtage into two, except at the middle and two extreme edges, which edges are made firm by lateral connecting pieces: the uſe of the open parts of the upper ſtage is to admit the object end of the teleſcope to view ſtars near the zenith.

The two large pillars, each 7 feet high, and 4 inches diam. aſcending from marble baſes on the floor of the obſervatory, and terminating with a large arch, which connects their ſuperior ends, conſtitute a part of the ſuperior ſupport of the vertical axis; two ſimilar pillars with a ſimilar arch croſſing the other at right angles are left out of the drawing, but may eaſily be conceived to be ſtanding over the other diagonal of the marble baſe, and fixed in the dark circles which are ſeen at the reſpective corners; at the top of the arches, however, a croſs or piece of four ſtraight bars is ſcrewed to the four portions of the diſcontinued arches, and a hole in the centre of this uppermoſt croſs piece, receives the tubular pivot of the vertical axis. The lower ſupport of the vertical axis conſiſts of three concentric circles of iron, laid one over another on friction rollers; the uppermoſt of which bears the inferior pivot of the axis, and the other two have each an adjuſtable motion, one from eaſt to weſt, and the other from north to ſouth, effected by the univerſal joints, ſeen without the baluſtrade at 90° from each other, which joints have handles at one ſide, and each a horizontal ſcrew at the other, which ſcrews, acting as preſſing ſcrews, move the large iron circles in their reſpective directions, when the axis is to be placed exactly perpendicular to a horizontal line drawn in any azimuth.

A more particular deſcription of theſe concentric iron circles of adjuſtment, for perpendicularity of the vertical axis, would not be intelligible without ſeparate plans, ſuch as are given in Mr. Piazzi's *Plate* II.

M is a mahogany circle placed on the uppermoſt iron circle; its diameter is 3 feet 2 inches, and its thickneſs 3 inches. On this circle of wood is ſurmounted a baluſtrade of metal, R R, compoſed of a ſuperior and inferior large ring, of each 3 feet diameter, connected by 20 cylindrical pillars, each of one inch diameter, and 13 inches high; this baluſtrade defends the azimuth circle, and ſerves to give either a ſlow or quick motion from it to the axis of the inſtrument, by means of the clamping mechaniſm, connected with an univerſal joint, of which the handle Q only is ſeen in the figure, but which may be apprehended from what has been ſaid of this kind of mechaniſm, when we deſcribed Borda's reflecting circle and its clamps with tangent ſcrews. The microſcopic micrometer N, which reads off the graduations of the azimuth circle, is alſo carried between two of the pillars of this baluſtrade, together with the ſubjoined reflector of ſilver for the illumination of the dividing marks of the azimuth circle: the field of view of the compound microſcope contains but a very ſmall ſpace of the image of the divided limb; it was therefore found neceſſary, not only to mark every degree with ten ſucceſſive Arabic numerals, and alſo each tenth ſpace, with larger numerals of the Roman character, but alſo to inſert *points* for diſcriminating the ten ſubdividing lines, thus, $\begin{array}{cccccccccc} \mathrm{I} & \mathrm{I} & \mathrm{I} & \mathrm{I} & \mathrm{I} & \mathrm{I} & . & .. & ... & .... \\ & . & .. & ... & .... & \mathrm{I} & \mathrm{I} & \mathrm{I} & \mathrm{I} & \mathrm{I} \end{array}$, which are counted 0, 1, 2, 3, &c. the diſtance between each of which we have already ſaid is 6′, therefore the correſponding values are 0′, 6′, 12′, 18′, 24′, &c. up to a degree, as read without the aid of the micrometer.

The compound microſcope N has the mechaniſm of the micrometer in the point where the focus of the eye-glaſs, or perhaps we ſhould rather ſay, where the united focus of the glaſſes of the compound eye-piece, meets the image of the ſubdiviſions of the limb, as formed in the tube by the object lens; this mechaniſm is rather complex, and cannot be very clearly apprehended perhaps by a mere verbal deſcription; it conſiſts of two parallel horizontal plates of metal having each an oblong hole along its middle, the upper of braſs, and the lower of ſteel; the braſs one is divided into ten ſpaces of each 1′, counted each way from zero, which is a point in the middle, and is moveable ſeparately by the horizontal ſcrew on the left hand; the ſteel plate carries a croſs hair or wire, and is adjuſtable to the right or left by a ſcrew of 70 threads per inch, which has a nut, as a head, divided into 60 equal parts, one of which parts correſponds to a *ſecond* of a degree; this divided head is placed at the right hand of the microſcope, ſo that one of the two ſcrews cannot be miſtaken for the other, and both may be held at the ſame time, and turned by the ſeparate hands of an obſerver, if neceſſary. To prevent a loſs of motion in the ſcrew of the divided head, or micrometer ſcrew, a ſpring of contrary preſſure is applied in conſtant action, which makes the croſs wire move backwards or forwards, without the loſs of even a *ſecond*, as counted on the divided head.

The microſcope as uſual has two adjuſtments, one for the object lens to make the image fall diſtinctly on the micrometer's thread and ſcale, and another for the eye-piece to render this image clear to the eye; alſo the micrometer has two adjuſtments, one to adjuſt zero of the ſcale, under the eye-piece, to zero of the image of the divided limb; and the other to ſet zero on the divided head to zero on the ſaid ſcale, conſequently to zero alſo on the divided limb: theſe two latter adjuſtments are effected by the different fixing ſcrews, which are inviſible in the figure.

The vertical circle has not its dimenſions given by Piazzi in his account, but we learn from a French notice taken of this inſtrument in another place, that its diameter is five feet, which correſponds to the length of the teleſcope of which Piazzi ſays the focal length of the object glaſs is five feet; the circumſcribing boundary of the circle, correſponding to the felly of a wheel, is formed of two ſeparate rings, united in various equidiſtant points by parallel cylindrical pieces, ſo that the appearance of the compound piece is that of a circular ladder; which form gives ſtrength without great addition to the weight. On the plane of one of theſe rings is firmly fixed, Piazzi ſays ſoldered if we underſtand him rightly, a third circle, which contains the lines of graduation, which lines are faintly ſeen in the figure. The central piece, or nave of the wheel, into which the ſpokes, or radii, are faſt, is a ſegment of a cylinder of caſt braſs, nicely perforated in the middle, and the ſpokes are compoſed of eight metallic cones and the teleſcope, which paſſes through the nave and forms two more. The horizontal axis of this large circle, or wheel, as we have deſcribed it, is formed of a double cone, which is hollow throughout, and has pivots of hard ſteel at the extreme ends; it has four ſupports, from an idea that the weight would be too much for the pivots alone to bear. One of the ſupports is ſeen at D D, which is a kind of frame attached to the perpendicular pillars C C next to the eye; the extreme end of the axis *a*, which is not perforated, bears on a Y formed in the middle of the croſs bar of this frame, which bar has an adjuſtable motion up and down, by means of the ſcrew *p*, with a head divided into 50 parts, each of which parts correſponds to $\frac{1}{100}$ of an inch. Another ſupport, every way ſimilar to D D, is attached to the two upright pillars C C, behind the circle, which therefore cannot be ſeen, but requires no further deſcription. The third and fourth ſupports of the axis are a fifth pillar, the top of which is ſeen through the arch of the frame D D and its bottom near G, and a ſixth pillar, P, oppoſite to the former. Theſe two pillars placed nearer the middle of the ſtage A, than the four corner pillars, C C C C, are each three feet and three inches high, and eleven inches diſtant from each other, meaſured from the interior ſides we preſume; they are made ſteady at their ſuperior ends, each by two croſs-bracing pieces, *t t*, faſtened to the long pillars, C C and C C, reſpectively; one of which pieces *t* only can be ſeen attached to the right hand ſupporting pillar, owing to the poſition of the figure. On the top of pillar P may be ſeen a ſmall frame, carrying a pair of friction rollers; which frame can be lowered or raiſed by a rod paſſing through the pillar down to below the ſtage A, under which is hid from the ſight a ſcrew of adjuſtment for the height of the ſaid rod and frame of friction rollers. The rollers are placed edge to edge in the ſame plane, forming a kind of curved V between them, on which the projecting ring of the conical axis is ſupported. The ſituation of this ring piece, attached to the cone, is at the mean point, between the centre of the circle and the back ſteel pivot, which pivot is inviſible in the figure. Thus one-half, or any ſmaller part of the weight of the circle may be made to bear on this ſupport, by adjuſting the ſcrew of the long rod within the pillar, the nut of which we have ſaid is under the ſtage A. Another ſupport, with a frame of two friction rollers, exactly ſimilar to the one deſcribed, is placed over the correſponding pillar, and under a correſponding annular piece embracing the ſecond cone of the axis at its middle point; but the rod of this pillar, which adjuſts the height and quantum of bearing of this ſecond frame, does not deſcend ſo low as to the ſtage A, but terminates a little below the middle of this pillar, which is cut into two and joined again by a ſmall frame of four little pillars near I, ſo that a hand may be put into the vacant ſpace of the ſmall frame, to adjuſt by a tapped nut acting here, inſtead of being put under the ſtage A; the reaſon of which is not quite evident from the appearance of the figure, nor is it explained in the original account. The end of the axis which is turned from view is perforated, and admits a lens that receives the light of a ſmall lantern H, placed in a line with it, and tranſmits this light, without the entrance of ſmoke or duſt, to a diagonal mirror, that has got a central hole in it, placed at the point of interſection of the teleſcope's line of ſight, and of the central line of the circle's axis: this mirror again reflects the received light towards the eye-piece of the teleſcope, and renders the two adjuſtable hairs, which croſs one another at right angles in the united focus of the eye-glaſſes, diſtinctly viſible to the eye of an obſerver on the darkeſt night. It was found, however, that when much light was admitted into the teleſcope, the ſtars of ſmall magnitude became inviſible; on which account a contrivance was introduced for proportioning the quantity of light, according to circumſtances. This contrivance conſiſts of a parallelopiped compoſed of three pieces of glaſs, the middle one white, and the two extreme ones green, contained in a frame which has an adjuſtable motion by means of pullies, two of which may be ſeen on the inſide of the back pillars, C C, which pullies aſſiſt the adjuſtment during the time of making an obſervation, if neceſſary, and limit the quantity of light, agreeably to the aſcent and deſcent of the parallelopiped interpoſed between the lantern and the end of the axis. The reaſon of the green glaſſes being at both ſides of the white glaſs, is that the refraction of the light may be corrected by the ſecond green glaſs, ſo as to prevent the wires in the focus of the eye-piece from appearing double. In this teleſcope there are ſix eye-pieces, five direct, and one diagonal, or what Piazzi calls priſmatic, becauſe the piece of glaſs that is placed at the elbow of a bent tube, put on as an eye piece, is a priſm bounded by one curved ſide and two rectilinear ones, the latter two of which are placed at an angle of 45°, with reſpect to each other; the curved ſide being that which firſt received the rays of light, and the diagonal one, we preſume, ſilvered. The peculiarity of this priſmatic eye-piece is, that it inverts the object without reverſing it; that is, the poſition is changed with reſpect to top and bottom, but not with reſpect to right and left. The priſmatic eye-piece has two powers; one making the magnifying property of the teleſcope 75, and the other 130. The powers with the five direct eye-pieces, are reſpectively 50, 75, 100, 130, and 170. The principal uſe of the priſmatic powers is to ſearch for ſtars and meaſure altitudes of bodies placed near the zenith; the ſaid eye-piece with its additional tube being horizontal when the teleſcope is in a vertical poſition.

The vertical circle is graduated into 360° and figured into 90° four times over; each ſeparate degree is alſo figured with arabics, and the ſubdiviſions dotted or pointed like the azimuth circle. The obſerved angle is read off by two different microſcopes with micrometers, placed above and below the vertical circle, at the diſtance from each other of a ſemicircle; the frame E of the ſuperior microſcope is attached to the neareſt pillars, C, C, as ſhewn in the figure, juſt under the upper ſtage B, which frame contains ſliding pieces of adjuſtment for ſetting the microſcope in the required poſition with reſpect to the diviſions on the limb of the circle; the adjuſtments both of the microſcope when placed, and alſo of its contained micrometer, are ſimilar to thoſe of the micrometer placed over the azimuth circle already deſcribed. The inferior microſcope F I of the vertical circle is in every reſpect ſimilar to the ſuperior one, the micrometer's divided nut in both being placed to the right. The micrometers of theſe microſcopes, however, have each two horizontal adjuſtments of motion, one parallel to the plane of the vertical circle, and the other perpendicular to that plane, and alſo each a vertical adjuſtment.

Beſides theſe microſcopes for reading off the ſubdiviſions, each frame contains moreover a ſmaller one, which we will call the ſecondary microſcopes, the uſe of which is for viewing a fine plumb-line, ſuſpended by a ſmall cock over the ſuperior frame E, and paſſing down to G through a wooden ſquare pipe, where the plumb may be ſeen immerſed in the ſmall veſſel G full of water, above a ſmall ſtage *u*, in order to keep the line from oſcillating. This veſſel G may be raiſed or lowered by the ſcrew that ſupports it. The ſecondary microſcopes have each the ſame adjuſtments as the above-mentioned microſcopes; and the plumb-line has alſo its point of ſuſpenſion ſo adjuſtable, that it can be brought into the foci of the upper and lower eye-pieces ſo as to biſect the fields of view, when the microſcopes are both properly adjuſted.

The plumb-line ſerves two ſeparate, and both very important purpoſes; its peculiar application to both which was another of Ramſden's happy thoughts; firſt, it not only ſerves to ſet the vertical axis perpendicular in one poſition, but by being carried round in azimuth with the axis and all the other appendages, ſerves to ſhew if the perpendicular direction of the ſaid axis is preſerved with reſpect to all the points of eaſt, weſt, north, and ſouth, and if any deviation is detected by the thread being at one ſide of the original ſituation, then one of the adjuſtments of the iron circles, under the inferior pivot of the axis, as effected by the handle of the compound-joint under the mahogany ring M, muſt be made to verify the poſition; and, ſecondly, the horizontal axis of the vertical circle is made perfectly level by the ſame plumb-line; this is effected by an additional apparatus, in a very ingenious, as well as very accurate manner, which may be thus explained without a figure: ſuppoſe a bar of metal to be made of ſuch a length as, when uſed as a horizontal meaſure, would juſt reach from the divided face of the vertical circle to a point directly oppoſite it in one of the pillars as the upper end; and ſuppoſe again this meaſuring bar to be applied below to a point at the lower part of the ſaid pillar, to try if in this ſituation it will alſo juſt touch the graduated face of the ſame circle; then, if the diſtance is found to be preciſely the ſame in both caſes, the concluſion would be from ſuch a rough meaſure, that the pillar and the plane of the vertical circle are parallel, or very nearly parallel, to each other; now, as the circle was originally made by being turned on its own pivots in a large frame, its axis is neceſſarily at right angles to its plane, and conſequently alſo to the ſurface of the pillar; hence, if the pillar were perfectly perpendicular, the axis, on a ſuppoſition that the meaſures were accurately taken, would be perfectly horizontal. But we know that a plumb-line is perpendicular whenever it is at reſt, therefore any contrivance that will meaſure very minutely the diſtance from the plumb-line to the plane of the circle, both above and below, will determine whether or not the axis is horizontal; this contrivance is what we have to deſcribe: conceive the ſaid bar of meaſurement to terminate at one end after the manner of a two-pronged fork, and ſuppoſe one half of a compound-microſcope, *viz.* the object, object lens, and body of the inſtrument, to be carried by one prong of the fork, and the eye-glaſs in a ſeparate tube, borne by the other prong; and it is eaſy to apprehend, that the image of any ſmall object, whatever it may be, may, by the adjuſtment of the object lens, be made to fall in the open ſpace between the prongs, which image may again be rendered diſtinct to the eye by the focal adjuſtment of the eye-glaſs; we have now got a meaſuring-bar with a compound microſcope carried by it, in two ſeparate halves, ſo that any ſubſtance, that will paſs between the prongs of its forked end, may be brought into the field of view, and be ſeen magnified by the eye-glaſs, uſed on the principle of a ſimple microſcope: let the thread of the plumb-line be this interpoſed body, which, indeed, will cover only a ſmall portion of the field of view; but as the plumb-line is not to be moved, except by the ſcrew at the point of ſuſpenſion, nor even touched by any external object, the microſcope muſt neceſſarily be brought to it, and placed in ſuch a manner, that the thread will biſect the field of view; this is done by fitting the forked end of the meaſuring bar into the upper frame E firſt, in ſuch a way, that it may be made to ſlide in and out any number of times to the ſame ſituation; then the adjuſtments of the frame, or of the cock of ſuſpenſion will bring the thread into the field of view; let now the object be a round dot on a ſlip of ivory, or mother-of-pearl would be better perhaps, and its image may be ſo adjuſted that the plumb-line will biſect it in its magnified ſtate. This ingenious contrivance of producing an image in the open air has been denominated *Ramſden's ghoſt* by ſucceeding inſtrument-makers from the name of its inventor. Let now the meaſuring bar, which we will ſuppoſe to be too ſhort, be laid, and ſupported horizontally in a direction juſt perpendicular to the plane of the circle, and let there be a thick pin ſcrewed into its end next the circle, which, by being unſcrewed, will approach the plane of the circle till it juſt touches it as the circle revolves, then the diſtance from the extreme end of this pin to the plumb-line is exactly gauged; it is of no importance what may be the total length of this gauge, provided it be kept unaltered; remove, in the next place, the meaſuring rod and its apparatus at each end in ſtatu quo, to a ſimilar fitting made for it in the inferior frame I F, and if, when the plumb-line biſects the image of the dot here as before above, which the adjuſtments of the frame only muſt now effect, the pin at the oppoſite end turns out to touch the plane of the circle below at the ſame right angle that it did above, then the plane is perpendicular, and the axis neceſſarily horizontal; but if there is any deviation, the adjuſting ſcrew *p* on the bearing frame D D muſt rectify one-half of this deviation, and the pin which ſcrews into the meaſuring bar the other half; after a few trials above and below the horizontal poſition may be given to the axis in queſtion to the exactitude of a *ſingle ſecond;* for we have ſaid, that a microſcope may be depended on to that degree of accuracy in reading off a micrometer's ſcale. When the vertical circle is truly fixed, a ſecond meaſuring bar may be added at the lower frame while the firſt remains at the upper one, and then turning the circle round on its axis would ſhow both above and below when any alteration takes place in the true poſition from whatever cauſe. But inſtead of uſing the plane of the circle itſelf, Ramſden judged it better to fix a little bridge, *x y*, over the object-glaſs of the teleſcope with a prominence *h*, which he made to come in contact with the pins of the meaſuring rod above and below ſucceſſively, by which means the contact is more nicely obſerved, and the method equally accurate. Whenever the line of collimation of the teleſcope is thus adjuſted, it will be certain to deſcribe a ſemi-circle in the heavens, when turned half round, which ſhall be truly perpendicular to the horizon, whether that ſemi-circle be in the meridian or in any given azimuth. Whenever Piazzi rectified the ſuperior and inferior micrometers and plumb-line, he took care to uſe the zeros of the vertical circle as the points that biſected the circle beſt into two equal ſemi-circles; and he gives as a reaſon, that he found theſe did not deviate more than a quarter of a ſecond from their true places. When the vertical circle is uſed in taking altitudes, it may be clamped by a piece *k*, on the pillar P, which, when looſe, will allow a quick motion, but when faſt will only permit a very ſlow one by means of the handle V of the compound-joint, which, like that at Q, is connected with the tangent-ſcrew out of ſight. Theſe, we believe, are all the eſſential parts of the grand inſtrument before us, which we have thought it better to deſcribe in our own manner, than to make a ſervile tranſlation of the original, which muſt have been, as we have ſaid, not only too long, but imperfect without at leaſt three additional plates on a reduced ſcale.

It remains now, that we point out the advantages and diſadvantages peculiar to the conſtruction of the aſtronomical circle of Ramſden above deſcribed. Piazzi has enumerated eight advantages that his inſtrument poſſeſſes, as compared with a mural quadrant; which advantages may be claſſed thus: *viz.*

1. The graduated circles are not encumbered with verniers, ſo as to have its diviſions defaced, or its ſteadineſs moleſted.

2. The ſubdiviſions are read by microſcopes which magnify nine times, ſo that the leaſt quantity may be eſtimated.

3. The vertical circle has its plane made by revolving on its own axis, and alſo its circular lines ſtruck therefrom; conſequently both a deviation of the plane and eccentricity of the divided circles are avoided.

4. The compound circle preſerves its figure much better than it would have done if it had been caſt in one ſolid piece.

5. The obſervations may be reverſed with reſpect to both altitudes and azimuths; therefore a mean of two reverſed obſervations of an altitude will correct the ſimple errors of diviſion, and alſo the error of the croſs-hair or wire of the teleſcope, which, in one caſe, will be +, and in the other —.

6. The inſtrument may be placed in the meridian, and be uſed conveniently as a ſimple tranſit-inſtrument, when clamped to the baluſtrade.

7. It gives altitudes and azimuths at the ſame time; and therefore is particularly uſeful in ſingle obſervations of a comet, or other temporary phenomenon.

8. The refraction of the atmoſphere, correſponding to a given temperature, may be determined by calculation from an obſerved altitude and azimuth, taken at any hour, of any ſtar of a given declination.

We wiſh it had been in our power to have concluded this account by ſaying that we ſee no diſadvantage attending the conſtruction of the inſtrument before us, as it is a fabric of great ingenuity and labour; but a regard for the duty of juſtice, which we feel incumbent on us, obliges us to ſay, that one great objection to the conſtruction before us ſtruck us very forcibly at the firſt ſight of the inſtrument, which has been confirmed by profeſſor Piazzi's own candid account of its uſes: the objection, we allude to, is that which ariſes out of the manner in which the upper end of the vertical axis is ſupported; the pillars and ſurrounding arches of metal can ſeldom, if ever, be all kept at the ſame degree of temperature in ſo large an inſtrument, in any ſituation where it can be placed to be permanently uſeful in taking obſervations; conſequently, we were, in the firſt inſtance, led to fear, that the unequal expanſion of the warm and cold parts of the ſaid bearing-pieces would throw the vertical axis frequently out of its true perpendicular ſituation; accordingly we find, from the proprietor's own candid confeſſion, that obſervations of the ſun cannot be relied on, and that, even in obſervations of the ſtars, a new rectification uſually becomes neceſſary every hour that elapſes from the laſt rectification: when the ſun ſhines, there is alſo a difference in the two ſemi-circles of the vertical circle of 10″ or 12″ occaſioned by unequal expanſion: and the variation in perpendicularity is ſtated to amount to 4″ or even 5″ in the direction of a line from Eaſt to Weſt, in a ſingle hour; but in a direction at right angles to this line the error of deviation will not uſually be more than 2″. The greateſt error in ſimple graduations of the vertical circle does not exceed 3″; but in the azimuth circle there is an error of + 6″ in each of two quadrants, and a correſponding error of — 6″ in each of the other two, as determined by reverſed horizontal obſervations. Theſe laſt, however, are minor errors, compared with the liability of the vertical axis, to have frequent and conſiderable deviations from a true vertical poſition; which deviation muſt not only be very troubleſome to rectify every hour, but muſt ſometimes render an obſervation doubtful notwithſtanding every precaution.

Profeſſor Vince of Cambridge has given a ſketch and brief account of the principles of this inſtrument in his "Practical Aſtronomy," but has not given a detail of the parts of the inſtrument as it was actually conſtructed; he has alſo given a ſimilar deſcription of the principles of Ramſden's large inſtrument for meaſuring horizontal angles in the ſame work, which we propoſe to introduce under our article THEODOLITE, of which it may be conſidered as an improvement; and, in the mean time, thoſe readers, who wiſh to ſee an earlier account of it in detail, are reſpectfully referred to general Roy's account contained in vol. lxxx. p. 145, of the "Philoſophical Tranſactions of London," and alſo to the account of the "Trigonometrical Survey," publiſhed in 1799, by captain William Mudge, and Mr.

Iſaac Dalby; in the latter of which publications all the neceſſary information may be obtained.

Repeating Circle *of Chevalier de Borda, without Reflection.*

The happy idea of meaſuring the angle which two terreſtrial objects form, by repeating ſucceſſively the obſervations on all the parts of the circumference of a circle, we have already ſaid, is due to the celebrated Tobias Mayer; but there remained to contrive, conformably to this idea, an inſtrument calculated for geometrical operations, and which, if poſſible, might equally ſerve for aſtronomical obſervations. This was done about the year 1789, by chevalier de Borda, to whom geometry and navigation, as well as aſtronomy, owe many obligations. The circle of Borda has been executed chiefly by Lenoir, of Paris, and is uſually 19 inches in diameter; it is divided into 400 parts, according to the ſyſtem of diviſion adopted by the Academy of Sciences, on the 27th of February, 1793, and which has already been employed in the inſtruments of the ſame kind, which Mechain and Delambre uſed in 1792, and the following years, for meaſuring the arch of the terreſtrial meridian from Dunkirk to Barcelona. The axis of this circle which is fixed in the centre, and turned with the limb, carries two moveable teleſcopes, B, D, (*Plate* VI.) the one before and the other behind, which turn freely and independently of each other, quite round the circumference, on the axis of the circle itſelf, and which ſlide over its anterior and poſterior limbs. This axis is 10 inches long; it goes through a hollow cylinder A, which is fixed on the ſtand E F of the inſtrument: beyond this cylinder the axis bears a circular piece G of $5\frac{1}{4}$ inches diameter, indented all round to be moved by an endleſs ſcrew H, connected with the cylinder or ſocket on the ſtand; and which may be detached or made to act at pleaſure, in order that the whole inſtrument may be made to turn with a rapid motion, or move ſlowly by means of the ſcrew. Borda wiſhed to render this motion ſtill more gentle, by having the head of the endleſs ſcrew moved by another ſcrew.

The hollow cylinder A, which receives the axis of the circle, carries a weight K, $5\frac{1}{4}$ inches diameter, and $1\frac{1}{2}$ inch in thickneſs, to counterpoiſe the circle, in order that it may be placed ſteadily in an inclined poſition. It is this cylindrical piece which bears the ſcrew that catches the indented circle connected with the axis.

The front teleſcope B carries a croſs index piece which has four verniers, L, M, N, O, by means of which the diviſions are read in four points of the circumference; whereby Borda has done away the errors that reſult from the eccentricity of the inſtrument, and alſo thoſe of ſimple diviſion are diminiſhed. The back teleſcope D carries a level filled with pure ether and an air bubble; this level ſerves to place the circle in the ſame ſituation with regard to the zenith and horizon, whether the limb be eaſtward or weſtward; it is ſo ſenſible that the motion of one line ($\frac{1}{12}$ of a French inch) in the bubble makes only $7''\frac{1}{2}$ inclination, ſo that its ſituation may be aſcertained within 2 ſeconds. This back teleſcope alſo ſerves to take angles horizontally, by pointing it againſt one of the two terreſtrial objects, the diſtance of which is to be meaſured. The teleſcopes are 27 inches long, with an aperture of 23 (French) lines; they are achromatic made by Lerebours.

Each of the four verniers carries a magnifying glaſs to look at the diviſions, and a tangent ſcrew R to effect an exact contact; two of which verniers have beſides a clamping ſcrew each to fix the index to the limb, and an adjuſtment to bring the ſtar or other object to the thread of the teleſcope by a ſlow motion. The teleſcope that carries the level has alſo a lamp and an adjuſtment S to give it a ſlow motion, and to bring the bubble to the middle of its tube; an ivory ſcale divided along the bubble ſerves to bring it back to the ſame point. The reticule, a kind of micrometer in the eye-piece of the teleſcope, is inclined 45°, becauſe, in order to take angles on the ground, it is convenient to place the object within the angle of the two threads. Each teleſcope's reticule has a motion by means of a ſcrew, to make the line of collimation parallel to the plane of the inſtrument, which is done by the help of a proof teleſcope. The circle carries, moreover, a ſix-inch axis, parallel to its plane, at a diſtance of $3\frac{1}{2}$ inches, which axis is fixed acroſs the cylinder A, at right angles; laſtly, it carries a quadrant V, to ſtop it at any elevation, which quadrant turns within a frame E of ſix inches opening, into which the counterpoiſe K may paſs when the plane of the circle is placed horizontally. Parallel to the hollow cylinder A is a tranſverſe level X, five inches long, which ſerves to adjuſt the ſtand F and the limb of the circle to be exactly vertical. The frame E over the ſtand is at the top of a hollow vertical cylinder F, which is moveable round a vertical ſteel rod placed faſt within it, and exactly turned to the length of 18 inches. At the bottom of the hollow cylinder is an azimuth or horizontal circle Y, 10 inches diameter, divided into half degrees, with a vernier which gives the minutes. This circle is indented, and the vertical rod Z, which is within reach of the hand of the obſerver, terminates with a pinion *e* which catches the circumference, and makes it turn, moving at the ſame time the hollow cylinder that ſurrounds the axis, and ſupports the frame E, on which the circle is fixed. The three feet bear on bridges which are contrived to make the motion of the ſcrews inſenſible on the axis. The ſcrew *a* raiſes a bridge *a b*, that has its bearing point at *c*; but the ſcrew of the foot bears on *d*, and by turning the ſcrew *a*, the foot is made to move on the point *d*, which, being nearer to the bearing point *c* than the extremity *b* of the lever, receives and communicates to the circle a motion leſs than that of the ſcrew *a* and the bridge *a b*. By theſe ſmall triangles, Borda has hit upon the means of avoiding the jerks which are often produced in an inſtrument by turning the ſcrew of the ſtand.

In uſing this circle for aſtronomical obſervations, the axis of the inſtrument muſt firſt be placed in a poſition nearly horizontal, by means of the ſmall quadrant V, that ſerves to incline the plane of the circle; then by uſing the ſcrews of the ſtand, ſuch a ſituation may be given to the inſtrument, that, when it makes a whole revolution round the vertical axis, the bubble of the level P will continue nearly in the middle of its tube. This precaution is very important, for it was found that 15 minutes of inclination in the plane would produce an error of two ſeconds on the inferior altitude of the pole ſtar; and that 33′ in the inclination would produce 10″; when the caſe happened, it was with ſome difficulty, that the cauſe of this diſcordance was found out. This level muſt alſo be verified by the addition of a plumb-line ſuſpended over the limb. The obſervations are always made by pairs, the one on the right of the inſtrument, and the other on the left; we ſhall therefore deſcribe them by pairs of obſervations.

Firſt obſervation of the pair.—Bring the vernier of the teleſcope B to zero of the limb and fix it faſt with the clamp; then move the whole circle by diſengaging it from the endleſs ſcrew, until the teleſcope points nearly to the ſtar obſerved; then the ſcrew H being made to catch the teeth, either this ſcrew or that of the ſtand of the inſtrument muſt be uſed to keep the thread of the teleſcope conſtantly on the ſtar obſerved; in the mean time the teleſcope D of the level behind the inſtrument is brought back to a horizontal poſition,

ſition, until the bubble be in the middle of the tube, which is done by uſing the adjuſtment ſcrew of the teleſcope; the level X is next brought back to the poſition it ought to have by means of the ſcrews of the ſtand of the inſtrument; and, laſtly, when the two levels, that of the teleſcope and that of the axis, are rightly placed, and the teleſcope is at the ſame time directed to the ſtar, the firſt obſervation is gone through.

Second obſervation.—To complete the ſecond obſervation of this pair, the inſtrument muſt be made firſt to revolve quite round its vertical axis, and the teleſcope being brought back on the ſtar, muſt be fixed by means of its fixing ſcrew, then the adjuſtment ſcrew muſt be uſed to keep it conſtantly directed to the ſtar; in the mean time the inſtrument is levelled, either with the ſcrews of the ſtand, or with the ſcrew H, to give the two levels the ſame poſition as they had before the firſt obſervation; but it is to be obſerved, that it is not neceſſary to uſe the ſame ſcrupulouſneſs for the ſmall level X, unleſs obſervations are made near to the zenith, for at a diſtance of 43° from the zenith, an error of 7 or 8 minutes in the poſition of the bubble produces only half a ſecond in the meaſured angle; but the level of the teleſcope muſt be placed as exactly as poſſible in the ſame poſition as it had originally, which will be eaſily obtained by means of the bridge *a b*; this level being thus exactly adjuſted, and its teleſcope being properly directed on the ſtar, the ſecond obſervation of the pair is gone through, and in this ſituation the vernier of the teleſcope will mark a quantity juſt double the angle required to be meaſured.

Firſt obſervation of the *ſecond* pair.—If a ſtill greater preciſion is wanted, a ſecond pair of obſervations are thus uſed; the inſtrument is brought back to its former ſituation, and the limb to the weſt; the endleſs ſcrew is detached; the whole circle is turned, and the teleſcope is again directed to the ſtar. The level is then made to turn, and the bubble brought to the middle with the adjuſtment ſcrew of the level alone, without touching the circle.

Second obſervation of the *ſecond* pair.—The circle being turned back again from weſt to eaſt, as in the ſecond obſervation of the firſt pair, the level muſt be adjuſted, and the bubble brought again to the middle by the motion of one of the feet ſcrews, or by the endleſs ſcrew H; after which the teleſcope is brought again to the ſtar, by making it paſs through double the zenith diſtance, as in the ſecond obſervation of the firſt pair; in this ſituation the vernier ſhews four times the diſtance, ſeeing that it began ſecondly at that point of the limb where the index was after the firſt pair of obſervations, in like manner as it began from zero in the firſt inſtance.

After the firſt pair of obſervations, which have given double the true zenith diſtance, are completed, the level muſt always be placed again preciſely as it was at firſt, which attention is very important when the obſervation is to be connected by a continued multiplication; for if the level ſhould be put 2″ differently, a diſtance from the zenith will be found, that being doubled, will make this ſimple error amount to 4″ more or leſs than it ought to do, ſo that the exactneſs ariſing out of the multiplication of the angle, which is the great advantage of the circle, will be counteracted.

A third pair of obſervations may be thus made, and ſix times the angle obtained, and ſo on for any number of pairs.

By this method of obſerving the angle, the error ariſing from the diviſions will continually decreaſe, and it may be conſidered as nearly annihilated after a certain number of obſervations. Six obſervations on the ſtars that revolve the moſt rapidly, may be made before they come to the meridian to the ſouth, and ſix after; and as the error in each is not 10″, the reſult may be depended upon to 1″ nearly. An expert obſerver will only want one minute and a quarter for each obſervation, ſuppoſing one perſon to be at hand to place the level, and another to note the ſecond. With the pole ſtar 48 obſervations may be made in one hour, and in one revolution the meridian altitude of this ſtar may be obtained within the accuracy of half a ſecond. For this purpoſe it is neceſſary, every time that the ſtar has been brought to the thread, to count the minute and ſeconds, to obtain its diſtance from the meridian, in order to get an account of the reduction; but it is not neceſſary to apply each reduction to the zenith diſtance which has been obſerved; it is even uſeleſs to note this diſtance, the laſt, that is, the ſum of all the preceding ones, is ſufficient.

To render this operation more intelligible, let us conſider the two firſt obſervations on the ſtar made in the two ſituations of the circle; they would give double the zenith diſtance if the ſtar had not changed; but let us ſuppoſe that one minute has elapſed between the two obſervations, and that the ſtar has aſcended 10″ during that minute; inſtead of double the zenith diſtance that would be obtained if the ſtar had not changed, we have the ſum of two diſtances, the ſecond of which is ſmaller than the firſt by 10″, if they were calculated ſeparately; the ſum found ſhould be divided into two parts, the one of which would exceed the other by 10″, and the two zenith diſtances for the two moments of obſervation would be obtained; it would beſides be eaſy to refer them immediately to the meridian.

For inſtance, let us ſuppoſe that at the moment of the firſt obſervation, we find, either by calculation, or by a table ſuch as Borda's, that the ſtar was 50″ lower than in the meridian, and in the ſecond obſervation only 40″, the ſtar having aſcended 10″ in the interval; 90″ ſhould be added to the obſerved ſum of the two zenith diſtances, this ſum ſhould be divided into two equal parts, and double the zenith diſtance in the meridian itſelf would be had; for we had two parts, the one of which was 10″ greater than the other; but 40″ were to be added to the former, and 50″ to the latter, to make them equal, hence 90″ have been added to their ſum, therefore they are equal, and half their ſum gives the diſtance ſought for, that is to ſay, the zenith diſtance in the meridian; but it is more eaſy to pay no regard to this change of altitude till after ten obſervations, or even more, are finiſhed.

When we have ten obſervations, and we take the tenth part of the amount of the degrees, we have the diſtance from the zenith, but this total is too conſiderable by ten reductions to the meridian, ſince this zenith diſtance, which is not taken in the meridian itſelf, is too conſiderable; we muſt then calculate each of thoſe reductions, and take the tenth part of their ſum, to be ſubtracted from the tenth part of the obſerved degrees, which is the ſame as if we had ſubtracted from each of the zenith diſtances the reduction belonging to itſelf.

When we take another ſeries of ten ſubſequent obſervations, we find nearly the ſame ſum; they only differ becauſe the ſum of the reductions is not the ſame as in the firſt ſet of ten.

In order to calculate the reduction of the different obſervations to the meridian, when this ſyſtem of repeating is uſed, general tables, ſuch as are contained in Caſſini's book, will be found uſeful; where an example of thoſe calculations is given at full length: there is alſo in the French "Connoiſſance des Tems," a table of reduction for the pole ſtar in particular, which is carried to 45′ from the meridian, calculated by C. Borda, the inventor of the inſtrument we have been deſcribing.

The repeating CIRCLE *without reflection, as made by Troughton.*

Plate VII. exhibits the repeating circle for meaſuring celeſtial and terreſtrial angles, as it has been conſtructed in London, on a ſcale of magnitude where the vertical circle is of 18 inches diameter: the conſtruction differs in many reſpects from that of the inſtrument made in France, from the directions of Borda, and as we conceive it may be conſidered as an improved inſtrument, we think it will be rendering aſtronomers and ſurveyors an acceptable ſervice to deſcribe it in this place, by way of contraſt with the preceding one.

Fig. 1 repreſents a general view of this inſtrument, and *fig.* 2 has the circle, index, teleſcopes, level, &c. detached, in order to ſhew more diſtinctly ſome of the ſmaller parts. The great letters refer to the general view, the ſmall ones to the partial one.

The circle, A A A, conſiſts of eight conical tubes joined to an octagonal centre piece at one end, and the ſtrong circular border at the other: this circular limb is ſtrengthened by another in the form of a hoop, which forms an edge bar thereto. The circle is divided into degrees and every 10′. The index B has the uſual contrivance for faſt and ſlow motion, and conſiſts of four branches, each of which is furniſhed with a vernier that ſubdivides the limb to 10″. C is the front teleſcope, 25 inches long, placed at half right angles with the branches of the index, to which it is faſtened near the centre; but in order that it ſhould obey the motion of the axis alone, it has no connection whatever with the limb. The axis of this index and teleſcope occupies the whole length from *a* to *a*. On the back of the circle is another index D, the ſingle branch of which carries the apparatus for faſt and ſlow motion, and clamps to the edge bar portion of the limb, to which it is contiguous. The back teleſcope E, ſimilar in every reſpect to the other, is fixed near the centre to this index, and as near as poſſible to the axis, and below it: the ſpirit level F is alſo faſtened to the ſame index above the axis, where it forms a counterpoiſe to the teleſcope; they all revolve together round the axis of the circle on a ſocket, with a length of bearing equal to *b b*. The general motion, where the circle, indices, teleſcopes, and level, all turn round together, is formed at the poſterior part of the axis of the circle, which fits the ſocket that croſſes the horizontal axis *c*, in a bearing reaching from *c* to *d*; *e* is the flaunch of the axis on which the front teleſcope turns; *f* is that by which the circle is fixed to its hollow axis; the part *g* paſſes through the octagonal centre piece, and *h* is the flaunch of the back index. G is the counterpoiſe fixed upon the ſocket of the general motion, whereby the whole is balanced on the horizontal axis. A clamp *i* in three pieces, jointed like a watch chain, embraces a collar on the hollow axis of the circle, and is acted on by the ſcrew *j*, by which the general motion may be clamped at pleaſure. To the upper part of the clamp is fixed a cock *k*, and to the upper part of the horizontal axis is fixed a cock *l*; theſe two cocks are connected by a ſcrew *m*, which, when *j* is clamped, gives ſlow motion to the circle, teleſcopes, &c. but when *j* is looſe, allows a free motion.

Two microſcopes appear, in the general view, looking at two oppoſite verniers of the index; by an eaſy motion round the centre, theſe may be turned to read off alſo at the other two verniers. By the ſemi-circle *n n n*, which is faſt to the horizontal axis *o o*, the circle may be made faſt in any poſition reſpecting its motion round this axis; this is done by a clamp at the lower end of one of the ſupporters, oppoſite to its fellow ſupporter H; on this ſemi-circle are three diviſions, which correctly mark its two quadrants; the circle being brought into the horizontal poſition by means of a nice ſpirit level applied to its ſurface, and an index adjuſted to the middle line, the extreme lines will ſhew when the plane is vertical on either ſide the pillar.

The azimuth motion of this inſtrument is formed by the pillar turning round a ſtrong ſteel axis, which is fixed in the tripod, and reaches up to the top. The circle is 12 inches diameter, turns with the pillar, and is divided like the other circle; three verniers, which ſubdivide it to 10″, are fixed to the tripod, which, with many other parts, are too plainly exhibited in the figure to need a particular account in words.

With Borda's repeating circle without reflection, as formerly conſtructed, it was nearly impoſſible to obſerve bright ſtars and planets by day, and ſmall ſtars alſo, becauſe not eaſily diſtinguiſhed one from another in the night time. To remedy this, Mr. Behrnauer of Budiſſin, an ingenious amateur of aſtronomy, propoſed to Troughton, a few years ſince, an apparatus for ſtopping the teleſcope and level at their relative poſitions, ſimilar, in ſome reſpects, to what he had before ſucceſsfully applied for ſtopping the indices of Borda's reflecting circle. The apparatus conſiſts of a divided ſemi-circle, attached to the back index, having two ſliding ſtops, which, being ſet to the proper zenith diſtance of an object to be obſerved, will be touched alternately in the reverſe poſitions by a pointer annexed to the front teleſcope. In the figure this ſemi-circle is ſeen at I, near which letter, one of the ſtopping ſliders reſts at about 30° of zenith diſtance; the pointer J is in contact with the other ſlider. This having fully anſwered the purpoſe, Troughton thought it would be almoſt equally deſirable that the azimuth motion ſhould have its ſtops alſo. For this end a ſmall cylinder, with an obtuſe point, is incloſed in a tube, which, puſhed forwards by a ſpiral ſpring, enters alternately a couple of holes made oppoſite to each other in the edge of the azimuth circle, at 360° and 180°, and thereby produces a ſtop, which may be felt when the face of the vertical circle is eaſt or weſt, but withdraws from the holes with a ſmall force, and allows the inſtrument to turn. By theſe ſimple contrivances, the object to be obſerved will always be found in the field of view, without the trouble of having recourſe to the diviſions.

This may be regarded as a conſiderable improvement, not only becauſe the bright ſtars may be obſerved by day, and faint ones by night, but alſo becauſe the buſineſs of repeating or multiplying the angle will be facilitated thereby; and conſequently the aſtronomer enabled to make a ſufficient number of obſervations proportionally nearer the meridian.

Laſtly, it may be remarked that in England there exiſts an ungenerous prejudice againſt this inſtrument; while on the neighbouring continent, perhaps, its value may be too much extolled. It is certain, however, that while the trigonometrical operations, between Paris and Dunkirk, for aſcertaining the diſtance between the national obſervatories of England and France, or the more recent and extenſive meaſurements of the ſame nature in the ſouth of France and in Spain ſhall remain upon record, the repeating land circle of Borda will be eſtimated among the very firſt inſtruments, for the general purpoſes of aſtronomy and topography, with every one who is in the leaſt acquainted with theſe ſubjects; to which we may add, as our concluding remark, that the alterations and additions made in this inſtrument by Troughton have greatly contributed to its improvement, whether we regard the accuracy or facility of its operations.

CIRCLE, *by the Rev. Francis Wollaſton, LL.B. and F.R.S.*

In a paper read before the Royal Society of London

don on May 9, 1793, and publiſhed in the "Philoſophical Tranſactions," Dr. Wollaſton has given an account of a *tranſit circle*, which he contrived, by the aſſiſtance of Mr. Ramſden and Mr. John Smeaton, and which was made by Mr. W. Cary of the Strand, after Mr. Ramſden and Mr. Edward Troughton had declined undertaking the conſtruction under the doctor's ſuperintendance. The undertaking originated from an impreſſion, that an inſtrument, which would at the ſame time determine with preciſion both the right aſcenſion and declination of a heavenly object was, notwithſtanding Ramſden's aſtronomical circle, a deſideratum in aſtronomy, and though the doctor at firſt intended only to ſuggeſt to ſome one of the beſt inſtrument-makers the notion he had entertained of an inſtrument of extenſive application in aſcertaining the relative ſituations of the heavenly bodies, yet, on finding that his plan was not likely to be readily adopted, he ſet about the buſineſs at his own expence, and, fortunately, met with a maker whoſe merit did ample juſtice to the deſign, notwithſtanding the obſtacles that occurred to impede his progreſs in the different ſtages of an original conſtruction. It will not be neceſſary for us to accompany the doctor through all his narrative of diſappointments and reaſonings contained in his paper, but to ſelect thoſe portions principally that relate to the deſcription of his inſtrument; which office we propoſe to do in his own words, as nearly as our mode of arrangement will admit.

"The drawing accompanying this account (in *Plate* VIII. of *Aſtronomical Inſtruments*), will ſhew the general form of the inſtrument; and needs very little explanation. The whole ſtands on three feet, adjuſtable by ſcrews, on a cylinder of one folid ſtone of $25\frac{1}{2}$ inches diameter and three feet ſix inches long, bedded on a pier of brick, well bonded together, and riſing from a good foundation, deep in the earth. The bottom plate, of $21\frac{3}{4}$ inches diameter, turns in azimuth, not on a long axis, but on a centre; and rides on a bell-metal circle, truly turned, and to which the bottom plate itſelf is ground. In this way it moves very ſmooth by hand; but it is capable of being turned by a winch, with tooth and pinion. The intent of its turning thus is merely for the convenience of reverſing the inſtrument: for, though it might be uſed out of the meridian, and for azimuths, yet, ſince it is deſigned principally for meridian paſſages, when it is in its place the whole is clamped firmly to the bottom frame by four clamps, which confine it to the circle on which it rides: and this method of turning proves itſelf to be ſteady, by the levels on the bottom plate never altering in the leaſt upon ſcrewing the clamps.

"The four pillars, and their braces, explain themſelves. They ſtand over the bell-metal circle; and the clamps are placed near the foot of each for greater ſteadineſs; ſince they carry the Ys for the pivot of the tranſit.

"The conſtruction of theſe Ys is peculiar: they hang, as it were, in gimmals, or gimbols, though of a very firm kind, and have a horizontal motion, ſmooth and ſteady: the T, or frame which carries them, turning on a perpendicular axis of $2\frac{1}{2}$ inches ground to its ſocket, on the outſide of the plate which connects them with the pillars, and reſting on that plate to which the bottom of the frame itſelf is ground likewiſe. In this frame they have a vertical motion: the Ys themſelves carrying a horizontal axis, which, conſiſting of two fruſta of cones on each ſide, in contrary directions, with a collar over them, guards againſt any ſhake whatſoever, while it admits of the Y adapting itſelf to the direction of the pivot. The idea of hanging them in this way, as well as that of turning the whole inſtrument in azimuth on a ground plate, was ſuggeſted by Mr. John Smeaton; to whom the world has been indebted for repeated capital improvements in mechanics.

"By thus hanging the Ys, the pivots have a bearing on them from end to end; inſtead of riding on a bell-metal ridge, as is the uſual method where the Ys are fixed, and cannot ſet themſelves in the direction of the axis. This ſeems to be a better bearing, and much leſs likely to wear the pivots.

"Yet, to guard againſt any wear, a pair of cylindrical ſprings, included in a tube, are applied through rings within the connecting plate above mentioned. Theſe carry, each of them, a pair of rollers, on which a braſs collar on each end of the axis of the teleſcope rides. The ſprings may be uſed or removed at pleaſure; and they can be ſtrengthened or weakened, by means of a ſcrew at the bottom of the tube, ſo as to take off from the pivots any part of the weight that may be judged beſt: and, ſince they are in a line with the axis, and are made capable of obeying it in every direction, there is no danger of their deranging its adjuſtments, while they render its motion exceedingly light and ſmooth indeed.

"The adjuſtments of the Ys are both of them at the ſame end of the axis, oppoſite to the divided circle and the microſcopes; becauſe the ſmalleſt adjuſtment of that end of the axis between the microſcopes would have affected them ſo as to require an entire re-adjuſtment of them too. At the farther end the axis is perforated, to admit light for illuminating the wires. The axis itſelf is 18 inches long, excluſive of the pivots, which are about $1\frac{1}{4}$ each.

"The microſcopes need no deſcription. They are on the ſame principle as thoſe in Ramſden's inſtrument, which are more fully deſcribed by major-general Roy, (Phil. Tranſ. vol. lxxx. p. 145.) and in captain Mudge's account of the "Trigonometrical Survey," vol. i. Lond. 1799. Mine are 9 inches long; the object-end at 2 inches from the limb of the circle. They magnify 24 times. One revolution of the micrometer-ſcrew is equal to one minute; and the head is divided to ſeconds.

"The fixed, or ſtationary wire in them, is at the firſt notch, or minute itſelf; and it is adjuſted by means of a plumb-line, which hangs from the top plate, and paſſes by the ſide of the axis; at about 8 degrees, from the centre. For this purpoſe, there are dots made on the limb, at a ſuitable diſtance on each ſide of the zero, both above and below, whether the teleſcope be horizontal or perpendicular either way. Theſe are viewed through two compound microſcopes, (of $5\frac{1}{2}$ inches long, and their object-glaſs at 3 inches diſtance from the limb) carried by the ſame frames as the other microſcopes.

"The curſor, or moveable wire, in the micrometer-microſcopes, is adjuſted much in the ſame way as general Roy's; excepting that the micrometer head is made to turn ſtiffly on the neck of the ſcrew, ſo as to allow of bringing the point of zero to front the eye, without the trouble of re-adjuſtment, if it happened to fall behind.

"There is, of courſe, a very ſenſible level for adjuſting the axis. The circle was ordered to have ten radii; that when the teleſcope is horizontal, and pointing to a meridian mark, there might be a vacancy between the cones, above or below, for introducing a level. In the brace between the pillars, over the moveable Y, (at A), it may be obſerved, the bottom bar is omitted, in order to give the better room for paſſing the level, without inclining it, or running any hazard of ſtriking it. From the lower bar of the oppoſite brace B, over the fixed Y, there ſtands out a forked piece of braſs, to receive the leg of the level, and direct it to its place; as alſo for keeping it upright when the foot ſtands on the pivot, and juſt allowing a very little ſhake, ſo as not to cramp it. By this contrivance the level is eaſily handled, and reverſed without danger of diſturbing it or the inſtrument.

"The top plate, as may be ſeen in the drawing, has a large opening cut more than half way acroſs it. The deſign of this is, to allow you to obſerve quite up to the zenith, and a little beyond it, clear of all obſtruction whatſoever. And ſince the whole inſtrument is capable of being reverſed, or turned half way round in azimuth; when you have occaſion to obſerve the tranſit of the ſtars, in that part of the heavens where they would be intercepted by the plate in one poſition, it is entirely out of the way in the other.

"The circle itſelf is of full two feet diameter at the diviſions; being 25½ inches at the edge. The undivided circle, on the ſide of the teleſcope next to the open end of the axis, ſerves for ſtrength and uniformity; and to it is applied the clamp of elevation. That clamp is ſo made, as to allow the circle to run freely all round, not bearing at all againſt it, but ſupporting itſelf, and yet being eaſily removeable. It has no command over the circle whatever, when handled with care, excepting in the altitude of the teleſcope, by an adjuſting ſcrew when the clamp is ſet: and, as that ſcrew has a milled head at each end, it is as conveniently turned from the one as from the other ſide of the inſtrument, to bring the horizontal wire to biſect the object.

"The teleſcope is of 2 inches aperture, and 33 focal length. The object glaſs does not ſlide within the tube, but ſcrews into the end of a piece of falſe tube, of 4 inches length, which ſlides on the outſide of the principal tube, and is fixed in its place by 3 ſcrews and collars running in grooves, when its diſtance from the wires is adjuſted.

"In this way one has the whole aperture of the tube, and no greater length than is abſolutely neceſſary for uſe, which, in ſuch an inſtrument, appeared to be an advantage. In ſome reſpects it is ſo; yet the hazard of diſturbing the collimation by touching the outſide of the tube is an objection.

"The wires are not in one cell, but in two diſtinct cells, with their faces towards each other. The perpendicular wires are 5, at 35 ſeconds of time diſtance in the equator, and are adjuſtable horizontally for collimation by a ſcrew. The horizontal wires are 3, at about 15 minutes of a degree aſunder, placed ſo as juſt not to touch, but to paſs clear of the other wires; and they are adjuſtable in collimation by another ſcrew peculiar to them. The two cells have each a power of turning ſeparately on the axis of viſion; but when once the two ſets of wires are brought to be truly at right angles to each other, the cells can then be fixed together, and turned together, and finally ſettled in their place by ſcrews and collars at the outſide of the tube. Theſe things, I believe (ſays the Doctor) are new; I thought they might be improvements on the uſual method; yet I find the adjuſtment of the horizontal wires in collimation might be diſpenſed with.

"My reaſon for having three horizontal wires, and at about that diſtance, was, that after having aſcertained what the difference is, I might obſerve the lower limb of the ſun or moon at the one, and the upper limb at the other of the extreme wires, without much altering the elevation of the teleſcope, and removing the centre of the object, or preceding and ſubſequent limbs of the ſun and moon, far out of the centre of the field.

"The diviſions on the circle itſelf come now to be ſpoken of. They were done by hand, and have been executed with great care. The original diviſions are by dots, or points, at every ten minutes. Within is another row, by ſtrokes or cuts, laid off from the points to every ten minutes likewiſe. The dots are what we will regard firſt, the cuts afterwards.

"As it always appears to me convenient, in actual obſervation, to contrive that every thing ſhall do itſelf, as far as I can, and to leave the mind as well as the body at perfect eaſe, and totally diſengaged from calculation, I conſidered that making both the microſcopes talk the ſame language, read off the ſame way, with the guiding figure always to the ſame hand, and the dot to be obſerved to the ſame hand too, and the readings always poſitive, would conduce much to one's eaſe, and thereby very greatly indeed to the accuracy and certainty of the obſervation.

"With this intent, ſince the microſcopes are, the one above, I ordered that to be marked A; the other below, B; conſidering that the numbers deduced from them could never be miſtaken, if one got into the habit of examining A firſt, and noting that down, and then examining and ſetting B under it; which, if all things are true, ought to be the complement to 90 degrees.

"To make the reading pleaſant, I ordered the micrometer-ſcrew in each to be placed on the right hand, and conſidered the moveable wire as always to be kept to the right hand of the other. This will, of courſe, in all caſes meaſure the diſtance of the fixed wire from the neareſt dot apparently on the right, or, ſince the microſcopes invert, the neareſt dot really to the left, which will be either the degree itſelf on that hand, or ſome multiple of ten minutes from it.

"That the numbering of the degrees might coincide with this idea, I conſidered that the figures ſhould be made to appear erect in the microſcopes in every poſition of the teleſcope, which they might be whenever it does not point below the horizon, and that they ſhould be reckoned backwards. To effect this, they ought to be reckoned backwards in themſelves, but to ſtand the contrary way, or inverted in reality. This would be different in the two microſcopes in reſpect of the centre of the circle, but that could create no difficulty. For, ſince the two quadrants neareſt to the object-end of the teleſcope would always be thoſe coming under the examination of microſcope A, and the two neareſt to the eye-end, thoſe to be obſerved at microſcope B, they might be figured accordingly. Hence, ſuppoſing the inſtrument placed in the meridian, with the graduated face turned towards the eaſt; if, when the teleſcope is horizontal, and points to the ſouth, the upper quadrant neareſt to the object-end be numbered from that end from 1 to 90°, with the head of the figures towards the centre of the inſtrument, and the other upper quadrant be numbered from the eye-end, with the feet of the figures towards the centre, they both would give the zenith-diſtances of the objects obſerved. The former at microſcope A, while the teleſcope points to the ſouth of the zenith; the latter at microſcope B, when you are obſerving towards the north.

"The two other, or lower quadrants, follow a ſimilar rule, and ſerve to ſhew the altitudes, if both be numbered from the quadrature, inſtead of either end of the teleſcope; thoſe leading towards the object-end being placed with their heads, while thoſe towards the eye-end ſtand with their feet towards the centre of the circle.

"The inſtrument has a figure at every degree, that one may always be in the field of view of the microſcope. Hereby it may be ſeen, that all on one ſide of the teleſcope give zenith diſtances, while all on the other ſide give altitudes; and yet, that the figures in both the quadrants neareſt to the object-end are placed with their heads towards the centre, and all towards the eye-end with their feet. This became neceſſary; and though it was a little perplexing at firſt to contrive and ſee executed properly, it is found very convenient indeed in uſe.

“ The interior diviſions, or cuts, are alſo numbered at every degree each way, from the eye-end to the object end of the teleſcope, with the feet of the figures always towards the centre. The uſe of them is likewiſe very great, not for reading off the obſervations, but for ſetting the inſtrument. For, at a proper diſtance from the main pillars, there is a ſmall pillar, carrying a compound microſcope with a wire in its focus, which being adjuſtable, and once ſet to the latitude of the place, gives immediately the north polar diſtance of any object ſeen; or, by fixing the inſtrument according to the polar diſtance of an object ſought, one is certain of its entering at the proper time the field of the teleſcope, near the centre wire. This pillar for the polar microſcope is removable to the other ſide of the main pillars, which becomes neceſſary when the inſtrument is reverſed.

“ This in general is the form, and theſe are the peculiarities in the conſtruction of this inſtrument, which being deſigned for meridian obſervations, or tranſits, I apprehend may beſt be named a *tranſit circle.*

“ In obſerving, I always ſtudy to be as much at my eaſe as poſſible, and therefore I always ſit, and uſe a priſmatic eye-glaſs. To avoid touching the inſtrument itſelf, or even the ſtone on which it ſtands, I have four upright poles from the floor to the roof, with croſs-braces on a level with the bottom plate of the inſtrument, againſt which I may lean while I obſerve, or when I handle any part of the inſtrument. Theſe I find to be of great comfort and uſe. Againſt two of the poles I hang a curtain occaſionally to keep off the ſun, or to leſſen a falſe light when I obſerve a ſtar in the day.

“ The two exterior horizontal wires, mentioned above, I find very convenient. They are really 14′, 43″, 5 of a great circle diſtant from the centre. By means of them I can without any hurry obſerve the preceding limb of the ſun at 3 wires; I ſet the lower limb to the upper wire, and read that off; then the upper limb to the lower wire; and am ready to obſerve the ſecond limb of the ſun at the 3d, 4th, and 5th wires; and laſtly I read off the upper limb after the obſervation is ended. In this way one has the meridian paſſage through the middle of the field, or within 2′ of it; and the meridian altitude of both the limbs, while the ſun's centre is on the meridian; for the little alteration in altitude is ſoon done, and can diſturb nothing.

“ Indeed, upon the whole, this inſtrument itſelf is capable of doing a great deal of good work, and convinces me fully that one between piers would be highly advantageous to aſtronomy. As a tranſit, mine is perfect, ſo far as that ſize permits: indeed it is in fact to all intents a tranſit-inſtrument. And for altitudes, ſince the readings are totally independent of the circle, though you have it in your power to re-examine your microſcopes by the plumb-line between each obſervation, if you pleaſe, you find there is no occaſion for it. In that reſpect it has the advantage over a quadrant. No force is uſed in ſetting this inſtrument; the whole, from its form, is counterpoiſed in itſelf; there is no more probability of deranging it in altitude, than in azimuth, and therefore all you have to do in actual obſervation beyond a common tranſit-inſtrument, is to biſect the ſtar as it paſſes, or as ſoon as ever it has paſſed the meridian wire, and read off the microſcopes afterwards. Thus every obſervation is complete, by aſcertaining the right aſcenſion and altitude of every object at once, and with very little trouble, which muſt tend greatly to the improvement of our catalogues.

“ There is one additional advantage in an inſtrument of this form, that you have it in your power to reverſe the whole in a few minutes without any hazard, which I do regularly; becauſe thereby you diſcover and deſtroy any errors which there may be in the inſtrument itſelf, or which may at any time ariſe in obſerving.”

Portable Circular Inſtrument for Tranſits, Altitudes, and Azimuths, by Troughton.

About the year 1790 the portable aſtronomical quadrant began to give place to the circular inſtrument; previouſly to that year, indeed, a few circles had been made for the ſole purpoſe of obſerving altitudes, but their improved ſtate cannot be dated farther back than the time we have mentioned.

The inſtrument, repreſented in *Plate* IX. of *Aſtronomical Inſtruments,* is of the moſt improved kind: in the conſtruction of which are combined the means of applying it to the various purpoſes of practical aſtronomy; namely, for obſerving right aſcenſions, declinations, azimuths, and equal altitudes; and alſo, to all the purpoſes of the moſt improved theodolite, and levelling inſtrument. It is contrived ſo that the joint effect injures not any particular part, but improves the ſtrength and ſymmetry of the whole.

It has been made of different magnitudes, from one foot to three feet diameter; which dimenſions are ſuppoſed to be the boundaries of this conſtruction. Thoſe of three feet, however, can hardly be called portable: fifteen and eighteen inch ones are the ſizes uſually made: the one under conſideration partakes of both, the lower circle being fifteen, the upper one eighteen inches diameter.

This being deſigned for a traveling inſtrument, its own packing-box is intended for a pedeſtal, where a better cannot be procured, and may do well enough when the purpoſes of ſurveying, &c. require its preſence in the field; but in the obſervatory it ought to be mounted upon a firm ſtone.

The baſe of this inſtrument is a ſtrong tripod ſupported on feet ſcrews, two only of which are ſeen in the figure A and B. To the centre of the tripod is fixed the axis of the azimuth motion, about ſixteen inches long: in cloſe contact with the tripod is the azimuth circle C, which is one entire plate; it is nicely centered upon the vertical axis, but only capable of being turned round through an angle of about three degrees; and for that purpoſe is acted on by a ſlow moving ſcrew, the head of which is ſeen below, a little to the left of the centre. The uſe of this motion is for ſetting the teleſcope to the meridian, when the index of the proper azimuth motion has been previouſly ſet to zero; or it is for adjuſting the inſtrument to the point of commencement, when horizontal angles are meaſured. A teleſcope is affixed to the lower ſide of the tripod having univerſal motion, which being ſet to any object, becomes a ſentinel for watching the poſition of the inſtrument, and pointing out any deviation that may happen to take place during the time required in any operation. The index of the azimuth circle is alſo one entire plate D, having, for the ſake of ſtrength and lightneſs, an half contrate edge one inch deep: the middle cone E is attached to this, and centered upon the vertical axis by two inſide collars nicely fitted thereto: this forms the azimuth motion, the weight reſting on the centre at the lower end. The tangent ſcrew is faſtened to the index plate, and goes round with it when quick motion is required. Two microſcopes oppoſite to each other, one of which F appears in the figure, read off the azimuth, and ſubdivide the graduations of the limb. On the azimuth plate are alſo fixed the two ſtrong pillars G G, which ſupport the upper circle and remaining parts. A little below the top of the vertical axis is a ſtrong bracing bar H, which, from its connection with the centre cone and two pillars, bind them firmly together, and prevent the incumbent weight from altering the figure of the attached plate, Higher up is ſeen the ſcrew apparatus I, for procuring faſt and ſlow motion for the vertical circle; this is fixed to the right hand pillar.

The vertical circle, K, is next to be noticed: it is compoſed of two entire circles, being flat plates croſſed out into ſix radii, having each a circular border, and circular centre. The centres are perforated to receive the larger ends of the cones of the tranſit axis. The axis has a cylindrical part in the middle, equal to the diſtance of two circles; and this cylinder being terminated at each end by a flaunch L, the two circles are ſcrewed faſt to it, and here form the central pillar. The two circles are otherwiſe bound together along the radii, and round the limb, by a number of pillars placed perpendicularly between them. The ſide of the diviſions is overlaid with another circular border, which covers the holes which the fixing pillars occaſion; this ring uſed to be of fine braſs for dividing upon, but recently one of the more perfect metals, gold, platina, or ſilver, has been uſed for that purpoſe. The teleſcope M is thirty inches long, and of two inches aperture; it paſſes through the cylindrical part of the axis, to which it is attached, and nearly fills the diſtance between the two circles, to which it is alſo faſtened at their extreme borders. On the middle of the cones of the axis are ſoldered two rings S S, at a diſtance from each other, exactly equal to the diſtance between the two pillars. Two rollers at the top of the pillars are, by the force of ſprings, urged upwards againſt the rings ſo as to ſuſtain the whole weight of the axis and circle, and thereby to relieve the parts of action from being injured by unneceſſary preſſure. The diſtance of the pillars being too ſhort for the tranſit axis, its length of 16 inches is firmly ſupported by a bar N, ſcrewed faſt to each of the pillars, extending in a line with the axis, and is terminated by a Y, or angle, in which is ſecured the pivot or end of the axis: the bar is braced by a prop near the Y, which joins the pillars at a diſtance below. Two ſtrong tubes O are firmly connected with the left hand pillar, with their ends bent upwards; theſe carry two oppoſite reading microſcopes, R, R; they are finiſhed with adjuſtments, P, P, for bringing them both upon a level; but the angles whereon the axis reſts may be raiſed or depreſſed, ſo as to bring the horizontal diameter of the circle to ſuit their height; an adjuſtment by which alſo the level of the axis is effected. A ſpirit level Q Q is ſeen in the figure hanging upon the bent tubes, which, after having aſſiſted in placing the vertical axis perpendicular, remains in its place, for marking any alteration of poſition that may happen in either the inſtrument or pedeſtal. This level may occaſionally be removed to the teleſcope, and there helps to verify the poſition of the reading microſcopes. Another level applies to the horizontal axis, juſt within the angles, reſting thereon with two forks, and paſſing through between the bars of the circle: with this alſo the vertical axis may be adjuſted, but its direct uſe is for levelling the one to which it applies. The inſtrument from which our ſketch was taken has no plumb-line, although this ſize is ſometimes furniſhed with that apparatus. However, it is rather doubtful whether the levels are not here quite as good; for the accuracy of the plumb-line increaſing in proportion to its length, ſeems better adapted for large inſtruments than for the ſize before us; particularly, as levels may be uſed as good as in thoſe of larger dimenſions. The teleſcope has four eye-pieces, which give it different powers; one of which having a diagonal mirror affords a convenient view of the heavens about the zenith. T is a ſmall ſupport for the lantern which throws light into the end of the conical axis, and illuminates the wires of the eye-piece in the uſual manner.

Reſpecting the powers of this inſtrument, it may be remarked, that the limbs of both circles are divided into degrees, and every five minutes; and that the microſcopes of both ſub-divide to ſingle ſeconds; by which means an angle may certainly be read off to two ſeconds. The powers of the teleſcope are fully equal to this quantity, and ſhew the pole ſtar in bright day light: the levels, which are furniſhed with graduated ſcales, are ſenſible to an inclination of one ſecond, and the adjuſtments being few and ſimple are eaſily rectified, and not ſubject to derangement.

This circle ſeems better adapted for the uſe of the private obſervatory, or for a gentleman travelling, than the repeating circle of Borda without reflection; the latter being deſtitute of the properties of the tranſit inſtrument; whereas, this is a complete one. Beſides, it is of a ſtronger frame, eaſier to manage, and equally portable.

We confeſs we cannot but admire the portable inſtrument we have here deſcribed, whether we conſider its various properties, its ſtability, its accuracy, or its beauty of figure.

The mural Tranſit Circle *by Troughton.*

In our account of the riſe and progreſs of aſtronomical inſtruments in the firſt part of our preſent article Circle, we had occaſion to remark, that Romer was the firſt perſon who applied what he called a *reticulum*, which we have tranſlated *reticule*, in the focus of a microſcope as a meaſure of the diviſions on the limb of an inſtrument; we alſo mentioned that Horrebow fixed a *circle* in the *meridian*, read off the diviſions by microſcopes before the year 1735; ſince which time there has been much converſation in England about ſubſtituting a mural circle for a mural quadrant in an obſervatory; and indeed various inſtruments, as we have ſeen, have been produced, to which a deſire of rendering them as extenſive as poſſible in their uſes, has generally added an azimuth circle, which has proved detrimental to the requiſite ſteadineſs of a meridian inſtrument; but no inſtrument entirely anſwering the deſcription of the title we have here given has been completed, at leaſt in England, till ſo lately as March of the year 1806, when Troughton, whoſe mind ſeems to have been formed by nature for the very buſineſs that he is occupied in, delivered out of his hands a mural tranſit circle, which is contrived to give at the ſame inſtant both the right aſcenſion and declination of any heavenly body, by the aid of a good aſtronomical clock, with a degree of accuracy that probably has never before been equalled. This inſtrument is in the poſſeſſion of Stephen Groombridge, Eſq. of Blackheath, to whom we beg leave to expreſs our obligation for his obliging permiſſion, granted to our draftſman, of taking the perſpective drawing of his circle, which is contained in *Plate* X. of *Aſtronomical Inſtruments*.

This circle, which is four feet diameter, and formed principally of hollow cones, is framed upon a ſtrong axis three feet in length; and conſiſts of two complete circles, faſtened together in a manner ſufficiently explained by the figure. The teleſcope A, five feet long, and three inches and a half aperture, croſſes the middle of the axis, and paſſes between the two circles, to the bodies of which it is attached. Each of the circles has a hoop, or edge-bar, at its back, to give it ſtrength; and is further braced by many parts, which tend to unite the two together. There alſo paſſes through the axis another tube B at right angles to the teleſcope; this forms part of the plumb-line apparatus to be deſcribed hereafter. The axis is ſupported at its extreme ends on the top of two ſtone piers, about five feet four inches high; the pivots of the axis reſt in angles, formed in braſs-work, which is cemented to the tops of the ſtones. The angle at the end to the right is acted on by a ſcrew which gives it a very ſlow motion vertically, for the purpoſe of adjuſting the axis to be horizontal; and a ſimilar ſcrew at the left angle gives a ſimilar motion for bringing the plane of the circle into the meridian. The figure of the ſtone-piers is priſmatical, and their inner ſurfaces, 27 inches apart, are parallel and perpendicular. The circle is divided on both ſides into degrees and every 5′. Upon the ends of two ſtrong horizontal bars, D, D, are fixed four micrometer microſcopes, two on each ſide, exactly in the horizontal diameters of the circles: theſe, three of which appear in the figure, ſubdivide the diviſions of the limbs to ſingle ſeconds; and are the indices by which the value of the obſervations are read off. Another microſcope, at right angles to the former, is ſeen, which paſſes through the left pier, and, from its ſituation, is ſuppoſed to be ſteadier than the other parts. It is uſeful in examining the accuracy of the diviſions, and for detecting ſmall motions in the more expoſed parts of the inſtrument. Upon the axis, half-way between the centre and pivots, are ſoldered and turned two rings; immediately below there is cemented into the inner ſurfaces of the ſtones, an apparatus which, by means of a ſpiral ſpring, incloſed in a tube or barrel E, is made to puſh up a roller againſt thoſe rings, ſo as to ſuſtain almoſt the whole weight of the circle, and thereby to relieve the pivots of the axis and the angle from unneceſſary preſſure. This work is well expoſed to view on the left ſide, but partly concealed on the right-ſide by the intervening circle.

On the inner ſurface of the pier, to the right, is fixed a frame which ſupports the uſual apparatus for quick and ſlow motion, which the figure ſufficiently explains; this in the eaſt or weſt direction is extremely pliable; but in the direction of the meridian furniſhes a ſtout reſiſtance; it is eaſily got at, when the obſerver is looking to north or ſouth, and in thoſe caſes where the milled heads are out of his reach, a jointed handle aſſiſts him very conveniently. When the inſtrument is reverſed, this apparatus engages with the oppoſite limb. A ſmall ſtool is ſhewn in the figure between the two piers, below the centre of the inſtrument; on its top is repreſented the water veſſel for the plummet to ſwing in; this veſſel may be raiſed or depreſſed an inch or more by a rack and pinion, to ſuit the length of the plumb-line. The teleſcope, being turned round to the horizontal poſition, brings the plumb-line tube B, mentioned before, into a vertical one. The plumb-wire hangs from an angle at the upper end, againſt which it is drawn into cloſe contact by the weight below, and is here conſidered as depending from a fixed point. At the lower end the main tube is croſſed at right angles by two ſmaller tubes; one of them parallel to the teleſcope, the other parallel to the axis. At one end of each is placed a luminous point, formed by a fine round hole, in a braſs pin, which is ſet in a diaphragm of mother-of-pearl; a lens in the ſame tube forms an image of the luminous point, upon the plumb-line, in the axis of the main tube. Theſe are viewed by eye-glaſſes in the oppoſite ends of the croſſing tubes, by which the plumb-line is ſeen directly paſſing through the image of the luminous point, which appears like the diſc of a ſmall planet. The tube which is parallel to the teleſcope regards the axis, and that which is parallel to the axis regards the reading microſcopes; by adjuſtments in the former, and reverſing the poſition of the inſtrument, the axis may be ſet truly level, and by ſimilar adjuſtments in the latter, and the ſame means, the reading microſcopes are brought to ſhew the true zenith diſtance. It ſhould have been mentioned, perhaps ſooner, that a ſmall pincher takes hold of the lower end of the plumb-line, the weight of which is ſufficient to paſs the wire through the main tube, having a hook at the lower end by which it is connected with the plummet. A cap ſcrews into the lower end of the main tube, furniſhed with a bolt for ſecuring the pincher, thereby preventing the plumb-line, when out of uſe, from being entangled or broken. By theſe means, the plumb-line is always in its place, ready for uſe, and the parts of the inſtrument are verified thereby in a few minutes.

The mechaniſm of the eye-piece of the teleſcope is intereſting, and in many reſpects new. The eye-glaſs, by touching a lever which is connected with a pinion, is carried along parallel to the axis, and readily ſet oppoſite any of the wires in obſerving a tranſit. This motion may in a moment be changed into a vertical one, while the upper and lower limbs of the ſun or moon are brought in contact with the declination wires. At about half the mean diameter of the ſun from the central horizontal wire, is a fixed wire on one ſide, and on the other ſide a moveable one all parallel; the latter is acted on by a micrometer ſcrew, which marks the quantity of motion by a nice graduation, croſſing the central wire a little way, but in its proper direction meaſures about 40′. By theſe contrivances, while the right aſcenſion of the ſun or moon is obſerved, without the loſs of a ſingle contact, one limb may be brought to the fixed wire, and the moveable wire ſet to the other limb, and the whole may be read off after the obſervation is finiſhed. We have ſpoken of the wires here, and elſewhere in Troughton's inſtruments, as though they were always metallic, but in many of his inſtruments he has introduced the fine threads ſpun by a ſpider, which are not only ſmaller than any other, but, what will appear remarkable, will bear the focal rays of the ſun without injury. A ſpirit level half the length of the axis, hangs upon two pivots, which project from two cocks ſcrewed faſt to the axis, on theſe it turns, and by its gravity keeps the right ſide up, and thus ſhews the level of the axis in every poſition of the teleſcope. This level does not appear in the plate, being completely hid behind the axis. Another level, ſeen in the figure, hangs upon two pivots which are attached to the eye-end of the teleſcope: this, on being brought to an horizontal poſition, will verify the adjuſtments of the microſcopes and other parts more quickly than the plumb-lines; it is not however ſo accurate. The axis is perforated, and by an illuminator placed at a proper angle in the centre, the light of a lamp placed oppoſite one end of the axis is reflected to the eye, and ſhews the wires by night. The quantity of light is regulated by letting it paſs through glaſſes differently coloured. Other parts, (ſuch as the circular plates at the object-ends of the microſcopes, furniſhed with univerſal motion, for illuminating the diviſions of the limbs), moſtly common to all inſtruments, are ſeen in the figure, but do not require particular notice.

In an obſervatory where there is but one inſtrument, the one under conſideration ſeems to be the beſt, though aſtronomers are not quite agreed upon this ſubject, ſome thinking, that the right aſcenſion, and declination inſtruments ſhould ever be ſeparate; they all, however, confeſs now, that, in an obſervatory, the azimuth circle is of little value.

It is reported that a large mural tranſit circle is in contemplation for Greenwich, (where, when there are two obſervers, it cannot be wanted) which promiſes to be greatly ſuperior, for the purpoſe of obſerving the declinations of the heavenly bodies, to any that has yet been ſeen; but this has not yet been even ordered, and therefore cannot now be given; ſhould it however be executed, we may hereafter preſent our readers with its figure and deſcription under the article *Obſervatory*, or ſome other appropriate title.

In our deſcription of this our laſt inſtrument, coming under the denomination of a Circle, we have judged it expedient to omit the letters of reference, except in three inſtances, partly becauſe the figure being already ſufficiently crowded would thereby be rendered leſs diſtinct, and partly becauſe the reader, who has peruſed the accounts of the other circles, cannot but underſtand the parts that have been verbally deſcribed, when he has the figure before him, and therefore will not be ſorry to diſpenſe with a long alphabetical enumeration of the different parts. It may be proper to ſubjoin, before we take our leave of the ſubject, that, as there is no azimuth circle in the inſtrument at preſent before us, the *reverſed* adjuſtment and *reverſed* obſervation are effected, by carefully lifting the whole circle out of the angles of bearing, and returning it when the ends of the axis are reverſed; which is a more certain way of making the ſecond poſition of the teleſcope at 180° from the former, than can be expected by any method that requires meaſurement, even when a diſtant object is viewed as a mark; for a deviation of the central wire from the true line of collimation, may eſcape notice, and deceive the obſerver.

In the Philoſophical Tranſactions of London, for the year 1806, is a deſcription of an aſtronomical circle of John Pond Eſq. of Weſtbury, as made for him by Troughton; with which inſtrument, aided by Dr. Hamilton's obſervations at Armagh, and Piazzi's at Palermo, he has corrected the declinations of many ſtars as given in Dr. Maſkelyne's Catalogue publiſhed in 1802. The account is copied by Mr. Nicholſon in his Journal for March 1807, but without the table of obſervations, as annexed in the original.

Another of Troughton's aſtronomical circles may alſo be ſeen deſcribed in Count Bruhl's pamphlet, entitled "On the Inveſtigation of aſtronomical Circles," which is an intereſting publication.

If it ſhould be remarked by any of our readers, that we appear to have been partial to Troughton, in our ſelection of circular inſtruments, our anſwer is, that we have found in him not only a very intelligent, but a communicative man, who, moreover, was ever ready to procure acceſs to our draftſman to the inſtruments we wanted, though not in his own poſſeſſion: beſides, when we conſider that his inſtruments are not only made in the moſt perfect manner, but have never before been deſcribed, we preſume the public will thank us and him, for the opportunity we here give the world of being acquainted with the characteriſtic marks of their conſtruction. With reſpect to ourſelves, we cannot in juſtice do leſs than publicly thank Mr. Troughton for the aid he has afforded us in this article, which, however, we ſhould have withheld from motives of delicacy, did we not conceive that his well earned fame ſoars far above the reach of any ſupport of ours.

Circle, Circulus, in *Geometry*, a plane figure, comprehended under one ſingle line, which returns into itſelf, having a point in the middle, from which all the lines, drawn to its circumference, and called radii, are equal.

Properly ſpeaking, it is the ſpace included within the circumference, or periphery, that is the circle: though in the popular uſe of the word, circle is frequently uſed for the periphery alone. See Circumference and Degree.

We ſhall here introduce ſome of the chief properties of the circle, referring for others to the articles Angle, Chord, Circumference, Diameter, Polygon, Sine, Tangent, Trapezium, &c.

1. Any two chords of a circle, equally diſtant from its centre, are equal to each other. Let O (*Plate* III. *Geometry*, *fig.* 49.) be the centre, A B and D E two chords; and having let fall the perpendiculars, O C, O F, draw the radii O A and O D. The triangles, O F D and O C A, have evidently the ſides and angles equal; and therefore A C or $\frac{1}{2}AB$ (ſee Chord) $= FD$ or $\frac{1}{2}DE$: conſequently $AB = DE$.

2. The angle B D C (*fig.* 50.) at the centre of a circle is double of the angle B A C at the circumference, when both ſtand upon the ſame arc, B C. Drawing the diameter, A D E, it is plain (No. 1.) that, as the angles at the baſe of an iſoſceles triangle are equal, and the external angle of a triangle is equal to both the internal and oppoſite angles, B D C is $= A + C = 2A$. In No. 2. $BDE = 2BAE$, and $EDC = 2EAC$, $\because$ by addition $BDC = 2BAC$. In No. 3. $CDE = 2CAE$, and $BDE = 2BAE$, $\because$ by ſubtraction $BDC = 2BAC$.

Hence, 3. All angles in the ſame ſegment of a circle, or ſtanding upon the ſame arc, whether that ſegment be greater or leſs than a ſemicircle, are equal to each other.

4. Angles D, G, (*fig.* 51.) in the circumferences, ſtanding upon equal ſubtenſes, AB, EF, of circles, having equal diameters, are equal to each other; and *vice verſâ*. From the centres, P and Q, draw the radii P A, P B, and Q E, Q F. Since $AB = EF$, and the radii are equal, the triangles, A P B, E Q F, are mutually equilateral, and conſequently equiangular; $\because P = Q$, and $D = \frac{1}{2}P = \frac{1}{2}Q = G$. Moreover, D being ſuppoſed $= G$, P will be equal to Q, and the two triangles, A P B and E Q F, having two ſides and the included angles reſpectively equal, have $AB = EF$.

5. The angle, A C B, (*fig.* 52.) in a ſemicircle is a right angle. For, drawing the diameter, $ACD = \frac{1}{2}ADE$ (by art. 2.) and $BCD = \frac{1}{2}BDE$; $\because ACB = \frac{1}{2}ADE + \frac{1}{2}BDE =$ half two right-angles $=$ one right angle.

6. If two lines, D E B, C E A, interſect each other within or without a circle, the angle, D E C, (*fig.* 53.) is equal, in the former caſe, to the ſum, and in the latter, to the difference of two angles in the circumference, ſtanding on the two arcs intercepted by thoſe lines. Draw the chord, C B; and, *firſt*, D E C, the external angle, $= DBC + ACB$, the ſum of the two internal angles; and, *ſecondly*, D E C, one of the internal angles, $= DBC - ACB$, the difference of the external angle and the other internal angle. Hence, an angle formed below or above the circumference of a circle, is greater or leſs than an angle in the circumference, ſtanding on the ſame arc.

7. If an oblique-angled triangle, A C B, (*fig.* 54.) be inſcribed in a circle, its vertical angle, A B C, will be greater or leſs than a right angle, by the angle C A D, comprehended under the baſe A C, and the diameter, A D, drawn from the extremity of the baſe. For, drawing BD, ABD will be a right angle, and $CAD = CBD$ (by art. 3.); $\because$ 1ſt, $ABC =$ a right angle $+ CAD$, and, 2dly, $ABC =$ a right angle $- CAD$.

8. Inſcribe a quadrilateral, A B C D, (*fig.* 55.) in a circle, and produce the ſide, B C, out of it, and the external angle, E C D, will be equal to the oppoſite internal angle, B A D. Draw the diameter, and join A F and C F; then the angle, B A F, in a ſemicircle, being a right angle ($= BCF$) $= ECF$, alſo a right angle, and $DAF = DCF$ (by art. 3.); we ſhall have the remainders B A D and E C D equal. Hence it follows, that the oppoſite angles, B A D, B C D, of a quadrilateral inſcribed in a circle, are, together, equal to two right angles; for B A D being $= ECD$, we ſhall have $BAD + BCD = ECD + BCD =$ two right angles. Hence alſo, if the oppoſite angles of a quadrilateral be equal to two right angles, a circle may be deſcribed about that quadrilateral. Hence, alſo, it appears,

that no oblique-angled parallelogram can have a circle deſcribed about it; becauſe its oppoſite angles being equal, their ſums muſt together, be either greater or leſs than two right angles.

9. The right lines, B E, C E, and B F, C F, (*fig.* 56.) drawn by pairs from two points, B and C, at equal diſtances in the ſame diameter from the centre of a circle, to meet in the circumference; the ſums of the ſquares of any two correſponding ones will be reſpectively equal. For, drawing O E and O F, $BE^2 + CE^2 =$ (ſee Triangle) $2BO^2 + 2OE^2$ $(2OF^2) = BF^2 + CF^2$. Hence, $BE^2 + CE^2 = AC^2 + CD^2$. For, $BE^2 + CE^2 = 2BO^2 + 2OE^2 = 2AO^2 + 2OC^2$. But $AC^2 + CD^2 = \overline{AO + OC}^2 + \overline{AO - OC}^2 = AO^2 + OC^2 + 2AO \times OC + AO^2 + OC^2 - 2AO \times OC = 2AO^2 + 2OC^2 = BE^2 + CE^2$.

10. If two lines, A B, C D, (*fig.* 57.) terminated at each extremity by the circumference, interſect each other within a circle, the rectangle A P × B P, under the parts of the one, will be equal to the rectangle, C D × D P, under the parts of the other. If one line paſſes through the centre, (No. 1.) and O Q be drawn perpendicular to the other line, then, joining O and C, Q C = Q D (ſee Chord), and D P = C Q − P Q; but the rectangle under the ſum and difference of the two ſides, OC, OP, of any triangle, COP (ſee Triangle), is equal to the rectangle under the whole baſe, C P, and the difference of its two ſegments; conſequently, ſince O C + O P = O A + O P = A P, and O C − O P = O B − O P = B P, the rectangle A P × B P = C P × D P. If neither of the two lines paſs through the centre (No. 2.), draw the diameter, E P F, and, by the former caſe, A P × B P = F P × E P = C P × D P.

11. If two lines, A P, C P, (*fig.* 58.) be drawn from two points, A, C, in the circumference of a circle, and produced to meet without the circle, the rectangle, A P × B P, contained under the whole and external part of the one will be equal to the rectangle, C P × D P, contained under the whole and external part of the other. Draw P F through the centre, make O Q perpendicular to A P, and join A and O: then the rectangle P F (= P O + O A) × P E (= P O − O A) is = A P (= P Q + Q A) × P B (= P Q − Q A). In the ſame manner, P F × P E = C P × D P; conſequently A P × B P = C P × D P. Hence, if P S be a tangent at S, and the radius, O S, be drawn; it follows, ſince P F = P O + O S, and P E = P O − O S, that PS^2 (= PF × PE) = P C × P D. Hence, alſo, if another tangent, P T, be drawn, and the radius, O T, P T will be = P S, *i. e.* two tangents drawn from the ſame point to the ſame circle are equal, becauſe the two triangles, P O T, P O S, are right-angled, and have two ſides of the one equal to two ſides of the other.

12. If a line, C A, (*fig.* 59.) be drawn from C, the centre of a circle, to a point, A, in any chord, B D, the ſquare of that line, together with the rectangle contained under the two parts of the chord, will be equal to the ſquare of the radius of the circle. Let E A F be another chord perpendicular to C A, and C, E be joined. Since E A = A F (ſee Chord), $AE^2 = AE \times AF = AB \times AD$ (art. 10.); and, adding to each quantity AC^2, we ſhall have CE^2 $(= CA^2 + AE^2) = AB \times AD + AC^2$. Hence it follows, that the ſquare of a line, C A, drawn from any point in the baſe of an iſoſceles triangle, B C D, to the oppoſite angle, together with the rectangle of the parts of the baſe, is equal to the ſquare of one of the equal ſides of the triangle.

13. The rectangles contained under the correſponding ſides of equiangular triangles, A B C, D E F, (*fig.* 60.) taken alternately, are equal; *i. e.* A B × D F = A C × D E. Produce B A, take A G = D F, and let the circumference of a circle paſs through the three points, B, C, G, and meet C A produced in H, and G, H be joined. The triangles, G A H and D E F, having the angle H = B (ſtanding upon the ſame arc) = E, and H A G = B A C (as vertical) = D, and the ſide A G = D F, we have alſo A H = D E; and therefore A C × D E = A C × A H = A B × A G = A B × D F.

14. The rectangle under the two ſides A C, B C, of any triangle A B C (*fig.* 61.) is equal to the rectangle under C D, perpendicular to its baſe, and the diameter, C E, of the circumſcribing circle. For, B and E being joined, the angles, A and E, will be equal, and A D C, E B C, are both right angles; conſequently the triangles, A C D, E C B, are equiangular; and, as A C and E C, C D and C B are correſponding ſides, the rectangle A C × C B = E C × C D, by the laſt article.

15. The rectangle of the two diagonals, A C, B D, of any quadrilateral, A B C D (*fig.* 62.), inſcribed in a circle, is equal to the ſum of the two rectangles, A B × D C, A D × B C, contained under the oppoſite ſides. Draw B F, and make the angle C B F = A B D. The triangles, C B F, D B A, are evidently equiangular, and the rectangles, B C × A D, B D × C F, under the correſponding ſides, taken alternately, are equal. The triangles A B F and B D C are alſo equiangular, and the rectangles A B × D C, and B D × A F are equal, as before: to theſe latter rectangles let the former be reſpectively added, and we ſhall have A B × D C + B C × A D = B D × A F + B D × C F = B D × A C. We are indebted to Ptolemy for the knowledge of this property, applied to the conſtruction of his table of arcs and chords.

16. A perpendicular, C D (*fig.* 63.) let fall from the right angle upon the hypothenuſe, AB, of a right-angled triangle A B C, will be a mean proportional between the two ſegments, AD, BD, of the hypothenuſe; and each of the ſides, containing the right angle, will be a mean proportional between its adjacent ſegment, and the whole hypothenuſe. For the triangles B D C, B C A are equiangular, as are alſo A D C, A B C, and A D C, B D C; conſequently, as the correſponding ſides of equiangular triangles are proportional, B D : C D :: C D : A D; A B : B C :: B C : B D; and A B : A C :: A C : A D. Hence it follows, and alſo by art. 5, that, if from any point C, in the circumference of a ſemicircle, a perpendicular, C D, be let fall upon the diameter A B, and two chords, C A, C B, be drawn from the ſame point, C, to the extremities of that diameter, the ſquare of the ſaid perpendicular will be equal to a rectangle, under the two ſegments of the diameter; and the ſquare of each chord will be equal to a rectangle under the whole diameter, and its adjacent ſegment; *i. e.* $CD^2 = BD \times AD$, $BC^2 = AB \times BD$, and $AC^2 = AB \times AD$. The firſt of theſe properties gives us what is uſually called "the equation of the circle:" for, if d denote the diameter A B, x the abſciſs A D, and y the ordinate C D, we ſhall have $y^2 = x \times \overline{d - x} = dx - x^2$. Hence it alſo follows, that if another chord, AE, be drawn, and a perpendicular, E F, be let fall upon the diameter, the ſquares of the chords will be as the ſegments of the diameter; *i. e.* $AD : AF :: AC^2 : AE^2$; for $AC^2 = AB \times AD$, and $AE^2 = AB \times AF$, $\because AC^2 : AE^2 :: AB \times AD : AB \times AF :: AD : AF$.

17. If a line P F C, (*fig.* 64) be drawn perpendicular

to the diameter A D of a circle, and any line be drawn from A to interſect the circle and perpendicular; the rectangle of the diſtances of the points of interſection from A will be equal to the rectangle of the diameter, and the diſtance of the perpendicular from A; *i.e.* $AB \times AC = AP \times AD$. For, if B D be drawn, the triangles ABD, APC, having the angle at A common, and the angles at P and B right, are equiangular and ſimilar; conſequently $AD : AB :: AC : AP$, and $AD \times AP = AB \times AC$. Hence, if PF interſects the circle in K, $AB \times AC = AK^2$; and if more lines be drawn, all the rectangles $EA \times AF$, $BA \times AC$ are equal, becauſe they are all reſpectively equal to the rectangle $AD \times AP$.

18. If, in a circle E D F (*fig.* 65), whoſe centre is C, and radius C E, the points B, A, be ſo placed in the diameter produced, that C B, C E, C A, be in continual proportion, two lines, B D, A D, drawn from theſe points to any point in the circumference of the circle, will always be in the given ratio of B E to A E. For, drawing D P perpendicular to the diameter E F, $DP^2 = EP \times PF$ (art. 16) $= 2CE \times EP - EP^2$; whence $AD^2 = \overline{AE + EP}^2 + PD^2 = AE^2 + EP^2 + 2AE \times EP + 2CE \times EP - EP^2 = AE^2 + 2CE \times EP + 2AE \times EP$. Alſo $BD^2 = \overline{BE - EP}^2 + PD^2 = BE^2 - 2BE \times EP + EP^2 + 2CE \times EP - EP^2 = BE^2 + 2CE \times EP - 2BE \times EP$. But CA, CE, and CB, are in continued proportion, therefore $AE : CE :: EB : CB$, or $AE : EB :: CE : CB$. Alſo, $AE^2 : EB^2 :: CE^2 : CB^2 :: CA : CB :: CE + AE : CE - EB :: 2CE \times EP + 2AE \times EP : 2CE \times EP - 2EB \times EP$. And $AE^2 : EB^2 :: AE^2 + 2CE \times EP + 2AE \times EP : EB^2 + 2CE \times EP - 2EB \times EP :: AD^2 : BD^2$. Conſequently, $AE : EB :: AD : BD$.

19. If any chord, P Q, (*fig.* 66), be drawn parallel to the diameter A B of a circle, and from a given point C, in that diameter, the lines C P, C Q, be drawn to the extremities of the chord; the ſum of the ſquares of theſe lines is equal to the ſum of the ſquares of the ſegments of the diameter; *i.e.* $CP^2 + CQ^2 = AC^2 + CB^2$. For, drawing P S, Q R perpendicular to the diameter AB, we ſhall have PS^2, or $QR^2 = PC^2 - SC^2 = QC^2 - RC^2$, *i.e.* $PC^2 - \overline{SO + OC}^2 = QC^2 - \overline{SO - OC}^2$; or $PC^2 - SO^2 - 2SO \times OC - OC^2 = QC^2 - SO^2 + 2SO \times OC - OC^2$, becauſe $OR = OS$. Conſequently $PC^2 = QC^2 + 4\overline{SO \times OC}$; but $AC^2 + CB^2 = \overline{AO + OC}^2 + \overline{AO - OC}^2 = 2AO^2 + 2OC^2$. But $PC^2 = AO^2 + OC^2 + 2SO \times OC = QC^2 + 4\overline{SO \times OC}$. Conſequently, $QC^2 = AO^2 + OC^2 - 2\overline{SO \times OC}$, and $PC^2 = AO^2 + OC^2 + 2\overline{SO \times OC}$; $\because PC^2 + QC^2 = 2AO^2 + 2OC^2 = AC^2 + CB^2$.

N.B. It will be the ſame, if the point C be taken without the circle.

20. The circle is the moſt capacious of all plain figures, or it contains the greateſt area within the ſame perimeter, or it has the leaſt perimeter about the ſame area; being the limit and laſt of all regular polygons, having the number of its ſides infinite. See POLYGON.

21. The area of a circle is always leſs than the area of any regular polygon circumſcribed about it, and its circumference always leſs than the perimeter of the polygon. But on the other hand, its area is always greater than that of its inſcribed polygon, and its circumference greater than the perimeter of the ſaid inſcribed polygon. Nevertheleſs, the area and perimeter of the circle approach nearer and nearer to thoſe of the two polygons, as the number of their ſides increaſes; the circle being always limited between the two polygons.

22. The area of a circle is equal to that of a triangle whoſe baſe is equal to the circumference, and altitude equal to the radius. *N. B.* This was firſt demonſtrated by Archimedes in his treatiſe entitled Κυκλȣ Μετρησις, or Circuli Dimenſio.—Prop. I. Or, the area of a circle, *e.g.* A C E (*fig.* 67.) is equal to a rectangle, O R S T, under its radius O R, and a right line, O T, equal to half the circumference. It is evident, in the firſt place, that the propoſed rectangle, O R S T, is greater than any polygon, A B C D E F, that can be deſcribed in the circle; for, drawing O A, O B, &c. and alſo O *v* perpendicular to A B, it is plain, that the triangle A O B ($Ov \times \frac{1}{2}AB$) will be leſs than $OA \times \frac{1}{2}AB$, or $OR \times \frac{1}{2}AB$. In the ſame manner, B O C is leſs than $OR \times \frac{1}{2}BC$, &c. Conſequently, the whole polygon A B C D E F is leſs than $OR \times \frac{1}{2}AB + OR \times \frac{1}{2}BC$, &c.; that is, leſs than a rectangle (O *m*) under O R and $Op =$ half the perimeter $(AB + BC + CD$, &c.) But this rectangle O *m* is itſelf leſs than O S, becauſe O *p* (half the perimeter of the polygon) is leſs than O T (half the circumference of the circle). Conſequently, the polygon A B C D E F is leſs than the rectangle O S. But it will apppear, in the ſecond place, that the ſame rectangle O R S T is leſs than any polygon H I K L M N that can be deſcribed about the circle: for, if O H, O I, &c. be joined, and the radius O P be drawn to the point of contact of H I, then the triangle H O I will be $= OP \times \frac{1}{2}HI = OR \times \frac{1}{2}HI$. In the ſame manner, $IOK = OR \times \frac{1}{2}IK$, &c.; and, therefore, the whole polygon $HIKLMN = OR \times \frac{1}{2}HI + OR \times \frac{1}{2}IK$, &c. $=$ a rectangle (O *n*) under O R and $Oq =$ half the perimeter $(HI + IK + KL$, &c.), which rectangle is, manifeſtly, greater than O S, ſince Oq (= half the perimeter of the polygon) is greater than O T. Hence, therefore, as the rectangle O S is greater than any polygon that can be inſcribed in the circle, and leſs than any polygon that can be deſcribed about it; it muſt be equal to the circle itſelf.

Hence, in order to find the area of a circle, half the circumference is to be multiplied into half the diameter, or the whole circumference into the whole diameter and a fourth part of the product be taken.

This rule may be otherwiſe demonſtrated, by the aid of fluxions. Put $r =$ the radius AC, (*fig.* 68.) $c =$ the whole circumference A E B A, or any part of it, and $x =$ the radius C D of a circle continually expanded. Then $\frac{c}{r} x\dot{x}$ will expreſs the fluxion of the whole circle or ſector whoſe circumference is c; and, conſequently, $\frac{cxx}{2r} =$ the area C D F; and $\frac{1}{2}cr =$ the area C A E of the whole circle or ſector accordingly. Otherwiſe, multiply the ſquare of the diameter by .7854, and the product will be the area. For the proof of this rule it ſhould be obſerved, that all circles, being ſimilar figures, are as the ſquares of their diameters, (ſee next article); conſequently, by the preceding article, the area of a circle whoſe diameter is 1, is $\frac{1 \times 3.14159, \&c.}{2 \times 2 = 4} = .78539$, &c.; whence $1^2 : d^2$ (the ſquare of any diameter) :: .78539, &c. : $.78539\,d^2$, the area of the circle, whoſe diameter is *d*. Hence, and from the next article, ſuppoſing D the diameter, C the circumference, and A the area of any circle, and $p = 3.14159$, &c. we may deduce the following equations: *viz.*

$$1.\ D = \frac{C}{p} = \frac{4A}{C} = 2\sqrt{\frac{A}{p}}.$$

$$2.\ C = pD = \frac{4A}{D} = 2\sqrt{pA}.$$

$$3.\ A = \frac{pD^2}{4} = \frac{C^2}{4p} = \frac{DC}{4}.$$

$$4.\ p = \frac{C}{D} = \frac{4A}{DD} = \frac{CC}{4A}.$$

Hutton's Menſ. p. 128, &c.

Other rules may eaſily be formed by aſſuming different numbers for expreſſing the proportion of the diameter to the circumference. See each of theſe articles.

23. All circles, like other ſimilar plane figures, are to one another as the ſquares of their diameters or radii. Let A C E and *ace* (*fig.* 69) be two circles, and they will be as the ſquares of their radii, or AO^2 to ao^2. Let Q be to the circle *ace* :: $AO^2 : ao^2$; and Q = circle A C E. For, *firſt*, it is evident, that Q is greater than any polygon A B C D E F that can be inſcribed in the circle A C E; becauſe, if another polygon, *abcdef*, ſimilar to it, be inſcribed in the circle *ace*; then we ſhall have the polygon A B C D E F : polyg. *abcdef* (:: $AO^2 : ao^2$) :: Q : circle *ace*; but the firſt conſequent being leſs than the ſecond, the firſt antecedent A B C D E F muſt be leſs than the ſecond Q. In the ſame manner it will appear, that Q is leſs than any polygon H I K L M N that can poſſibly be deſcribed about the circle A C E; for deſcribing another ſimilar polygon *hiklmn* about the circle *ace*, we ſhall have H I K L M N : *hiklmn* (:: $AO^2 : ao^2$) :: Q : circle *ace*; but the firſt conſequent is greater than the ſecond, and, therefore, the firſt antecedent muſt be greater than the ſecond Q. Conſequently, as Q is greater than any polygon that can be inſcribed in the circle A C E and leſs than any polygon that can be deſcribed about it, it muſt be equal to the circle: whence A C E : *ace* :: $AO^2 : ao^2$. According to Archimedes, the area of the circle is to the ſquare of the diameter, as 11 to 14, or, more nearly, as .7854 to 1; or ſtill more nearly, as .7853981633,9744830961,5660845819,8757210492, 9234984377,6455243736,1480769541,0157155224, 9657008706,3355292669,9553702162,831807666, 7734611 + to 1; as it has been found by modern mathematicians. Dr. Wallis's "Arithmetic of Infinites" contains the firſt infinite ſeries for expreſſing the ratio of a circle to the ſquare of its diameter: *viz.*

1ſt. The circle is to the ſquare of its diameter

$$\left.\begin{array}{l}\text{As } 1 \text{ to } \dfrac{3 \times 3 \times 5 \times 5 \times 7 \times 7, \&c.}{2 \times 4 \times 4 \times 6 \times 6 \times 8, \&c.}\\ \text{Or } 1 \text{ to } \dfrac{9}{8} \times \dfrac{25}{24} \times \dfrac{49}{48}, \&c.\end{array}\right\}\ \text{found out by Wallis himſelf.}$$

$$\text{Or as } 1 \text{ to } 1 + \cfrac{1}{2 + \cfrac{9}{2 + \cfrac{25}{2 + \cfrac{49}{2 \times \&c.}}}}, \text{ by lord Brounker;}$$

$$\text{Or as } 1 - \frac{1}{2 \times 3} - \frac{1}{2 \times 4 \times 5} - \frac{1 \times 3}{2 \times 4 \times 6 \times 7} - \frac{1 \times 3 \times 5}{2 \times 4 \times 6 \times 8 \times 9}, \&c. \text{ to } 1, \text{ by ſir Iſaac Newton;}$$

$$\text{Or as } 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11}, \&c. \text{ to } 1, \text{ by Gregory and Leibnitz:}$$

and many other forms of ſeries have been invented by different authors, for expreſſing the ſame ratio between the circle and the circumſcribed ſquare. See QUADRATURE.

24. The circumferences of all circles, *e. g.* A B C D, *abcd* (*fig.* 70.) are in the ſame proportion as their diameters, or their radii, O B, *ob*. Let O E, *oe*, be ſquares on the radii O B, *ob*; and let O G, *og*, be two rectangles contained under the ſame radii and right lines O H, *oh*, reſpectively equal to the ſemi-circumferences A B C, *abc*. Then, theſe rectangles being equal to the circles themſelves, we ſhall have O E : O G :: *oe* : *og*. The baſes alſo, O C, O H, *oc*, *oh*, are in the ſame ratio; whence (by equality and alternation) O C (O B) : *oc* (*ob*) :: O H : *oh* :: 2 O H (circumference A B C D) : 2 *oh* (circumference *abcd*.) As the areas of circles are proportional to the rectangles of their radii and circumferences, the quadrature of the circle would be effected by the rectification of its circumference; or in other words, if the length of the circumference could be accurately aſcertained, the true area might alſo be found. Many attempts have been made, in the way of approximation, to accompliſh this object, and different reſults, aproaching nearer and nearer to the truth, have been obtained from different proportions of the diameter to the circumference: but, after all, the determination of the true area of the circle has been generally thought impracticable. For an account of what has been done in this way by ancient and modern mathematicians, ſee the articles DIAMETER, CIRCUMFERENCE, QUADRATURE, and RECTIFICATION.

Beſides the foregoing well-known properties of the circle, it may not be improper to give the formations of the following very beautiful, general, and intereſting theorems reſpecting it, which were publiſhed at Edinburgh in 1746, by the late Dr. Matthew Stewart, the ſucceſſor of Mr. Maclaurin, without demonſtrations, and remained ſo for a period of 59 years, till 1805, when they were not only demonſtrated by James Glenie, eſq. A.M. F.R.S. Lond. and Edin. in a paper printed in the "Philoſophical Tranſactions of the Royal Society of Edinburgh," for that year, but alſo derived as mere corollaries from a general geometrical inveſtigation delivered by him in the ſaid paper. They are the following:

Let there be any regular figure of a greater number of ſides than three circumſcribed about a circle, and from any point in the circumference of the circle let there be drawn perpendiculars to the ſides of the figure; twice the ſum of the cubes of the perpendiculars will be equal to five times the multiple of the cube of the ſemi-diameter of the circle by the number of the ſides of the figure. Thus, if n denote the number of the ſides of the figure, and r the radius or ſemi-diameter of the circle, twice the ſum of the cubes of theſe perpendiculars will be equal to $5nr^3$.

Let there be any regular figure circumſcribed about a circle of a greater number of ſides than three, and from any point within the figure let there be drawn perpendiculars to the ſides of the figure, and likewiſe let there be drawn a right line to the centre of the circle; twice the ſum of the cubes of the perpendiculars drawn to the ſides of the figure, will be equal to twice the multiple of the cube of the ſemi-diameter of the circle by the number of the ſides of the figure, together with thrice the multiple by the ſame number of the ſolid, whoſe baſe is the ſquare of the line drawn to the centre, and altitude the ſemi-diameter of the circle.

Thus, if n denote the number of the ſides of the figure, and l the line drawn from the point within the figure to the centre of the circle, twice the ſum of the cubes of theſe perpendiculars will be equal to $2\,n\,r^3 + 3\,l^2 r$.

Let there be any regular figure inſcribed in a circle, and from all the angles of the figure let there be drawn right lines to any point in the circumference of the circle; the ſum of the fourth powers of the chords will be equal to ſix times the multiple of the fourth power of radius, or the ſemi-diameter of the circle, by the number of the ſides of the figure.

Let there be any regular figure inſcribed in a circle, and from all the angles of the figure and the centre of the circle let there be drawn right lines to any point; the ſum of the fourth powers of the lines drawn from the angles of the figures, will be equal to the multiple by the number of the ſides of the figure of the fourth power of the ſemi-diameter of the circle, together with four times the multiple by the ſame number of the fourth power of the line, whoſe ſquare is equal to the rectangle contained by the ſemi-diameter and the line drawn from the centre, together with the multiple by the ſame number of the fourth power of the line drawn from the centre.

Let there be any regular figure of a greater number of ſides than four circumſcribed about a circle, and from any point in the circumference of the circle, let there be drawn perpendiculars to the ſides of the figure; 8 times the ſum of the fourth powers of the perpendiculars will be equal to 35 times the multiple by the number of the ſides of the figure, of the fourth power of the ſemidiameter of the circle.

Let there be any regular figure of a greater number of ſides than four circumſcribed about a circle, and from *any point* let there be drawn perpendiculars to the ſides of the figure, and likewiſe a right line to the centre of the circle; 8 times the ſum of the fourth powers of the perpendiculars will be equal to eight times the multiple by the number of the ſides of the figure of the fourth power of the ſemidiameter of the circle, together with 24 times the multiple by the ſame number of the fourth power of the line, whoſe ſquare is equal to the rectangle contained by the ſemidiameter, and the line drawn to the centre, together with 3 times the multiple of the fourth power of the line drawn to the centre of the circle by the number of the ſides of the figure.

And in general, let there be any regular figure circumſcribed about a circle; and let the number of the ſides of the figure be n, and let m be any number leſs than n; let r be the ſemidiameter of the circle; and from any point in the circumference of the circle let there be drawn perpendiculars to the ſides of the figure, the ſum of the m powers of the perpendiculars will be equal to $n \times \dfrac{1.\,3.\,5.\,7.\,.\,.\,2\,m - 1}{1.\,2.\,3.\,4.\quad .\,.\,.\,.\,m}$ $\times\, r m$, in which expreſſion the numbers in the numerator are to be continued, till the laſt number be equal to $2\,m - 1$ and are to be continually multiplied into one another, and thoſe in the denominator are to be continued till the laſt number be m, and are to be continually multiplied into one another.

Let there be any regular figure circumſcribed about a circle, and let n be the number of the ſides of the figure; let m be any number leſs than n, and let r be the ſemidiameter of the circle; and from any point (within the figure, if m be an odd number, but if even from any point either within or without) let there be drawn perpendiculars to the ſides of the figure; and likewiſe let there be drawn a right line to the centre of the circle, and let v be the line drawn to the centre; let a be the co-efficient of the third term of a binomial raiſed to the m power, b the co-efficient of the fifth term, c the co-efficient of the ſeventh term, and ſo on; the ſum of the m powers of the perpendiculars will be equal to $n\,r^m + n\,A\,v^2\,r^{m-2} \times n\,B\,v^4\,r^{m-4} \times n\,C\,v^6 r^{m-6} \times$, &c. ſubſtituting A for $a \times \frac{1}{2}$, B for $b \times \dfrac{1.3}{2.4}$, C for $c \times \dfrac{1.\,3.\,5}{2.\,4.\,6}$ and ſo on.

Let there be any regular figure inſcribed in a circle, and let the number of the ſides of the figure be n, and let m be any number leſs than n; let r be the ſemi-diameter of the circle; and from all the angles of the figure let there be drawn right lines to any point in the circumference of the circle; the ſum of the $2\,m$ powers of the chords will be equal $n \times \dfrac{1.\,3.\,5.\,7\ldots\ldots\ldots 2\,m - 1}{1.\,2.\,3.\,4\ldots\ldots\ldots\quad m} \times 2^m\, r^{2m}$, in which expreſſion the numbers in the numerator are to be continued till the laſt number be $2\,m - 1$, and are to be continually multiplied into one another; and thoſe in the denominator are to be continued till the laſt number be m, and are to be continually multiplied into one another.

Theſe and a number of other general theorems reſpecting the circle are not only demonſtrated by Mr. Glenie, in a conciſe and ſimple manner in the ſaid curious geometrical paper, but are derived as mere corollaries from a general inveſtigation, that extends not only to regular but alſo to irregular figures circumſcribed about, and inſcribed in, the circle; and from which may eaſily be deduced an endleſs number of theorems much more general than even thoſe of Dr. Stewart, that remained for 59 years undemonſtrated, and though publiſhed without demonſtrations were the principal cauſe of his being appointed ſucceſſor to the celebrated Mr. Maclaurin.

For the method of inſcribing within the circle, or deſcribing about it triangles, polygons, quadrilaterals, ſquares, trapeziums, &c., and the properties thence reſulting, ſee the ſeveral articles.

For the method of deſcribing a circle through three given points, ſee CHORD.

For the mode of obtaining a circle from the ſection of a cone; ſee CONIC SECTION.

CIRCLES, *parallel* or *concentric*, are ſuch as are equally diſtant from each other in every point of their peripheries; or are deſcribed from the ſame centre; as, on the contrary, thoſe ſtruck from different centres are ſaid to be *eccentric*.

CIRCLE, *arc of*. See ARC.

CIRCLE, *the quadrature of the*, or the manner of making a ſquare, whoſe ſurface is perfectly and geometrically equal to that of a circle, is a problem that has employed the geometricians of all ages. See the article QUADRATURE.

CIRCLE, *ſector of a*. See SECTOR.

CIRCLE, *ſegment of a*. See SEGMENT.

CIRCLES *of the higher orders*, are curves wherein $A\,P^m : P\,M^m :: P\,M : P\,B$, or, $A\,P^m : P\,M^m :: P\,M^n : P\,B^n$. *Plate* V. *Geometry*, *fig*. 71. When m and n are each equal to 1, then $A\,P : P\,M :: P\,M : P\,B$, which is a property of the common circle. *Cor*. I. Suppoſe $A\,P = x$, $P\,M = y$, $A\,B = a$: then will $P\,B = a - x$. And conſequently $x^m : y^m :: y : a - x$. Hence we have an equation that defines infinite circles, viz. $y^{m+1} = a\,x^m - x^{m+1}$; and another defining other infinite circles, viz. $y^{m+n} = \overline{a - x.}\rceil_{n} x^m$.

Cor. II. If $m = 1$, then will $y^2 = a\,x - x^2$; and therefore a circle of the firſt order is contained under this equation alone. If $m = 3$, the equation becomes $y^4 = x^3\,\overline{a - x}$ or $a\,x^3 - x^4$, which denotes a curve of the form A B (*fig*. 72). But when m denotes an even number, the curve will have two infinite legs; thus if $m = 2$, $y^3 = a\,x^2 - x^3$, which equation defines a circle of the ſecond order; and alſo one of Newton's defective hyperbolas, being his 37th ſpecies of curves, whoſe aſymptote is the right line E F (*fig.* 73), making an angle of 40° with the abſciſs A B.

CIRCLE *of curvature*, in *Geometry*, that circle the curvature of which is equal to that of any curve at a certain point. It is alſo called the circle of equi-curvature. See CURVATURE.

CIRCLES *of the ſphere*, are ſuch as cut the mundane ſphere, and have the periphery either on its moveable ſurface, or in another immoveable, conterminous, and equi-diſtant ſurface. Hence ariſe two kinds of circles, *moveable* and *immoveable*. The firſt are thoſe whoſe peripheries are in the moveable ſurface, and which therefore revolve with its diurnal motion, as the meridians, &c. The latter, having their periphery in the immoveable ſurface, do not revolve; as the ecliptic, equator, and its parallels, &c.

If a ſphere be cut in any manner, the plane of the ſection will be a circle, whoſe centre is in the diameter of the ſphere. Hence the diameter of a circle paſſing through the centre, being equal to that of the circle which generated the ſphere; and that of a circle which does not paſs through the centre, being only equal to ſome chord of the generating circle; the diameter being the greateſt of all chords; there hence ariſes another diviſion of the circles of the ſphere, *viz.* into *great* and *leſſer*.

CIRCLE, *great*, *of the ſphere*, is that which divides it into two equal parts, or hemiſpheres; having its centre in the centre thereof. Hence all great circles are equal, and cut each other into equal portions, or ſemicircles.

The great circles are the horizon, meridian, equator, ecliptic; the colures, and the azimuths; which ſee in their places.

CIRCLE, *leſſer*, *of a ſphere*, is that which divides the ſphere into two unequal parts, and has its centre in the axis of the ſphere, but not in the centre thereof. Theſe are uſually denominated from the great circles to which they are parallel; as parallels of the equator, &c.

CIRCLES *of altitude*, otherwiſe called *almucantars*, are leſſer circles parallel to the horizon, whence they are alſo called parallels of altitude, having their common pole in the zenith, and ſtill diminiſhing as they approach the zenith. They have their names from their uſe, which is to ſhew the altitude of a ſtar above the horizon.

Some have ſuſpected a variation in the apparent ſolſtitial altitudes of the ſun. Something of this kind was perceived by M. Caſſini in 1655, by means of the great gnomon in the church of St. Petronius at Bologna; which was further confirmed by other obſervations at the royal obſervatory at Paris. The variation obſerved by M. Caſſini, during the courſe of twenty-two years, only amounted to a few ſeconds. And by comparing the obſervation made by Pytheas at Marſeilles three hundred years before Chriſt, with another made by Caſſini in 1672 at the ſame place, it appears, that in two thouſand years time this difference of altitude has only amounted to a few minutes. V. Mem. Acad. Scienc. 1693, p. 180, ſeq. See ECLIPTIC. See alſo ALTITUDE.

CIRCLES *of declination*, are great circles interſecting each other in the poles of the world.

CIRCLE *of diſſipation*, in *Optics*. See the article DISSIPATION.

CIRCLES, *diurnal*, are immoveable circles, ſuppoſed to be deſcribed by the ſeveral ſtars, and other points of the heavens, in their apparent diurnal rotation round the earth.

Thus if a right line be conceived to be continued from the centre of a ſtar, perpendicular to the axis of the world, as far as the ſurface of the ſphere of the world, it will deſcribe a diurnal circle for it, in making one revolution about its axis. The diurnal circles are all unequal: the equator is the greateſt.

CIRCLE *equant*, in the *Ptolemaic Aſtronomy*, is a circle deſcribed on the centre of the equant. Its chief uſe is, to find the variation of the firſt inequality.

CIRCLES *of excurſion*, are leſſer circles parallel to the ecliptic, and at ſuch a diſtance from it, as that the excurſions of the planets towards the poles of the ecliptic may be included within them; being uſually fixed at about 10 degrees.

It may here be added, that all the circles of the ſphere above deſcribed, are transferred from the heavens to the earth; and thence come to have a place in geography, as well as in aſtronomy; all the points of each circle being conceived to be let fall perpendicularly on the ſurface of the terreſtrial globe, and ſo to trace out circles perfectly ſimilar to them. Thus, the terreſtrial equator is a line, conceived preciſely under the equinoctial line, which is in the heavens; and ſo of the reſt.

CIRCLES, *horary*, in *Dialling*, are the lines which ſhew the hours on dials; though theſe be not drawn circular, but nearly ſtraight.

CIRCLE, *horary*, *on the artificial globe*, a brazen circle fixed to the north pole divided into 24 hours, and furniſhed with an index, ſhewing the difference of meridians, and ſerving for the ſolution of many problems. The uſual poſition of this circle prevents the braſs meridian from moving quite round in the horizon; ſo that globes of the common ſort cannot be applied to the purpoſe above mentioned. Mr. Harris contrived to remedy this inconvenience, by placing two horary circles under the meridian, one at each pole; theſe are fixed tight between two braſs collars placed about the axis, but ſo that they may be eaſily turned by the hand when the globe is at reſt; and when the globe is turned, they are carried round with it, the meridian ſerving as an index to mark out the horary diviſion. The globe, thus prepared, will ſerve for ſolving problems in all latitudes, as well as in places near the equator. Philoſophical Tranſactions abridged, vol. viii. p. 352. See GLOBE.

CIRCLE *of illumination*, is that imaginary circle on the ſurface of the earth, which is formed by a plane paſſing through the centre of the earth, ſo that the line which joins the centres of the ſun and earth may be perpendicular to it, and which ſeparates the illuminated hemiſphere of the earth from the dark. This Mr. Keil calls the illuminated diſc of the earth; and all lines paſſing from the ſun to the earth, which are phyſically parallel, are perpendicular to the plane of this circle.

CIRCLES *of latitude*, or *ſecondaries of the ecliptic*, are great circles perpendicular to the plane of the ecliptic, paſſing through the poles thereof, and through every ſtar and planet. They are ſo called, becauſe they ſerve to meaſure the latitude of the ſtars, which is nothing but an arc of one of theſe circles, intercepted between the ſtar and the ecliptic.

CIRCLES *of longitude*, are leſſer circles, parallel to the ecliptic; ſtill diminiſhing, in proportion as they recede from it. On the arcs of theſe circles, the longitude of the ſtars is reckoned.

CIRCLE *of perpetual apparition*, one of the leſſer circles, parallel to the equator; deſcribed by any point of the ſphere touching the northern point of the horizon, and carried about with the diurnal motion. All the ſtars included within this circle never ſet, but are always viſible above the horizon.

CIRCLE *of perpetual occultation*, is another leſſer circle at a like diſtance from the equator, deſcribed by the ſouthern point of the horizon, and containing all thoſe ſtars which never appear in our hemiſphere.

The ſtars ſituate between theſe circles alternately riſe and ſet at certain times, during the diurnal rotation.

Circles, *polar*, are immoveable circles, parallel to the equator, and at a diſtance from the poles equal to the greateſt declination of the ecliptic, which is now 23° 28′.

That next the northern pole is called the *arctic*; and that next the ſouthern one the *antarctic*; which ſee reſpectively.

Circles *of poſition*, are circles paſſing through the common interſections of the horizon and meridian, and through any degree of the ecliptic, or the centre of any ſtar, or other point in the heavens; uſed for finding out the ſituation or poſition of any ſtar. They are uſually ſix in number; and cut the equator into twelve equal parts, which the aſtrologers call the *celeſtial houſes*. Hence ſome call them *circles of the celeſtial houſes*.

Circle, *arc* or *arch of a*. See Arch.

Circle, *axis of a*. See Axis.

Circle, *centre of a*. See Centre.

Circle, *eccentric*. See Eccentric.

Circle, *equal*. See Equal.

Circle, *fairy*. See Fairy.

Circle, *right*. See Right.

Circle, *ſegment of a*. See Segment.

Circles, *ſecondary*. See Secondary.

Circles, *vertical*, or *azimuths*. See Vertical, and Azimuth.

Circle, in *Logic*, that fault of an argument that ſuppoſes the principle it ſhould prove, and afterwards proves the principle by the thing it ſeemed to have proved.

Or, a circle in logic, called alſo *ſyllogiſtic circle*, is when the ſame terms are proved, *in orbem*, by the ſame terms; and the parts of the ſyllogiſm, alternately, by each other, both directly and indirectly.

Thus the papiſts argue, when they prove the Scriptures to be the word of God by the infallible teſtimony of their church, and the authority of the church by the Scripture.

There are two kinds of circles; the one *material*, the other *formal*.

The *formal* is that which in two reciprocal ſyllogiſms begs the medium, which is the next cauſe of the greater extreme. This kind is by no means to be admitted: otherwiſe the ſame thing becomes both prior and poſterior; the cauſe and effect of itſelf; which is abſurd.

The *material* circle, called alſo *regreſſus*, conſiſts of two ſyllogiſms, the former whereof proves the cauſe by the effect; and the latter the effect by the cauſe: this may be admitted.

Circle, Circulus, is underſtood among the ſchoolmen, of a viciſſitude of generations, ariſing one out of another. Thus, good concoction cauſes a good habit of body; a good habit of body produces ſtrength and vigour; theſe occaſion frequent exerciſes; and theſe a good concoction. It is a celebrated dogma of the Scotiſts, "There is no circle in cauſes of the ſame order, or kind."

Circles *of the empire*, are provinces, and principalities of the empire, compoſed of princes, prelates, counts, and imperial cities, poſſeſſing a provincial and partial juriſdiction, and aſſembled for the regulation of their common affairs. See Diet.

The diviſion of the empire into ſix circles was eſtabliſhed by Maximilian I. in 1500, at Augſburg; twelve years afterwards he divided it afreſh, into ten circles; which partition was confirmed by Charles V. at the diet of Nuremberg, in 1522.

Though the order of theſe circles has never been well regulated; yet, in the imperial matricula, it is as follows: the circle of Auſtria, that of Burgundy, that of the Lower Rhine, and that of Upper Saxony, which were the circles added in 1512, thoſe of Bavaria, Franconia, Suabia, Upper Rhine, Weſtphalia, and the Lower Saxony, the ſix that were firſt eſtabliſhed. Each circle, according to the laws of the empire, had its directors or ſummoning princes, and its commanding officer under the title of captain, colonel, or field marſhal, &c. It was the province of the firſt to convoke aſſemblies of the ſtates of each circle, and to direct and ſuperintend its concerns; and the latter had the command of the troops, and the care of the artillery and neceſſary ammunition in each circle. The ſtates of each circle were required to contribute to the exigencies of the empire, of which they were members, by a tax impoſed on them for maintaining the troops and defraying other expences, in proportion to the number of horſe and foot, and other neceſſary occaſions.

Circles *of judgment*, in *Antiquity*, were ancient monuments of the Runic kind, conſiſting of upright ſtones, found in all the Daniſh dominions, in Holſtein, Sleſwic, Jutland, the iſles, Norway and Iceland; and alſo in Sweden. They ſeem to have been erected at different ages; ſome are more ancient than the 11th century, and others as recent as the 15th. The druidical circles in Britain claim a much higher antiquity. See Druid.

CIRCOCELE. See Cirsocele.

CIRCOLO *mezzo*, in the *Italian Muſic*, is a diminution of four quavers or ſemiquavers, or notes of equal value, which repreſent a ſemicircle proceeding by conjoint degrees.

CIRCON, in *Mineralogy*. See Zircon.

CIRCUIT, in French *circuit* or *enceinte*, in *Fortification*, is the wall or rampart of ſtone or earth, or partly of both, or the dike, ditch, &c. which ſurrounds or encloſes any city, town, place, or ſpot of ground. This term is alſo applicable to the line or lines, which form the perimeter of any, being ſynonymous thereto.

Circuit, or Circuity, in *Law*, a longer courſe of proceeding, to recover the thing ſued for, than is needful.

Thus, if a man grant a rent-charge of 10 *l.* out of his manor, and after, the grantee diſſeiſeth the grantor of the ſame manor, who brings an aſſiſe, and recovers the land, and 20 *l.* damages; which being paid, the grantee brings his action for 10 *l.* of his rent, due during the time of the diſſeiſin, and which he muſt have had, if no diſſeiſin had been: this is called *circuity of action*; becauſe, as the grantor was to receive 20 *l.* damages, and to pay 10 *l.* rent, he might have received 10 *l.* only for damages, and the grantee have kept the other 10 *l.* in his hands, by way of retainer for his rent, and ſo ſaved his action, which appears to be needleſs. Terms de Ley.

Circuit is alſo the journey or progreſs the judges take, twice every year, through the ſeveral counties of England and Wales (except as in the caſes ſtated under *General* Assises), to hold courts, and adminiſter juſtice, where recourſe cannot ſo well be had to the king's courts at Weſtminſter.

Theſe were firſt eſtabliſhed, with ſome little difference, by Henry II.; who, with the advice of a great council of his prelates, earls, and barons, at Northampton, A.D. 1176, divided the whole kingdom into ſix parts, or circuits, and appointed three judges, learned in the law, to hold courts in each of theſe, by a commiſſion from the king, empowering them to hear and determine all cauſes not exceeding the value of one-half of a knight's fee, unleſs the matter was of ſuch importance or difficulty, as to require the judgment of the king's court in his royal preſence. Theſe juſtices itinerant took an oath, to adminiſter juſtice to all perſons with impartiality. They had alſo authority to judge in all criminal cauſes and pleas of the crown, and to tranſact a variety of other affairs for the public good. A ſmall change was made in this excellent inſtitution, A.D. 1179, by dividing the kingdom into four circuits, and allowing a greater number of judges to each of theſe circuits. It is eaſy to conceive how great a check the circuits of theſe judges, of ſuperior rank, knowledge, and integrity, muſt have given to the wantonneſs and partiality of the inferior courts, and how great an advantage they were to the people, by bringing juſtice within their reach. It muſt, however, be confeſſed, that though the honour of bringing this wiſe inſtitution to a ſettled ſtate is due to Henry II., there is ſufficient evidence that courts were held, occaſionally at leaſt, by itinerant judges in more ancient times. Madox, Hiſt. Excheq. p. 86—88. See JUSTICES *in eyre.*

Theſe were afterwards expreſsly ordained by *Magna Charta;* which, beſides prohibiting all denials or delays in the adminiſtration of juſtice, fixed the court of common pleas at Weſtminſter, that the ſuitors might be no longer haraſſed with following the king's perſon in all his progreſſes; and at the ſame time brought the trials of iſſues home to the very doors of the freeholders, by directing aſſiſes to be taken in the proper counties, and eſtabliſhing annual circuits.

Theſe circuits are now uſually made in the reſpective vacations after Hilary and Trinity terms; aſſiſes being allowed to be taken in the holy time of Lent by conſent of the biſhops at the king's requeſt, as expreſſed in ſtatute Weſtm. 1. 3 Edw. I. c. 51. See *General* ASSISES and JUSTICES *of Aſſiſe.* The ſeveral counties of England are divided into ſix circuits: viz. 1. *Midland;* containing the counties of Northampton, Rutland, Lincoln, Nottingham, Derby, Leiceſter, Warwick. 2. *Norfolk;* including Bucks, Bedford, Huntingdon, Cambridge, Norfolk, Suffolk. 3, *Home;* comprehending Hertford, Eſſex, Kent, Suſſex, Surrey. 4. *Oxford;* containing Berks, Oxford, Hereford, Salop, Glouceſter, Monmouth, Stafford, Worceſter. 5. *Weſtern;* including Southampton, Wilts, Dorſet, Cornwall, Devon, Somerſet. 6. *Northern;* comprehending York, Durham, Northumberland, Cumberland, Weſtmorland, Lancaſhire. Two judges are appointed to each circuit. In Wales there are two circuits, viz. North and South Wales. In Scotland there are three circuits, viz. South, Weſt, and North, which the lords of juſticiary go twice a year, *viz.* in May and October, for trial of crimes only: though, by a recent ſtatute, they have an appellate juriſdiction in civil caſes under 12 *l.* See JUSTICIARY.

CIRCUIT, *electrical,* denotes the courſe of the electric fluid from the charged ſurface of an electric body, to the oppoſite ſurface into which the diſcharge is made. Some of the firſt electricians apprehended, that the ſame particles of the electric fluid which were thrown on one ſide of the charged glaſs, actually made the whole circuit of the intervening conductors, and arrived at the oppoſite ſide; whereas Dr. Franklin's theory only requires, that the redundancy of electric matter on the charged ſurface ſhould paſs into the bodies, which form that part of the circuit which is contiguous to it, driving forward that part of the fluid which they naturally poſſeſs, and that the deficiency of the exhauſted ſurface ſhould be ſupplied by the neighbouring conductors, which form the laſt part of the circuit. On this ſuppoſition, a vibrating motion is ſucceſſively communicated through the whole length of the circuit. This circuit is always formed of the beſt conductors, let the length of it be ever ſo great. Many attempts were made both in France and England, at an early period in the hiſtory of electricity, to aſcertain the diſtance to which the electric ſhock might be carried, and the velocity of its motion. The French philoſophers, at different times, made it to paſs through a circuit of 900 toiſes, and even of 2000 toiſes, or about two Engliſh miles and a half; and they diſcharged the Leyden phial through a baſon of water, the ſurface of which was about an acre. And M. Monnier found, that, in paſſing through an iron wire of 950 toiſes in length, it did not ſpend a quarter of a ſecond: and that its motion was inſtantaneous through a wire of 1319 feet. In 1747, Dr. Watſon, and other Engliſh philoſophers, after many experiments of a ſimilar kind, conveyed the electric matter through a circuit of four miles; and they concluded from this and another trial, that its velocity is inſtantaneous, or, as we may ſuppoſe, too rapid to be meaſured. Prieſtley's Hiſt. of Electricity, vol. i. ſect. 2. p. 128. 8vo. ed. 1775. See ELECTRICAL *ſhock.*

CIRCUITORES. See AGONISTICI.

CIRCULAR, any thing that is deſcribed, or moved in a round; as the circumference of a circle, or the ſurface of a globe. The circular form is of all others the beſt diſpoſed for motion, and the moſt capacious. The modern aſtronomers ſhew, that the heavenly bodies do not move in circular, but in elliptic orbits. See PLANET, &c.

CIRCULAR *Arcs.* See ARCH.

CIRCULAR *Inſtrument of Reflection,* or *Multiplying Circle,* in *Navigation.* See CIRCLE.

CIRCULAR *Letter,* a letter directed to ſeveral perſons, who have the ſame intereſt in ſome common affair: as in the convocation of aſſemblies, &c.

CIRCULAR *Lines,* an appellation given by ſome to ſuch ſtraight lines as are divided by means of the diviſions made in the arc of a circle. Such are SINES, TANGENTS, SECANTS, &c.

CIRCULAR *Numbers,* are ſuch whoſe powers end in the roots themſelves; as 5, whoſe ſquare is 25, and cube 125. See NUMBER.

CIRCULAR *Parts, Neper's,* or *Napier's,* are the complements of the two oblique angles of a right-angled ſpherical triangle, the complement of the hypothenuſe, and the two legs, by having any two of which the third is known.

Napier, in his treatiſe, entitled, "Logarithmorum Canonis Deſcriptio," gave a general rule, with regard to theſe circular parts, which is as follows: *viz.* "The rectangle under the radius, and the ſine of the middle part, is equal to the rectangle under the tangents of the adjacent parts, and to the rectangle under the coſines of the oppoſite parts." The right angle, or quadrantal ſide, being neglected, the two ſides, and the complements of the other three parts, are called the circular parts, becauſe they follow each other, as it were, in a circular order. If any one of theſe be fixed upon as the middle part, thoſe that are next to it are the adjacent, and thoſe that are fartheſt from it are the oppoſite parts. This excellent rule, conciſe and yet comprehenſive, includes all the particular rules for the ſolution of right-angled ſpherical triangles, and may be eaſily applied to oblique ſpherical triangles, by letting fall a perpendicular, thoſe two caſes excepted in which either the three ſides or the three angles are given; and for theſe a ſimilar expedient has been deviſed by lord Buchan and Dr. Minto. M. Pingré, in the "Memoires de Mathematique et de Phyſique," for 1756, reduces the ſolution of all the caſes of ſpherical triangles to four analogies; which, in reality, are Napier's circular parts, under another form, together with his ſecond or fundamental theorem, applied to the ſupplemental triangle. Theſe analogies are very difficult to be retained in the memory; and, therefore, Napier's rule, which is ſo eaſily remembered, ought to be preſerved under its preſent form. Indeed, it cannot be eaſily forgotten, provided that one circumſtance be regarded; *viz.* that the ſecond letters of the words "tangents" and "coſines" are the ſame with the firſt of the words "adjacent" and "oppoſite." Moreover, the rule for reſolving the two caſes of ſpherical triangles, to which the former rule is inapplicable, may be thus expreſſed: "Of the circular parts of an oblique ſpherical angle, the rectangle under the tangents of half the ſum and half the difference of the ſegments at the middle part (formed by a perpendicular drawn from an angle to the oppoſite ſide) is equal to the rectangle under the tangents of half the ſum and half the difference of the oppoſite parts." By the circular parts of an oblique ſpherical triangle are meant its three ſides and the ſupplements of its three angles. Any one of theſe ſix being aſſumed as a middle part, the oppoſite parts are thoſe two of the ſame denomination with it; *e. g.* if the middle part is one of the ſides, the oppoſite parts are the other two; and if the middle part is the ſupplement of one of the angles, the oppoſite parts are the ſupplements of the other two. Farther, ſince every plane triangle may be conſidered as deſcribed on the ſurface of a ſphere of an infinite radius, theſe two rules may be applied to plane triangles, provided that the middle part be reſtricted to a ſide. Thus it appears, ſays lord Buchan, in his "Life of Napier," that two ſimple rules ſuffice for the ſolution of all the poſſible caſes of plane and ſpherical triangles. Theſe rules, from their neatneſs, and the manner in which they are expreſſed, cannot fail of engraving themſelves deeply on the memory of every one who is a little verſed in trigonometry. It is a circumſtance, he adds, worthy of notice, that a perſon of a very weak memory may carry the whole art of trigonometry in his head. See PART, TRIANGLE, and TRIGONOMETRY.

CIRCULAR *ſailing*, the method of navigating a ſhip upon the arch of a great circle of the globe. See GREAT CIRCLE SAILING.

This mode of ſailing has been theoretically recommended, becauſe the neareſt diſtance between two places on the globe is the arc of a circle, and becauſe it is of importance that a ſhip ſhould arrive at its deſtined port by the ſhorteſt courſe. As in Mercator's ſailing, the ſolution of caſes is performed by plane triangles, ſo in this method of ſailing caſes are reſolved by means of ſpherical triangles; but theſe latter ſerve rather for exerciſes in the ſolution of ſpherical triangles than for any uſeful purpoſes of navigation. See SAILING.

CIRCULAR *ſcale*. See SCALE.

CIRCULAR *ſegment, reſiſtance of*. See RESISTANCE.

CIRCULAR *ſpots* are made on pieces of metal by large electrical exploſions. See experiments and obſervations upon them in Dr. Prieſtley's Hiſtory of Electricity, vol. ii. ſect. 9. ed. 8vo. and Phil. Tranſ. vol. lviii. p. 68.

Theſe beautiful ſpots, produced by the moderate charge of a large battery diſcharged between two ſmooth ſurfaces of metals, or ſemi-metals, lying at a ſmall diſtance from each other, conſiſt of one central ſpot and ſeveral concentric circles, which are more or leſs diſtinct, and more or fewer in number, as the metal upon which they are marked is more eaſy or difficult of fuſion, and as a greater or leſs force is employed. They are compoſed of dots or cavities, which indicate a real fuſion. If the exploſion of a battery, iſſuing from a pointed body, be repeatedly taken on the plain ſurface of a piece of metal near the point, or be received from the ſurface on a point, the metal will be marked with a ſpot, conſiſting of all the priſmatic colours diſpoſed in circles, and formed of the ſcales of the metal ſeparated by the force of the exploſion.

CIRCULAR *velocity*, a term in *Aſtronomy*, ſignifying the velocity of a planet, or revolving body, which is meaſured by the arch of a circle; as ſuppoſe by A B, *Plate, Aſtronomy, fig.* 11.) deſcribed on the centre of attraction S.

The circular velocity of a body moving from B to C is meaſured by the arc B C.

CIRCULAR *winding-ſtairs*. See STAIRS.

CIRCULATING DECIMALS. See REPETEND.

CIRCULATION, the act of moving round, or in a circle. See the following articles.

CIRCULATION *of the blood*, in *Anatomy*, is the courſe which this fluid purſues in the heart and lungs, and in the blood-veſſels of the body. This courſe is very juſtly named a circulation, inaſmuch as the blood is always paſſing round in the ſame track, and its motion conſtantly tends to the point from which it began.

The word *circulation*, when uſed abſolutely, comprehends the whole courſe of the blood, as well in the lungs as in the arteries and veins of the body at large.

The *greater circulation* is the paſſage of the blood from the left ſide of the heart, through the arteries, to the extremities of the body, and its return through the veins to the right ſide of the ſame viſcus.

The *leſſer circulation* is the tranſmiſſion of the blood from the right to the left ſide of the heart, through the lungs.

The uſes of the blood in the animal economy are ſo numerous and important, that every circumſtance relating to its properties, or to the laws of its motion, cannot be too carefully inveſtigated by the phyſiologiſt and practitioner.

By filling the veſſels with ſubtle fluids after death, it appears that the blood is copiouſly diſtributed to every part of the ſyſtem, at leaſt with a very few exceptions, as the inſenſible coverings of the body, the ſubſtance of the teeth, &c. and common experience muſt have convinced every perſon of the ſame fact, for hardly any part can be wounded with the point of the fineſt needle without a flow of blood being produced. This fluid does not, however, as the ancients thought, move backward and forward in one order of veſſels, but is carried, in a circulatory courſe, from the heart to all parts of the body by the arteries, and is thence returned to the ſame part by the veins.

In a ſyſtematic account of this ſubject, we ſhould firſt conſider the ſtructure of the heart and blood-veſſels, and the powers by which they are enabled to receive and to propel the blood, we refer the reader for a more complete account of theſe points to the articles HEART, ARTERY, VEIN.

The arteries receive the blood from the heart, and diſtribute it to all parts of the body. Theſe veſſels are in general leſs capacious than the veins, but of a more ſolid and compact texture; they are highly elaſtic, and probably poſſeſſed of conſiderable muſcular powers. All the arteries of the body are derived from one of two trunks: 1ſt, the pulmonary artery, which, ſpringing from the right ventricle, ramifies through the lungs; 2dly, the aorta, which, commencing from the left ventricle, is diſtributed over the whole body. The arteries, after their various ramifications and anaſtomoſes, terminate by communicating with the origins of the veins; ſo that the blood returns towards the heart in a continuous canal, in which there are no obvious marks of diſtinction to define the limits between the two orders of veſſels.

The ſtructure of the veins ſoon becomes clearly diſtinguiſhed from that of the arteries; they poſſeſs no muſcularity; they are much more capacious; leſs conſtant in their courſe and diviſions; weaker in their texture; and leſs elaſtic than the latter veſſels. They are alſo generally characterized by the poſſeſſion of valves, which prevent the return of blood towards their extremities. There are ſeven large venous trunks opening into the two auricles of the heart. The ſuperior and inferior venæ cavæ return the blood from the upper and lower parts of the body to the right or anterior auricle; the coronary vein pours into the ſame cavity that which has circulated through the ſubſtance of the heart itſelf. The two right and two left pulmonary veins diſcharge, into the left or poſterior auricle, the blood which has paſſed through the lungs.

The heart is placed in the centre of the ſanguiferous ſyſtem, and is endowed with great muſcular power, by which it is enabled to diſtribute and circulate the blood through the two orders of veſſels which we have now deſcribed. The trunks of the circulating tubes meet together in this part, which is the firſt mover of the whole animal frame, and ſuſtains, by a perpetual and truly wonderful power, this primary vital function, from the ſecond or third week after conception to the laſt period of our exiſtence.

This organ alternately receives and propels the blood. That which has circulated through the body enters the right auricle by the ſuperior and inferior venæ cavæ; the coronary vein pours into the ſame cavity the blood which has ſupplied the heart itſelf. The right auricle propels this, which is venous blood, through the anulus venoſus into the right or pulmonary ventricle, and it goes from this cavity to circulate through the lungs by the pulmonary artery. It is again brought to the heart by the four pulmonary veins, which open into the left auricle. It becomes changed from the ſtate of venous to that of arterial blood, by the expoſure to the atmoſpheric air, which takes place in its circulation through the lungs; for an account of which change ſee Respiration. From the left auricle it paſſes through the left anulus venoſus, into the ventricle of the ſame ſide, and is thence expelled by the aorta into the arterial ſyſtem of the whole body. From the minute arteries it enters the origins of the venous ſyſtem, and is again poured into the heart by the three venous trunks, which we have already mentioned.

This paſſage of the blood through the cavities of the heart is regulated and maintained in an undiſturbed ſucceſſion by valves placed at the different openings, which prevent all reflux of the circulating fluid. See the account of the *ſtructure of the* Heart.

Having thus deſcribed the courſe of the blood, we think it right to ſubjoin the proofs and experiments on which it is ſupported; although the fact of the circulation has been ſo long admitted, and is now ſo generally eſtabliſhed, that the enumeration may to ſome perſons appear ſuperfluous.

The courſe of the blood through the heart, *i. e.* from the right auricle to the left ventricle, by the medium of the lungs, is manifeſt from the ſtructure of the heart itſelf. The valves, which are placed at its various apertures, actually will not admit of the blood's motion in any other direction than what we have deſcribed.

That the blood paſſes from the heart into the trunk of the aorta, thence into its branches, and ſo on to the moſt minute ramifications, is evinced: 1ſt, by the effect of ligatures on theſe veſſels: the artery becomes turgid between the heart and the ligature, and empty between the ligature and its diſtribution. 2dly, By opening an artery, when tied, above and below the ligature: the blood in this caſe flows only from the opening which is neareſt to the heart. 3dly, By ocular teſtimony: the paſſage of the blood can be ſeen with the aid of glaſſes in frogs, fiſhes, &c.

The paſſage of the blood through the veins, in a contrary courſe to that, in which it flows along the arteries, *i. e.* from the minute ramifications towards the trunks, and thence to the heart, is proved; 1ſt, By the ſtructure and diſpoſition of the valves, which afford an invincible impediment to all retrograde motion. 2dly, By ligatures on theſe veſſels, which make the vein turgid between the extremities of the body and the ligature, and empty in the reſt of its courſe. 3dly, By opening a vein, when tied, above and below the ligature. 4thly, By microſcopical obſervation in the lower animals.

The paſſage of the blood from the arteries into the veins ſeems to flow as a corollary, from what we have ſtated concerning the proofs of its courſe in theſe two ſyſtems of veſſels. We have ſhewn that the ultimate arteries are continuous with the origins of the veins; that the blood moves from the heart to the extremities in the former veſſels, and that it paſſes from the extremities to the heart in the latter. The intermediate paſſage is a direct conſequence of theſe facts. But it may be demonſtrated by inconteſtible proofs independently of this argument. If we tie the artery of a part, its correſpondent vein receives no blood; if we take off the ligature, the vein is again filled. The quantity of blood expelled from the aortic ventricle is ſo conſiderable, that the ſupply can only be kept up by a return of this blood to the heart. We calculate that two ounces of blood are expelled from the heart at each pulſation; if we ſuppoſe eighty pulſations in a minute, 9600 ounces will be thrown into the aorta in an hour, and 14400 lbs. in a day. The ſame blood therefore which the aorta received from the heart muſt return to this viſcus; and the only paſſage by which it can return is through the veins. Nearly the whole blood of the body will be diſcharged from a wound of a ſingle artery or vein. Laſtly, the paſſage of the blood from the arteries into the veins may be proved by the direct teſtimony of the ſenſes in living animals. The uſe of the microſcope affords this proof in the tranſparent parts of cold-blooded animals, as the meſentery and web of the foot in frogs, the tail of fiſhes, &c.

The motions of any part of the heart, conſidered ſingly and individually, conſiſt in a conſtant ſeries of alternate contractions and dilatations; or, as they are technically named, alternate ſtates of *ſyſtole* and *diaſtole*. The contractions take place as in any other muſcles: the dilating cauſe conſiſts in the forcible entrance of blood into the cavity. The auricles and ventricles, when viewed in relation to each other, are ſucceſſively contracted and dilated; the correſponding parts acting at the ſame time on both ſides of the heart. Thus, when the auricles contract, in order to expel the blood which they have juſt received from the ſyſtem at large, and from the lungs, the ventricles are relaxed, and therefore in a ſtate fit for receiving this blood. When, in the following moment, the recently filled ventricles contract, in order to urge forwards the blood into the two arterial trunks, the auricles are relaxed, and become immediately diſtended by the current of venous blood. The action of the heart, and of the veſſels connected with it, may therefore be diſtributed into ſucceſſive periods. In the firſt of theſe, the venæ cavæ and pulmonary veins pour their blood into the two auricles, and thus cauſe a diaſtole of theſe cavities. The ſyſtole of the auricles tranſmits the blood into the ventricles in the ſecond period; and theſe latter cavities expel their contents into the arteries in the third portion of time. Thus the action of the veins takes place at the ſame point of time with that of the ventricles; and the contraction of the auricles is ſynchronous with that of the arteries.

The ſyſtole of the ventricles, which is ſuppoſed to occupy one third of the time of the whole pulſation of the heart, is accompliſhed by an approximation of the ſides of the cavities to the middle partition, and of the apex to the baſis of the heart. The whole viſcus by this means becomes ſhorter and more obtuſe. The well known fact of the heart's ſtriking againſt the left breaſt in its contraction, may ſeem on the firſt glance to refute this account of the ſyſtole of the ventricles. But, on a further examination, it can have no ſuch effect;

ſince the phenomenon in queſtion depends on two cauſes amply ſufficient to produce the effect, which have been long ago explained by Ferrein and Senac. (See Queſtiones Medicæ, 12.—Monſpelii, 1732.—Anatomie de Heiſter avec des Eſſais de Phyſique. Traité de la Structure du Cœur, tom. i. p. 354, et ſeq.) The ſwelling of the auricles, which are at the back of the heart, and particularly of the left auricle, which is interpoſed between the ſpine, and the baſe of the left ventricle, neceſſarily cauſes the point of the heart to advance towards the ſide; and this motion may be imitated in the dead body by injecting or inflating the auricles. The other cauſe conſiſts in the connection of the large arteries, particularly of the aorta, with the baſe of the heart. A curved and flexible tube, when ſuddenly diſtended, becomes in ſome meaſure ſtraightened. Thus when the blood is impelled into the aorta, the curve of that veſſel approaches more nearly to a ſtraight line. Its poſterior end being firmly attached to the vertebræ, is immoveable; to its anterior and moveable part is fixed the heart, which, by the ſtraightening of the veſſel, is obliged to deſcribe a portion of a circle, in doing which the apex ſtrikes againſt the ſide. Theſe two circumſtances occur ſimultaneouſly; the venous blood ruſhes into the auricles, at the ſame time that the contraction of the ventricle fills the aorta.

The impulſe of the blood expelled by the ſyſtole of the aortic ventricle is felt in the whole arterial ſyſtem; and it produces, in all arteries which come within the ſphere of the touch, and which have an area of not leſs than one ſixth of a line in diameter, an obvious and perceptible effect, called the pulſe, which is a real ſtate of diaſtole of the artery, and which is aſcertained to correſpond exactly, and to be perfectly ſynchronous with the ſyſtole of the heart. The number of pulſations in a given ſpace of time varies infinitely in healthy perſons. Age is the chief cauſe of theſe varieties: but other circumſtances, which conſtitute the peculiar ſtate of health of each individual, have conſiderable effect; ſo that no ſtandard can be ſettled which ſhall prove generally correct. The following numbers afford, we believe, as near an approximation as can be expected amidſt ſo much uncertainty; they will ſerve at leaſt as a comparative view in ſubjects of different ages.

The heart of an infant, ſleeping tranquilly, performs, in the firſt days of exiſtence, about 140 pulſations in a minute. At the end of the firſt year the pulſations are in the ſame ſpace of time about 124:

At the end of the ſecond year	110
——— third and following years	96
——— ſeventh and following	86
——— time of puberty	80
——— age of manhood	75
——— ſixtieth year	65

beyond which time the variations are very great.

The female ſex are obſerved, *ceteris paribus*, to have a more frequent pulſe than the male; and ſhort perſons exceed tall ones in this reſpect. It is alſo remarked, that the inhabitants of cold climates have ſlow pulſes. It is moſt familiarly known that the pulſe is accelerated by taking a meal, by the act of coition, by exerciſe of the body, or affections of the mind. The latter cauſes, indeed, if carried to a conſiderable extent, produce moſt vehement palpitations of the heart. In ſaying thus much of the pulſe, we have thought it more natural to refer it to the heart, which is its ſource, than to the arteries, in which it is commonly examined.

It has been queſtioned, whether the heart expels the whole of the contained blood in its ſyſtole. It ſeems probable that this is the caſe in a healthy animal; although it has been denied on the faith of experiments. We muſt be cautious in applying inferences, drawn from the interrupted and diſordered action of the heart of an animal, expiring under the torture of an experiment, to the living functions of the viſcus. If any blood remains in the ventricle, it excites a conſtant contraction of the cavity. In ſome cold-blooded animals, and in the incubated chick, the heart is obſerved to become completely pale in its ſyſtole, which proves an entire evacuation of the ventricles.

The pulſations of the heart proceed in a regular and continued ſucceſſion to the laſt period of life: and then all its parts do not ceaſe to act at once. But the right auricle and ventricle ſurvive the oppoſite cavities for ſome little time; ſo that the former part has been called the *ultimum moriens*. The blood which returns by the venæ cavæ, after the laſt expiration, no longer finds the uſual paſſage through the lungs, which are contracted, but it is ſtill urged on from behind by that which the aorta has recently propelled. Hence, it is forced into the right auricle, and excites contraction in that part by the ſtimulus of its preſence, ſome time after the left ſide has been at reſt. This congeſtion on the right ſide of the heart in the laſt agony, explains the empty ſtate of the arteries, particularly the larger ones, after death. Sabatier has aſcribed to the ſame cauſe, the greater relative capacity of the right ventricle and auricle of the adult heart. (See Mémoire ſur l'inégale capacité des cavités du cœur, et des vaiſſeaux pulmonaires, in his Traité complet d'Anatomie, tom. iii.) The appearance, which we are now alluding to, does not admit of explanation from any circumſtances connected with the healthy functions of the heart and lungs; yet Sabatier's ſtatement can hardly be received as completely ſatisfactory. For, not to mention that we ſeldom find theſe cavities actually diſtended, this explanation ſuppoſes the veins to pour the blood into the heart, with greater force than the ventricle can exert in reacting; which does not appear probable from comparing the ſtructure of the two parts. The facts, however, contained in the memoir above-mentioned deſerve attention: it is ſtated that, by opening the venæ cavæ, and tying the aorta, which prevents accumulation of blood on the right, and cauſes it on the left ſide of the heart, the left cavities will be found after death to exceed the capacity of the right. This experiment would have been more convincing, had the difference been aſcertained with certainty and correctneſs, inſtead of reſting on the inaccurate ground of a mere inſpection.

The longer duration of action in the right, than in the left cavities of the heart, is to be aſcribed ſolely to the circumſtance of the former parts continuing to receive blood, after the latter are completely evacuated. Hence, if an experiment be inſtituted, in which theſe conditions ſhall be reverſed; the prerogative of *ultimum moriens* will be transferred to the left cavities. Haller has produced this effect: he opened the venæ cavæ, preſſed out the blood from the right cavities, and tied thoſe veins. He made a large aperture in the pulmonary artery, in order to evacuate more completely the right ventricle. The pulmonary veins were left untouched; but the aorta was tied. Thus the right auricle and ventricle were evacuated, while the blood was received and retained in the oppoſite cavities. By this means the right auricle and ventricle remained in action, long after all contraction of the left cavities had ceaſed. See Elementa Phyſiologiæ, lib. iv. ſect. 5. § 14.

It is hardly poſſible to determine the velocity of the blood's motion in the healthy ſtate; for individuals differ from each other in this reſpect; and conſiderable variety probably takes place in different parts of the body. It is generally ſuppoſed, that the blood flows in a more gentle ſtream through the ſmall arteries than in the arterial trunks; and that the velocity of its current is ſomewhat leſs in the veins, than in the arteries of the body. Theſe differences have, however, been exaggerated by former phyſiologiſts. The mean velocity of the blood in the aorta is calculated at eight inches for each pulſation; which gives about 50 feet in a minute. If we reflect that the ſyſtole of the ventricle, which gives this whole impulſe to the blood, occupies only one third of the whole pulſe, the velocity of the blood's motion muſt be trebled in that diviſion of the time. It is ſaid that this velocity, which we have aſſigned to the blood's motion at its departure from the heart, becomes ſpeedily diminiſhed in its further progreſs; and the diminution has been deduced from various cauſes. The firſt and moſt powerful of theſe is the conſtantly increaſing area of the branches, when compared with the trunk of an artery. See ARTERY.

It is a well known law in hydraulics, that the velocity of a fluid paſſing through an inverted cone conſtantly decreaſes, and that the diminution of velocity is in the ratio of the increaſe of area. The mathematical phyſiologiſts have alſo noticed the effects of friction; deducing theſe from a compariſon with the courſe of fluids in dead tubes. Other cauſes have been deduced from the ſame ſource; hence the ſerpentine courſe of ſome arteries, the unfavourable angles by which they ſometimes ariſe, and their communications with each other are enumerated among the circumſtances, which retard the courſe of the arterial blood. But it muſt be remembered, that in viewing theſe retarding cauſes, we are conſidering their action on the blood, as if this fluid were contained in inanimate tubes; and influenced merely by the contraction of the heart; without taking into account any acceſſory impulſe, which may be, and moſt probably is, derived from the arteries. This retardation has been variouſly eſtimated by different calculators; who have all made it very conſiderable. Hales ſuppoſes the blood to flow through the capillary arteries of a frog, at the rate of two-thirds of an inch in a minute; which will be about 650 times ſlower than in the human aorta. ("Statical Eſſays," vol. ii. p. 66.) Robinſon and Whytt have gone ſtill farther; the former ſtating that the velocity of the blood's motion in the aorta, is to that in the ſmalleſt veſſels, as 1100 to 1. ("Diſſertation on the Food and Diſcharges of Human Bodies.") We mention theſe calculations to ſhew what abſurdities have been committed by men of the greateſt abilities, when they have applied the laws which regulate the properties of dead matter to the living functions of the animal machine. Haller's "Obſervations on the Circulation in living Animals," entirely overthrow theſe calculations. ("Elementa Phyſiologiæ," lib. 6. ſect. i. § 30.) He found by his microſcopical experiments, that the blood flowed generally as rapidly through the ſmall as through the larger veſſels. He ſtates alſo, that in living animals it is poured out as far from a ſmall as from a large artery. The numerous and diverſified experiments of Spallanzani, afford additional evidence of the ſame truth, and throw conſiderable light on the whole ſubject. The reſults of his experiments are ſo concluſive, that we preſent them to the reader in his own words: "I did not find that the blood, in paſſing out of the middle-ſized arteries into their branches, experienced the leaſt retardation from any difference in the capacity of theſe veſſels, or the numerous angles which they formed with one another; neither did the mode of the circulation, whether languid or ſtrong, oſcillatory or intermittent, appear to be at all affected by the multiplicity of natural and artificial curvatures, or the flexures and convolutions made by the different ramifications. When the ſtrength of the animal was not impaired, the blood in the ſmall arteries moved very rapidly, and with nearly an equal velocity; but when, on the contrary, it had been exhauſted, or in an unhealthy ſtate, the circulation was carried on with the ſame celerity in the middle ſized arteries; whilſt it began to abate in the ſmall arterial ramifications, and ſtopped ſooner or later in proportion to their diſtance from the heart. The united reſults of theſe experiments diſplay, in a ſtriking point of view, the true motion of the blood from the origin to the termination of the arteries, which was hitherto only conjectural, and ſubject to frequent diſputes, from the want of a ſufficient number of experiments. Theſe facts, beſides, confirm the ſage maxim of Haller, reſpecting the caution with which we ought to apply mechanical principles to the animated ſyſtem; for, in fact, if the animal machine be ſtrictly ſubject to hydraulic laws, why do they not produce the ſame effects in the vaſcular ſyſtem, as in common tubes? Whilſt, however, we acknowledge that theſe laws muſt exert an influence upon the phenomena of the circulation, we contend that their power is counterbalanced by oppoſite cauſes, inherent in the ſanguiferous ſyſtem." ("Experiments upon the Circulation of the Blood throughout the Vaſcular Syſtem, by the Abbé Spallanzani," p. 259.)

We have ſtated, that the blood is thrown into the arteries, by ſeparate contractions of the heart; yet theſe veſſels are conſtantly full, as may be proved by opening them during the heart's diaſtole. For the blood flows on in ſuch a way, that the ſubſequent quantity diſcharged from the right ventricle, overtakes that which is before, and thus cauſes the pulſation of the arteries. The exceſs of velocity in the blood, coming from the heart, over that contained in the arteries, becomes conſtantly leſs; and at a certain point ceaſes altogether. Here the pulſe ceaſes alſo. Hence in microſcopical obſervations on the courſe of the blood in ſmall veſſels, its ſtream appears to be uniform: and it is commonly ſtated, that the pulſation ceaſes in veſſels of about one-ſixth of a line in diameter.

The motion of the blood in the minute veins, ſeems to be equal in velocity to its courſe in the ſmall arteries; this velocity increaſes in the larger trunks; and there is a conſtant acceleration in the blood's courſe until it arrives at the heart. This fluid is paſſing through tubes which conſtantly decreaſe in area; and it follows of neceſſity, that by diminiſhing the channel of a fluid, its courſe muſt be accelerated. Hence ~~the~~ trunks of the venæ cavæ return to the heart, within a given time, as much blood, as the aorta carried out of this viſcus.

The motion of the blood along the veins muſt be derived from the impulſe, which it receives from the heart, and from the action (if there be any) of the arteries. Its circulation in theſe veſſels is aided by the contraction of the muſcles, which muſt urge on the contained fluid towards the heart; ſince their valves prevent any retrograde motion.

The return of the venous blood is affected by reſpiration. It appears in living animals, that the large veins become turgid during expiration; either from the obſtruction of the blood's courſe through the lungs, or in conſequence of its reflux from the heart; they are evacuated in inſpiration. In this latter ſtate the depletion of the veins cauſes the brain to ſubſide; whereas in expiration the retention of the blood produces diſtention and ſwelling of the viſcus.

As the motion of the blood in the veins is not derived from any immediate force, it is conſiderably affected by gravity; in ſpite of the valves, which counteract this influence conſiderably. The experiments of Haller and Spallanzani have ſhewn this fact in cold-blooded animals. It is evinced alſo by various phenomena in the human ſubject; viz. varices of the legs, ſwelling of the feet after the erect poſition has been long preſerved, &c.

Some very curious and intereſting phenomena have been obſerved in experiments on living animals, and referred to a general principle termed derivation; in conformity with which it appears that the blood flows rapidly towards any quarter, from which the uſual preſſure is removed. The experiments of Haller and Spallanzani have much illuſtrated this ſubject, which is of the greateſt importance in a practical view. (See Haller's "Elementa Phyſiologiæ," lib. 6. ſect. 1. § 40. Spallanzani's "Experiments on the Circulation, &c." p. 386, et ſeq.) The blood ruſhes from all quarters towards an inciſion in a vein or artery; it forſakes the neighbouring trunks and branches; it is diſcharged both in the direction of the circulation, and in a retrograde courſe; it moves againſt the force of gravity, as well as contrary to its uſual current. When the blood ſtagnates in an animal ſubmitted to experiment, it flows again through an opening made in an artery or vein. The blood in the artery, correſponding to the vein that is opened, recovers or accelerates its courſe according to the ſtagnation or velocity which it poſſeſſed before the operation. An inciſion into the heart has the ſame effect; the blood flows out at the opening both from the arteries and veins. The ſwelling of a part under a cupping glaſs is probably derived from the principle which we have now deſcribed.

When the circulation ceaſes before death, it appears to ſtop firſt in the ſmall veſſels; and this ſtagnation is propagated towards the heart. "The arterial blood," ſays Spallanzani, in ſpeaking of the phenomena of languid circulation, "which at firſt had an uniform courſe, loſt more or leſs quickly its equilibrium, and abated in velocity at each diaſtole of the heart; to this abatement ſoon ſucceeded a complete ſtagnation, except during the ſyſtole, when the blood preſerved ſome remains of motion, which however diſappeared by degrees. Thus the circulation ceaſed in the arteries by a ſucceſſive and gradual diminution of momentum, without any flux or reflux, intermittent or vibratory motion. The motion of the blood in the veins, ceaſed in the ſame gradual manner; and theſe different phenomena were alike evident in the arterial and venous fluid of cold and warm-blooded animals." P. 383.

It has been ſtated that the globules of the blood paſs more in the axis of the veſſel than the other parts of this fluid. This circumſtance has been deduced from an abſurd application of the laws of hydraulics to the circulation, and is not founded on any actual obſervation in living animals.

It appears alſo, from experimental inquiries on the ſubject, that we are not warranted in aſſigning to the blood any inteſtinal motion, in addition to the regular and uniform progreſſion, which we have been now deſcribing. Yet it is not unlikely, that the various directions, diviſions, and anaſtomoſes of the blood-veſſels may have ſome influence on the elements of the blood.

We proceed to conſider the powers, which animate the organs of circulation, and enable theſe parts to execute their ſeveral functions. Thoſe of the heart, as being the greateſt and moſt important, will claim our firſt attention; but there are ſecondary and auxiliary forces, which probably have conſiderable ſhare in aiding the actions of this viſcus.

We ſhall readily perceive, that no certain calculation can be formed of the powers of the heart, when we conſider that neither the quantity of blood expelled at one pulſation, nor the diſtance through which it paſſes in a given time; nor the velocity of its courſe, can be defined with any certainty; much leſs can we form any accurate eſtimate of the obſtacles which occur to the blood's motion; which muſt conſiderably affect ſuch a calculation. We may however approach in ſome degree to the truth, by collecting and comparing the reſults of probable conjecture. If we calculate the blood contained in the body at thirty pounds, the number of pulſations in one minute at 75, and the quantity expelled from the left ventricle at each pulſation at $2\frac{1}{2}$ ounces, the whole quantity will paſs through the heart about twenty-three times in the courſe of an hour; it will perform the circulation once in leſs than three minutes. The velocity with which this blood is propelled by the ſyſtole of the left ventricle may be collected from the violence with which it is ejected from a wounded artery; and the altitude to which it aſcends. Blumenbach has ſeen it projected more than five feet from the carotid of an adult during the firſt contractions of the heart. Our countryman Hales calculated from his experiments, in which he meaſured the height of the blood's aſcent in a glaſs tube, inſerted into a large artery, that it would be thrown $7\frac{1}{2}$ feet from the human carotid: he eſtimates the ſurface of the ventricle at fifteen ſquare inches; and thus finds that 1350 cubic inches, or about 51lbs. weight, preſs upon the left ventricle, and muſt be overcome by its ſyſtole. Many other calculations of the powers of the heart have been formed upon mathematical principles: but different perſons have been led to ſuch oppoſite reſults, that we are warranted from this circumſtance in diſregarding them altogether. Borelli makes the powers of the heart equal to 180,000lbs.; Keill to eight ounces. Senac obſerves, that if a weight of 50lbs. be attached to the foot, with the knee of that ſide placed on the oppoſite one; the weight will be elevated at each pulſation: this weight is placed at a conſiderable diſtance from the centre of motion; and, allowing for this circumſtance, he eſtimates the moving power at 400lbs.

This power of the heart, ſo wonderful both in extent and duration, muſt be referred to the irritability of the organ; in which point of view it ſeems far to exceed all other muſcular parts of the body. That the immediate cauſe of contraction in this viſcus ariſes from the preſence of blood in its cavities, is ſhewn by the celebrated experiment of Haller; in which the longer duration of action in the right or left cavities was varied by influencing the ſupply of blood.

In the action of thoſe muſcles, which depend on the will; a ſupply of nerves, and a diſtribution of blood to the moving fibres, ſeem to be eſſential conditions. It has been diſputed whether or not theſe circumſtances are neceſſary in the heart; and what ſhare they may contribute to the heart's action. We may obſerve, in the firſt place, that the actions of the heart are completely involuntary; that no exertion of the will can produce the ſmalleſt effect in accelerating, retarding, or otherwiſe affecting the actions of this part. Yet, various arguments prove that the nerves exert an influence over this organ. Not to mention the peculiar arrangement of the cardiac nerves; the ſympathy between the heart's action, and nearly every other function, even of the moſt different claſſes, ſuffices to demonſtrate the connection. The vehement diſturbance of the heart from the paſſions of the mind muſt be familiar to every perſon from his own experience: its action is alſo ſtrongly influenced by various ſtates and affections of the alimentary canal. That its irritability muſt be influenced by different ſtates of the vaſcular ſyſtem is rendered probable by the remarkable and copious apparatus of blood-veſſels, which are diſtributed to it.

The action of the heart is intimately connected with the changes which the blood undergoes in its paſſage through the lungs. For when reſpiration is obſtructed, the heart's action ceaſes; and it may be recalled by again introducing air into the lungs. Hence ariſes the importance of inflating the lungs, in inſtances of apparent death from drowning, &c. in order to excite the heart to action.

There is a mechanical power derived from the ſtructure of the heart, which is ſaid to aſſiſt in the function of circulation. The blood being expelled by the ſyſtole of its cavities, they are in an empty and contracted ſtate; a tendency to the formation of a vacuum now ariſes, in conſequence of which, the blood arriving by the veins immediately ruſhes into the vacant ſpace.

The other organs of circulation, beſides the heart, are endowed with powers by which they contribute to the performance of this function. The arteries probably contribute eſſentially to the circulation, although the degree of their aſſiſtance, and their mode of action, are not yet ſatisfactorily explained. By their elaſtic power, theſe veſſels recover their original ſize, after being diſtended by the heart's action; and they muſt of courſe urge on the blood proportionally. It is a fact moſt ſamiliarly known, that the arteries pulſate; and that they pulſate powerfully, ſo that the courſe of the blood through the popliteal artery is ſufficient, when we place one knee on the other, to elevate the whole leg and foot, even with the addition of a conſiderable weight. Phyſiologiſts have been long accuſtomed to aſcribe to theſe veſſels a ſtate of ſyſtole, or contraction, as well as a ſtate of diaſtole, or dilatation; which are conſidered as alternating with the ſimilar ſtates of the heart; and the latter of which is referred to a muſcular power, or irritability, reſiding in the arterial coats. It ſeems certain that the effect, which we call the pulſe, cannot be aſcribed originally to any property of the veſſel in which it occurs; but that its origin muſt be derived from the contraction of the heart, and the conſequent diſtention of the arterial tube by the blood, which is then expelled from the left ventricle. We admit, therefore, a diaſtole of the arteries, ariſing from the lateral preſſure of the blood, forcibly projected into theſe canals. That this pulſation is produced by the heart's action, is proved by aneuriſms, and by the effect of ligatures on an arterial trunk; for theſe deſtroy the pulſe in the arteries, beyond the part. We are not equally warranted in aſcribing a true ſyſtole to the arteries; or a contraction of theſe veſſels by muſcular power, to a ſmaller area than that to which they are reduced by their elaſticity. Nay, ſome phyſiologiſts have proceeded ſo far, as to deny altogether the exiſtence of irritability in the arteries; or at leaſt to affirm, that the action of the heart alone ſuffices to carry on the circulation. The following arguments ſeem to prove the exiſtence of muſcular powers in the arteries, and their actual exertion in the living body. We have already ſhewn that the cauſes which would retard the blood's motion in dead tubes, do not ſeem to operate in the arteries of the body: this can only be explained, by ſuppoſing them to be overbalanced by ſome powers reſiding in theſe veſſels. If we divide an artery in a living animal, the orifice cloſes; if we divide it for ſome extent, it contracts gradually, ſo as to become nearly ſhut (Hunter on the Blood, p. 114.). The arteries of an animal bled to death are contracted to a ſmaller area than their elaſticity would bring them to; they may at leaſt be diſtended conſiderably, and will not by their elaſticity recover their former contracted ſtate (Ibid.). The functions of the arteries argue the poſſeſſion of living powers: by theſe the growth and formation of the various parts of the body is affected; they perform the different ſecretions: theſe phenomena, as well as thoſe of bluſhing and paleneſs, cannot be accounted for, if we conſider the arteries merely as dead tubes. The great ſupply of nerves which theſe veſſels poſſeſs in many parts of the body, *viz.* the branches of the carotid, the arteries of the neck, and thoſe of the cheſt and abdomen, is a preſumptive proof to the ſame effect. In ſome rare inſtances the heart has been wanting in fœtuſes, otherwiſe well formed: we muſt ſuppoſe that there was a circulation which muſt, under theſe circumſtances, have been carried on by the veſſels only. It has been ſtated, in oppoſition to the irritable power of the arteries, and to their ſyſtole as aiding the circulation, that ſtimuli which affect other muſcles cauſe no ſigns of irritability in theſe tubes That an artery, laid bare in the living ſubject, cannot be ſeen to contract; that if divided, its diameter is not leſſened in the ſuppoſed ſtate of ſyſtole; that the blood flows in a continuous ſtream, excepting as far as it is affected by the heart's action. (Kirkland on the preſent ſtate of medical ſurgery, vol. 1. p. 306. et ſeq.) Hence Blumenbach ſtates it as his opinion, that the arteries do not contract in the healthy ſtate, or as long as the heart is adequate to the natural performance of its functions; but if theſe veſſels are affected by preternatural ſtimuli, or if the heart's action, from whatever cauſe, become deficient, then the vital powers of the arteries will ſerve as an auxiliary force for keeping up the circulation. Blumenbach Inſtit. Phyſiol. ſect. 7. § 130. Laſtly, all obſervers agree in ſtating that the blood flows with an uniform current through the ſmaller ramifications; and it has been generally allowed, that this is the caſe in all arteries of leſs than one-ſixth of a line in diameter. Now we ſhould infer from reaſoning *à priori*, as Mr. Hunter has actually affirmed, that the muſcular force of an artery would increaſe in a direct ratio with the diminution of its ſize, (On the Blood, p. 122,) for the auxiliary power muſt be the more required, in proportion as we recede from the ſource of motion. But if either theſe ſmall arteries, or the larger ramifications which immediately precede them, contribute to the circulation by any actual contraction, the blood's motion could not appear regular and uninterrupted. Theſe, which appear to be the principal arguments on both ſides of the queſtion, are left to the conſideration of the reader. Further proofs and illuſtrations, derived from accurate obſervation in living animals, and from a comparative view of the organs of circulation in the different orders of animals, ſeem to be required, before a decided and ſatisfactory opinion can be formed on the ſubject.

Some phyſiologiſts, being of opinion that the action of the heart could not reach to the ſmalleſt order of ſanguiferous veſſels, have aſcribed the paſſage of the blood in the minute arteries, and thence into the veins, to an oſcillatory motion of theſe parts, and have employed this explanation in the doctrine of inflammation. Microſcopical obſervation, however, detects nothing but an uniform progreſſive motion in the ſmall veſſels.

There is little to be ſaid reſpecting the powers which belong to the veins, ſince theſe veſſels obviouſly take a leſs active ſhare in the circulation than the other parts of the ſyſtem. The return of the blood through the veins is only effected by the preſſure from behind of the arterial blood, aſſiſted by the valves, which prevent any retrograde motion.

Circulation of the Blood in the Fœtus.

The deſcription which we have juſt given, applies to the circulation as it is performed in the adult ſubject; this function differs conſiderably in the fœtal ſtate; and the difference is cauſed from ſome variations in the ſtructure of the heart, and adjacent veſſels, which ariſe from the connection eſtabliſhed between the mother and the child, through the medium of the placenta, and from the want of reſpiration. See HEART and PLACENTA.

The ſituation of the child in utero precludes the acceſs of atmoſpheric air to its lungs; theſe organs are conſequently ſmall and collapſed; and the leſſer circulation of the blood cannot be ſaid to take place in the fœtal ſtate. Although its circulation might be conſidered in this reſpect as more ſimple than that of the adult, this function becomes conſiderably complicated by the connection with the placenta. A portion only of the child's blood circulates through this part; and it is no doubt ſo altered or modified by this paſſage through the veſſels of the placenta, as to be rendered more fit for the growth and nouriſhment of the child. No ſuch alteration or modification has however been actually demonſtrated in the fœtal blood. Phyſiologiſts have diſcovered no difference in this fluid in the various veſſels of the fœtus. It is of the ſame dark colour in the arteries and veins. The interruption of the communication with the placenta, before reſpiration has commenced, is however ſuddenly fatal. Our ignorance of the functions of the placenta, and of the liver, which is of immenſe ſize in the fœtus; as well as of the changes which the fetal blood probably undergoes in the complicated ſyſtem of organs, which are connected with its circulation in this ſtate of exiſtence, leaves many parts of the ſubject in doubt and obſcurity.

The blood, which has paſſed through the placenta, is returned to the ſyſtem of the child by the umbilical vein; it is chiefly diſtributed through the liver, and is ſent in a ſmaller quantity by the ductus venoſus directly into the trunk of the inferior cava. This veſſel, paſſing in an oblique aſcent from the right towards the left ſide, ſends its blood into the left auricle through the foramen ovale; the Euſtachian valve preventing it from paſſing towards the right ventricle. The valve of the foramen ovale guards againſt the poſſibility of its return to the right ſide of the heart. The ſuperior vena cava pours its blood into the right auricle and ventricle, as it paſſes obliquely into the former cavity, in a direction from before backwards, and from the right towards the left ſide. The thick ſuperior margin of the foramen ovale concurs with this direction in preventing any paſſage towards the left auricle. The continuation of the trunk of the pulmonary artery, under the name of ductus arterioſus, into the aorta, conveys this blood into the poſterior part of the arch of the latter veſſel, and it is hence tranſmitted in great meaſure by the umbilical arteries to the placenta. It appears, therefore, that the blood of the inferior vena cava, including that which has recently circulated through the placenta, is ſent entirely to the head and upper extremities, through the branches of the aortal arch; while that portion of this fluid, which returns to the heart through the ſuperior cava, is ſent to the deſcending portion of the aorta, and therefore in great part to the placenta. Hence Sabatier has obſerved, that the courſe of the blood in the fœtus may be compared to the figure 8, the point of decuſſation being in the heart. This fluid is tranſmitted through the umbilical vein, the inferior cava, and the foramen ovale, into the left auricle and ventricle; from which the three large branches of the arch of the aorta conduct it to the head and upper extremities. The ſuperior cava returns it to the heart; it goes through the right auricle and ventricle, the ductus arterioſus, and the aorta, to the umbilical arteries, which return it to the placenta. By this arrangement, the blood, which has gone through the placenta, is not returned to that part, until it has circulated through the whole ſyſtem of the child; whereas, by the opinion, which ſuppoſes a mixture of the blood of the two venæ cavæ in the right auricle, it follows, that a portion of the placental blood would return to that part, without circulating in the ſyſtem of the child; and the blood, which had already gone through the proper veſſels of the fœtus, would recommence its courſe in theſe ſame veſſels, without receiving the ſalutary influence, which is probably exerted on it by the placenta. Sabatier derives from this expoſition of the courſe of the blood, an explanation of the relatively diminutive ſize of the lower parts of the body, when compared with the head and upper extremities of the fœtus. The former parts, ſays he, are ſupplied with a leſs pure blood. We cannot, however, admit this phyſiology. The phenomenon in queſtion ariſes out of the future ſtate of the human embryo, and muſt be conſidered in connection with the long ſtate of helpleſs infancy, to which the individuals of the human ſpecies are excluſively devoted in the early periods of their exiſtence. In quadrupeds, which are obliged to go alone almoſt from the moment of their birth, theſe proportions are not found; although their veſſels are diſtributed in the ſame manner as in the human fœtus. The embryos of the quadrumana, and of the ſquirrel, the foal, &c. are examples of this fact.

The differences in the ſtructure of the heart and circulating veſſels in the fœtus, are ſuch that they are readily and eaſily changed after birth, ſo as to become accommodated to the alterations which take place in the new mode of exiſtence. Two ſtriking and eſſential changes in the animal economy are co-eval with birth, *viz.* the obſtruction of the placental circulation, and the commencement of reſpiration. The former of theſe diminiſhes the quantity of blood conveyed to the right auricle by the inferior cava; the latter cauſes a developement of the ſtructure of the lungs, and a conſiderable enlargement of the pulmonary veſſels; ſo that the left auricle receives more and more blood from the pulmonary veins. Hence the quantity of blood contained in the two auricles becomes equal; and the foramen ovale is cloſed by its valve growing to the margin of the apertures. The ductus arterioſus now contracts; ſo that the whole blood of the pulmonary artery muſt circulate through the lungs in its courſe from the right to the left ſide of the heart. The Euſtachian valve gradually diminiſhes as its function has ceaſed; the umbilical arteries and vein cloſe. Thus the heart and veſſels become adapted to the double circulation, which belongs to the perfect animal. Theſe changes take place gradually, and not abruptly; it is many months, nay even one or two years, before the foramen ovale is cloſed. The ductus arterioſus contracts much more rapidly; indeed this veſſel, as well as the umbilical arteries and vein, are impervious within a very ſhort period after birth.

We refer the reader, on the ſubjects of this article, to the 3d, 4th, and 6th books of Haller's "Elementa Phyſiologiæ." Senac, "Traité de la Structure du Cœur, de ſon Action, et de ſes Maladies." Hales's "Statical Eſſays," vol. ii. Blumenbach "Inſtitutiones Phyſiologiæ," ſect. 7. Spallanzani's "Experiments on the Circulation of the Blood." Sabatier "Sur les Organes de la Circulation du Sang du Fœtus," in his "Traité Complet d'Anatomie," tom. iii.

CIRCULATION, *diſcovery of.* The vaſt importance of this diſcovery to the whole ſcience of phyſiology; the influence which it neceſſarily exerted on the doctrines of pathology; and the general revolution which aroſe from this ſource throughout the whole circle of medical knowledge, will juſtify us in giving a ſlight hiſtorical ſketch of the ſubject, and in pointing out the opinions held by thoſe anatomiſts and phyſiologiſts who preceded our immortal countryman Harvey. To him, indeed, the glory of this greateſt of all phyſiological diſcoveries has been aſſigned by the almoſt unanimous concurrence of his ſucceſſors. Some, however, have endeavoured to deprive him of his well-earned fame, by aſcribing a knowledge of the circulation to various preceding writers. Mr. Dutens, in the ſecond volume of his "Recherches ſur l'Origine des Decouvertes attribuées aux Modernes," has brought forwards paſſages from Hippocrates, Plato, Ariſtotle, Julius Pollux, Apuleius, and others, in order to prove that they knew the courſe of the blood. After the poſitive dogmatical aſſertions with which the author ſets out, we are ſurpriſed by the weakneſs and inadequacy of his proofs, and can only account for the inconſiſtency by ſuppoſing him to have been utterly ignorant of the ſubject. He quotes a few iſolated paſſages which cannot, by the moſt favourable interpretation, be conſtrued into the ſemblance of a proof, that the writers in queſtion knew the circulation of the blood. Thus he adduces the following paſſage from Hippocrates: "Venæ per corpus diffuſæ, ſpiritum, et fluxum, ac motum exhibent, ab unâ multæ germinantes; atque hæc una undè oriatur, et ubi deſinat, non ſcio: circulo enim facto, principium non invenitur." Another equally unſatisfactory follows from Plato: "Cor vero venarum originem, fontemque ſanguinis per omne corpus impetu quodam *manantis*," the Greek word is περιφερομενȣ. Theſe are really the ſtrongeſt quotations which Mr. Dutens has furniſhed on the ſubject, ſo that nothing more would be required in order to diſprove his opinion, than to examine the very paſſages which he adduces in ſupport of it.

Let us further remark, on the ſame point, that this ſpecies of argument, derived from the conſideration of ſingle words and paſſages, is by no means a ſatisfactory one. A ſentence or term employed accidentally and undeſignedly, may ſuggeſt to the mind of a perſon acquainted with all the details of a ſubject, various notions that were not in the contemplation of the writer, and may very probably have been unknown to him; while they would be paſſed over without attention by a perſon not poſſeſſing this previous knowledge. The only fair and unexceptionable method of determining whether any individual was acquainted with a particular fact, is to conſider all that he has ſaid on the ſubject, and to draw our inferences from the reſult of this general examination. Such an inquiry will prove moſt clearly, that a knowledge of the circulation, ſuch as we poſſeſs at preſent, can be aſcribed to no one before Harvey; although a part of the ſubject, viz. the paſſage of the blood through the lungs, had been deſcribed by ſeveral perſons before the time of that illuſtrious character.

That the blood moves, has been univerſally known and admitted, ſince the ſcience of medicine has aſſumed a diſtinct form: how much of its courſe, and of the laws that regulate its motion, has been aſcertained at any given period, is another queſtion. The circulation is ſo generally known in the preſent day, and the proofs on which it reſts are ſo obvious and familiar to every tyro in the profeſſion, that we feel ſurpriſed how they ſhould ſo long have eſcaped the obſervation of the numerous ingenious and learned characters, whoſe names adorn the annals of anatomy. We muſt remember that the courſe of the blood, taken altogether, forms a ſubject of conſiderable intricacy; that the purſuit of anatomy was attended in the early periods of the ſcience with conſiderable difficulty and danger; and that the unlimited ſway which the authority of Galen held over the minds of men for ſome centuries, precluded all attempts at further inveſtigation. We may alſo account for the ignorance of the ancients on this ſubject, by remembering the juſt diſtinction which Haller has drawn, between the kind of information which may be reaſonably expected from them and that which cannot be looked for in this ſource, "Faciles ab antiquitate ſperamus, quæcunque ex ingenio ſolo naſci poſſunt; id enim, ſub felici cælo hominibus vitæ negotiis minus implicitis, ſummum fuit. Quæ verò multiplici, neque a caſu ſperabili, ſed imperato ad ſuos fines experimento nituntur, ea ab eâ ætate non ſperes." Bibl. Anat. tom. i. p. 9.

Hippocrates ſtates that the blood meets with obſtacles in its courſe, which retard or entirely arreſt its progreſs; that it goes from the internal parts towards the ſurface: and *vice-verſâ*, that the blood muſt flow forwards from the heart, ſince the valves hinder its return, and that the arteries are diſtended, when their blood is ſtopped. In ſpeaking of the blood's motion he compares it to the courſe of rivers, to the ebbing and flowing of the ſea, and even to the revolutions of the planets. He aſſigns the origin of the arteries to the heart, and that of the veins to the liver, and ſuppoſes that there are two oppoſite motions in the temporal arteries, by which their pulſations are produced. He ſpeaks of four fluids in the body, the blood, water, mucus, and bile, which come from the heart, head, ſpleen, and liver; all thoſe parts are, however, ſupplied from one principal ſource, the ſtomach.

Can we diſcover any traces of a knowledge of the circulation in this confuſion of ideas? and may we not be juſtly ſurpriſed, to find that enlightened men ſhould be ſo led away by their prejudices, as to allow to Hippocrates the knowledge of a diſcovery, which no one had perceived in his writings for nearly three thouſand years? The obſervations of the founder of medicine had led aſtray all who followed him to the time of Harvey; but when the reſearches of that great man had unfolded the myſtery of the circulation, his enemies dared to affirm, that the writings of Hippocrates had furniſhed the lights which guided him in the path of diſcovery.

The philoſophers who joined the ſtudy of medicine to that of the other ſciences, ſeem to have been equally ignorant of the laws which regulate the blood's motion. A paſſage has been already quoted from Plato on this ſubject; but it would be a moſt remarkable inſtance of liberality to allow him, on the credit of the vague and indefinite expreſſion, which he there employs, the honour of an admirable diſcovery, which he would have explained more clearly if he had known, or even ſuſpected it. In the ſequel to this paſſage, he employs various allegories, in which the heart is a ſentinel or officer to receive the orders of the ſoul, and convey them to all parts. Ariſtotle expreſsly ſtates that the blood never returns to the heart.

The Alexandrian anatomiſts maintained that the arteries held no blood, but were filled with air; from which circumſtance they gave them the name, which they have conſtantly retained, from αηρ, air, and τηρεω, to hold. To explain the occurrence of blood in theſe veſſels after death, they ſuppoſed the exiſtence of ſubtle communications with the veins.

The genius of Galen diſdained to follow blindly the ſteps of his predeceſſors; and he endeavoured at leaſt to diſcover the truth by experiments, and obſervations on the ſtructure of the body. By theſe means he aſcertained ſome facts, although he could not ſucceed in piercing the veil which concealed the ſecret of the circulation. He ſeems to have recognized the uſe of the valves at the two orifices of the ventricles. He proved, by tying an artery with two ligatures, that theſe veſſels contain blood during life; and ſtates that they are filled by the contraction of the heart, in conſequence of which they pulſate. Theſe circumſtances ſeem to indicate a conſiderable advancement in the knowledge of the circulation; but we muſt mention, in the ſame ſpirit of impartiality, the contradictions and uncertainty which prevail in the works of Galen on this ſubject, and the limits which his labours could not exceed. He ſtill referred, with Hippocrates, the origin of the veins to the liver, and ſuppoſed a paſſage

ſage of the blood through the ſeptum of the ventricles, while a ſmall portion entered the pulmonary artery to nouriſh the lungs: he imagined laſtly, that it might paſs reciprocally between the pulmonary artery and veins.

There could be little reaſon to expect, that in the troubled and barbarous times, which followed the age in which Galen flouriſhed, the ſecret of the circulation ſhould be diſcovered; ſtill leſs that it ſhould be explained to phyſicians by men, whoſe purſuits were foreign to the ſcience of medicine. Yet it has been boldly aſſerted that Nemeſius, biſhop of Emeſa, knew the courſe of the blood, as it has been aſcertained by the ſubſequent labours of Harvey. The editor of the Oxford edition of his works, has imbibed the true ſpirit of a commentator; who diſcovers in the writings of the ancients, meanings which never were in the contemplation of the authors; and abuſes the moderns as plagiariſts, for decorating themſelves with the diſcoveries of antiquity.

But on what grounds does Nemeſius claim the honour of a diſcovery, denied to ſo many great geniuſes? Becauſe, according to Freind, the biſhop ſtates, that the blood paſſes from the arteries into the veins during ſleep. This reſtriction immediately overturns the claim; which would indeed be deſtroyed by the kind of motion that he ſuppoſes to take place, *viz.* a reciprocal alternation of undulations, like that of the Euripus. In another paſſage cited by Dutens, he ſpeaks of the arteries in their dilatation attracting the blood from the veins; which ſufficiently proves that he knew nothing of the matter; and exemplifies ſtill further the abſurdity of a perſon's attempting to dogmatize as Dutens has done, on ſubjects of which, as being foreign to his profeſſion, and difficult of inveſtigation, he cannot reaſonably be expected to be a competent judge. "Thus," to uſe the words of Senac, "a theologian writes on the nature of man; a ſubject which does not very properly belong to ſuch a writer: on no other teſtimony, than ſome vague and ridiculous expreſſions, he gains the credit of knowing the circulation, of which the greateſt phyſicians and anatomiſts had been hitherto completely ignorant. Thus it is, that interpreters and commentators are miſled by a blind zeal for antiquity, and diſcover hidden meanings in the moſt ſimple expreſſions. How would their boldneſs and aſſurance have been augmented, if Nemeſius had expreſſed himſelf as clearly, as an ancient ſcholiaſt of Euripides has done, where he ſays, "that the blood flows through the veins, and that theſe veſſels receive it from the arteries." Should we, however, on this inſulated and caſual expreſſion, be juſtified in beſtowing on a weigher of words, and meaſurer of phraſes, the honour of a diſcovery, which had eluded the reſearches of the greateſt philoſophers?

The ſtate of darkneſs and ignorance, in which the human mind languiſhed during the ſucceeding ages, does not allow us to expect that any writer of that period can diſpute with Harvey the honour of the great diſcovery. About the ſixteenth century the curioſity of mankind was again excited to the inveſtigation of this intereſting ſubject. Reaſon, which had hitherto ſubmitted to the yoke of authority, began to aſſert her rights; and ſeveral phyſicians were bold enough to examine ſubjects, which Hippocrates and Galen had not been able to develope.

The firſt ray of light was thrown on the circulation, by a man, whoſe name cannot be mentioned without exciting feelings of compaſſion for his unmerited and barbarous treatment, and of indignation at the unrelenting bigotry of his cruel perſecutor, and implacable judge. Gifted with an ardent and penetrating genius, Servetus made a rapid progreſs, at a very early age, in the ſciences of natural philoſophy and divinity. By applying the rigorous, and exact kind of proof required in ſubjects of the former kind, to the latter ſcience, he refuſed to aſſent to propoſitions, which he could not comprehend; and openly declared his diſbelief of the ſacred myſtery of the Trinity. This compelled him to leave Spain his native country; from which he paſſed into France, and ſtudied medicine at Paris, under Winter d'Andernach, who was profeſſor in the college lately founded by Francis I. He viſited different parts of France and Germany, and after various perſecutions on account of his religious opinions, ſettled in Dauphiny. But the reformer of Geneva, either being too narrow-minded to grant to a rival, that freedom of thought, and liberty of conſcience, which he had ſo ſucceſsfully exerted in his own perſon; or fearing that his ſchemes of aggrandizement would be interrupted by the ſuperior talents of Servetus; had him ſeized and condemned to the flames. Thus, ſays Portal, one heretic deſtroyed another; but the difference was, that an ambitious and deſigning knave pronounced the condemnation, and one of the fineſt and moſt enlightened geniuſes of Europe was the lamented victim of this iniquitous ſentence.

The paſſage, which proves Servetus to have been acquainted with the pulmonary circulation, occurs in his work de Reſtitutione Chriſtianiſmi; which having been carefully deſtroyed on account of the hereſy which it contains, is now extremely ſcarce; ſo that two or three copies only are ſuppoſed to exiſt, and the duke de la Valiere gave the ſum of 132*l.* for one. Blumenbach Introd. in Medic. Literar. p. 125.

He ſtates that the vital ſpirit is compoſed of the moſt ſubtile parts of the blood, and of the air, which inſinuates itſelf into the lungs; and that the ſource of this blood is in the right ventricle. "But the communication, that is to ſay, the paſſage of the blood from the right to the left ventricle, does not take place acroſs the middle ſeptum, as perſons have generally imagined; it depends on a more ſingular ſtructure. In the long windings of the lung, this ſubtile blood is agitated, and prepared by the action of the viſcus, and gains a yellow colour. From the *vena arterioſa*, (pulmonary artery), it paſſes into the *arteriæ venoſæ*, (pulmonary veins), where it becomes mingled with the air that has entered the lungs, and loſes its fuliginous excrements. Laſtly it enters the left ventricle, which attracts it in its diaſtole. Such is the preparation of the blood, from which the vital ſpirit is formed; this preparation, and this paſſage from the arterial vein into the venous artery, are evidently proved by the ſize of the veſſels; which would not be ſo large, nor poſſeſs ſo many branches; nor carry to the lung ſo great a volume of blood, if it were deſtined to the nouriſhment only of the viſcus." He adds that the vital ſpirit is ſent from the left ventricle into all the arteries of the body.

This repreſentation proves inconteſtably that Servetus knew the minor circulation. He laid the foundation of a building, which had baffled all the efforts of the great geniuſes of antiquity. In order to perfect this deſign it was only neceſſary to extend the ideas of the firſt architect. He indicated the route, through which the blood paſſes from the right to the left ventricle; it remained to be proved that all the blood takes this paſſage, and that it returns again to the heart from the arteries through the veins.

The obſcure ſketch of the circulation, which was furniſhed by Servetus, appears in a more finiſhed and luminous form in the works of Realdus Columbus. He deſcribes the entrance of the blood into the heart from the vena cava, and its ſubſequent paſſage through the lungs into the left ventricle and aorta. He advanced a ſtep farther than Servetus; for he ſtates that the whole blood paſſes through the lungs, and not the vital ſpirit only. But he falls into the ſame error with preceding anatomiſts on the ſubject of the liver; ſuppoſing that gland to be the ſource of the blood which nouriſhes the ſtomach, ſpleen, &c.

Arantius and Cæſalpinus deſcribed more perfectly and clearly than Columbus, the paſſage of the blood through the lungs; which they confirmed by ſeveral arguments drawn from the ſtructure of the parts, and particularly from the poſition and mechaniſm of the valves. The latter indeed approached very nearly to the grand deſideratum, the paſſage of the blood from the arteries through the veins to the heart. He obſerves that a vein ſwells below the ligature; but he did not follow this up to prove the circulation. He ſays that the blood returns to the heart through the veins during ſleep; but he ſuppoſed it to move backwards and forwards in the ſame veſſels, like the Euripus. He was miſled alſo in the labyrinth of the liver, where ſo many phyſiologiſts have loſt themſelves. The arrangement of the arteries and veins in this organ preſents ſuch an intricate combination that we need not wonder at its proving, for ſo long a time, a ſource of miſtake and illuſion.

Paul Sarpi, the learned hiſtorian of the council of Trent, is one of thoſe to whom the circulation is ſaid to have been known; but the want of all arguments that bear the leaſt conviction on the ſubject, will juſtify us in declining any particular conſideration of his claim, as well as thoſe of Fabri, a Jeſuit, of Helvicus Dietericus and others.

Notwithſtanding the labours and writings of the anatomiſts, whoſe opinions we have thus curſorily examined, the minds of men were ſtill enſlaved by thoſe errors, which, having prevailed for ſo many centuries, had acquired the ſanction which time and authority beſtow on any opinions, however abſurd. The moſt enlightened phyſicians were ſatisfied with the labours of their predeceſſors: and Harvey alone had ſufficient courage and information to canvaſs theſe inveterate prejudices, which length of time had conſecrated as infallible truths. He obſerved and deſcribed the true courſe of the blood with a wonderful ſagacity and clearneſs. None of the arguments, which prove the circulation, eſcaped the reſearches of this acute obſerver; ſo that a modern phyſiologiſt, in recounting the proofs of this phyſiological fact, could add little, if any thing, to what is accumulated in the original work of Harvey. He was not contented with demonſtrating the circulation in ſome parts only; but followed up the ſubject in all the viſcera of the body. He traced the courſe of the blood through the liver, where every preceding anatomiſt had diſcovered nothing but perplexity and confuſion. The work of Harvey is, in ſhort, one of thoſe rare and precious productions which embrace a ſubject in its whole extent, and preſent it to the mind in ſo perfect and finiſhed a form, as ſcarcely to admit a ſingle addition or improvement.

The merits of our countryman, whoſe fame can never periſh, while medical ſcience continues to be cultivated, will be exalted to a ſtill higher pitch, when we conſider the ſtate of medical knowledge in England at that time. While anatomical ſchools had been long eſtabliſhed in Italy, France, and Germany, and ſeveral teachers had rendered their names illuſtrious by the ſucceſsful purſuit of the ſcience, anatomy was ſtill unknown in England, where diſſection had hitherto hardly begun. Yet, at this inauſpicious period, did Harvey make the diſcovery, which may be conſidered as a ſecond and more perfect foundation of the ſcience of medicine; and which amply juſtifies Haller in ranking him as ſecond to Hippocrates only.

Harvey ſtudied anatomy at Padua under Hieronymus Fabricius; who had inveſtigated more minutely, and deſcribed more accurately the valves of the veins firſt diſcovered by Cannanus. Returning to his own country, he commenced a ſeries of experiments on living animals; and taught the circulation in his lectures about the year 1616. But he did not publicly promulgate his grand diſcovery till 1628, when his "Exercitatio anatomica de Motu Cordis et Sanguinis in Animalibus" appeared at Frankfort: and this is the only edition, which bears the ſtamp of Harvey's own authority. This treatiſe, which Haller has moſt appropriately ſtyled "aureum opuſculum," is conſtructed entirely upon the reſult of experiment, and contains an excellent arrangement of the ſubject. The author was now created phyſician to king Charles I. and demonſtrated the circulation before him in a living animal.

The publication of this grand diſcovery rouſed the attention of all Europe. The old profeſſors, accuſtomed to pay a blind and implicit deference to the authority of Galen, which was now utterly ſubverted, and, aſhamed of confeſſing that their whole life had been ſpent in teaching the groſſeſt errors, took up their pens in oppoſition to the author of theſe innovations. One party aſſerted that the diſcovery was not a new one: that it had been known to ſeveral perſons, and, indeed, to all antiquity. Such were the aſſertions of Nardi, Vander Linden, Hartmann, Almeloveen, Barra, Drelincourt, Patin, Falconet, Heiſter, Regnault, &c. A ſufficient refutation of theſe ſtatements will be found in the hiſtorical ſketch, which we have already exhibited. Other adverſaries of Harvey proceeded in a more rational manner; and attempted to diſprove his ſtatements by experiment and reaſoning. Primeroſe led the way in this attack, and he was followed by Emilius Pariſanus, Joh. Riolan, Caſp. Hoffmann, and others. If men of ſuch acknowledged erudition as Riolan and Hoffmann were ſo utterly unacquainted with the circulation, as to deny it altogether, may we not ſafely conclude that the ſubject is not deſcribed in any of the writers, who preceded Harvey? Out of all his numerous opponents, this illuſtrious man anſwered Riolan only; in his "Secunda et tertia exercitatio de circulatione ſanguinis." The reply was rather extorted by the rank, fame, and learning of Riolan, than by the ſtrength of his arguments. If we ſeek to define exactly the preciſe ſhare of merit which Harvey may claim in the diſcovery of the circulation, it will be neceſſary to hold a middle courſe between the groſs and palpable abſurdity of thoſe who diſcover a knowledge of the circulation in the writings of Solomon, Hippocrates, Plato, Ariſtotle, &c., and the too great partiality of ſuch as would deny all knowledge of the ſubject to every anatomiſt who preceded Harvey. It ſeldom happens, that ſo extenſive and intricate a ſubject as that which we are now conſidering, is ſurveyed and brought to light in all its branches by the labour of an individual; nor has it happened in the preſent inſtance. For Servetus, Columbus, Arantius, and Cæſalpinus, were acquainted with the courſe of the blood through the lungs; and the latter writer has even an obſcure hint towards the greater circulation. But no one attempted to prove the latter point by arguments and experiment before the time of Harvey: the expreſſions of Cæſalpinus, which are by no means clear or ſatisfactory, had been before the public for half a century without exciting the leaſt inveſtigation, and without ſuggeſting to Fabricius the true office of the valves in the veins. The entire merit of the greater circulation may, therefore, be aſcribed to our illuſtrious countryman; and if we compare the luminous method, and irrefragable proofs which are found in his expoſition of the other part of the ſubject, with the partial and confuſed ſtatements of preceding authors, his merit will here be only ſecond in degree to that of actual diſcovery.

The doctrine of the circulation met with ſome ſupporters on its firſt promulgation. Walæus of Leyden exerted himſelf ſtrenuouſly on this ſide, and defended the propoſitions of Harvey in two excellent letters addreſſed to Bartholin. Des Cartes alſo, whoſe authority at that time carried vaſt weight with it, took a decided part in the controverſy in favour of Harvey, from its commencement. The doctrine was pretty generally admitted throughout Europe before the deceaſe of its propoſer.

The nature of the communication between the arteries and veins was left undetermined by Harvey, who decided no point which he could not make the ſubject of experiment. The art of injecting the veſſels of the dead body, which has been diſcovered and carried to great perfection ſince his time, has ſhewn a continuation of canal joining the two ſyſtems of blood-veſſels: and the employment of the microſcope has completed the proof, by demonſtrating the circulation in the tranſparent parts of frogs, &c. during life. The transfuſion of the blood of one animal into the veſſels of another, which has been performed with ſucceſs in many inſtances, has added another ſtrong proof to the demonſtration of the circulation. See the "Hiſtoire de l'Anatomie, et de la Chirurgie" of Portal, and the "Bibliotheca Anatomica" of Haller, in the articles concerning the writers, whoſe names are mentioned in this account; "Elementa Phyſiologiæ," tom. i. ſect. 3. Senac "Traité du Cœur," livre 3. Dutens "Recherches ſur les Decouvertes attribuées aux Modernes."

Circulation *of the Sap*, in *Vegetable Phyſiology*, is a ſubject which has been long involved in the utmoſt obſcurity. After the diſcovery of the circulation of the blood in animals, ſeveral diſtinguiſhed philoſophers, who beſtowed attention upon the anatomy and phyſiology of plants, expected to diſcover ſomething equivalent in their conſtitution. The ſlighteſt obſervation was ſufficient to determine that the juices of the earth were abſorbed by the roots of plants, and pervading their ſubſtance, ſupplied them with nouriſhment, thus contributing eſſentially to their health and increaſe. This regular propulſion of fluids through the vegetable body is evinced by taking an entire plant with its root, or even a branch cut from its parent ſtem, and after it has begun to droop, placing its lower extremity in water. By the abſorption of the water through its veſſels, the plant or branch will ſoon revive, and continue in vigour for a longer or ſhorter period, according as the circumſtances in which it is placed may be more or leſs favourable. It was alſo very ſoon diſcovered that an extraordinary motion of the ſap took place at a certain time of the year. If a vine, for inſtance, be wounded in the ſpring, juſt before its leaf-buds open, it *bleeds*, as the gardeners expreſs it, that is, the ſap runs out very abundantly, inſomuch that if the wound be not ſtopped, the experiment is fatal to the branch on which it is made. The ſame thing was obſerved in the birch, whoſe ſap ſo procured is, in ſome countries, manufactured into wine, as that of the American ſugar maple, *acer ſaccharinum*, is made to yield ſugar. This bleeding does not take place if the vine be cut after the leaves begin to expand; but in autumn, after a ſlight froſt, not during the froſt, the ſap runs in a ſimilar manner from a wound, though in a far leſs degree. This is called technically the *flowing of the ſap*. An ordinary branch of a vine will yield about a pint in 24 hours. The liquor thus obtained is clear and colourleſs, with little ſmell or taſte, and ſeems ſcarcely different from common water, yet it ſoon undergoes chemical changes, which ſhew it to be ſomething more. The peculiar ſecretions of the vine, which are very acid, alſo come along with it, and ſtill more thoſe of the birch and ſugar-maple; ſo that the perfectly pure ſap, or nutritious fluid of any plant, is ſcarcely to be obtained unmixed with adventitious matter.

When this flowing of the ſap began to be ſtudied by phyſiologiſts, their ſanguine hopes of detecting the vegetable circulation by its means were not at all anſwered. In vain were ligatures tried to diſcover its courſe, as had been practiſed with ſo much ſucceſs on the veins and arteries of animals. Nothing like a ſwelling from a ſtoppage of the ſap in its paſſage, by ligatures, and conſequent accumulation in the veſſels, has ever been perceived in vegetables. It was obſerved to flow equally from both ſides of a tranſverſe wound, and in as great quantity from the portion of the ſtem or branch above the wound as below it, at leaſt till the upper portion, not being ſupplied from the root, was exhauſted. It was alſo ſeen to proceed always from the wood, not from the bark. Some authors having thought they obſerved the ſap to flow more abundantly from the lower ſide of an inciſion during the heat of the day, and from the upper in the cool of the evening, have aſſerted that it mounts during the former period, and deſcends at the latter. But the moſt ſurprizing circumſtancee of all was, that after the leaves were expanded, when it was known that a great perſpiration was going on through thoſe organs, and that there conſequently muſt be as great and conſtant a propulſion of the ſap at leaſt as took place before, no ſuch violent movement in that fluid could be perceived; for during the greater part of the year only a ſlight effuſion of ſap happens from a wound. Dr. Smith, taking all theſe phenomena into conſideration, has ſuggeſted that probably this great motion in the ſap, which has been univerſally believed to exiſt in trees for a ſhort period before their buds open, is altogether imaginary. He is perſuaded the ſap is at that period, as well as through the winter, (in deciduous trees at leaſt,) quieſcent, and that it has in ſpring merely an extraordinary propenſity to run, cauſed by the reviving warmth of that ſeaſon, and the accumulated irritability of the vegetable conſtitution during winter. For this reaſon the ſap flows in ſome degree in a warm autumnal day after a froſt, the cold having increaſed the ſenſibility of the plant to the warmth which follows, and thus what happens in winter and ſpring is acted for a ſhort period on a ſmall ſcale. This flowing of the ſap, or ſpeaking more correctly, this facility of the ſap to run, is therefore the firſt ſtep towards the revival of vegetation in the ſpring, and its exciting cauſe is heat, doubtleſs by ſtimulating the vital principle, and not by any mechanical action. The effect of heat in this reſpect is in proportion to the degree of cold to which the plant has previouſly been expoſed. In forced plants the irritability is exhauſted, according to the remark of Mr. Knight in the "Philoſophical Tranſactions for 1801," which is ſtrikingly to our preſent purpoſe.

"It is well known," ſays that gentleman, p. 342, "that the degree of heat required to put the ſap into motion, in the vine, is not definite, but depends on that to which the plant has been previouſly accuſtomed. Thus, a vine which has grown all the ſummer in the heat of a ſtove, will not be made to vegetate during the winter by the heat of that ſtove; but, if another plant of the ſame variety, which has grown in the open air, be at any time introduced, after it has dropped its leaves in the autumn, it will inſtantly vegetate. This effect appears to me to ariſe from the latter plant's poſſeſſing a degree of irritability, which has been exhauſted in the former by the heat of the ſtove, but which it will acquire again during the winter, or by being drawn out and expoſed for a ſhort time to the autumnal froſt.

For the ſame reaſon, all vegetation goes on better in the increaſing heat of ſpring, than in the decreaſing heat of autumn, and ſome plants, even of the moſt hardy kind, as radiſhes, which grow ſo freely at the former ſeaſon, can by no art be made to vegetate at all in the decline of the year. An attention to this law of nature will enable us to procure flowers from many plants that do not readily bloſſom under ordinary management. The Cape jaſmine, *Gardenia florida*, is beſt kept in a common greenhouſe, ſecured from froſt, till about April, when if expoſed to the ſtrongeſt heat of a bark bed it is made to flower in the greateſt luxuriance.

The propulſion of the ſap, in one direction at leaſt, from the root upwards, being eſtabliſhed, the next ſubject of inquiry is the ſyſtem of veſſels in which it runs. Malpighi and Grew, the leaders in this branch of philoſophy, and all their followers, even the intelligent Du Hamel among others, were convinced of the exiſtence of three kinds of longitudinal veſſels in the vegetable body, ſap veſſels, air veſſels, and veſſels denominated *vaſa propria*, containing ſecreted fluids. The laſt are obvious to the moſt careleſs obſerver, filled with the reſin of the fir, the milk of the fig, celandine, &c. Air-veſſels are found in moſt parts of a plant, of a roundiſh or oval form, intermixed with the *parenchyma* or pulp. So far is unqueſtionable; but the above ingenious obſervers thought they had alſo diſcovered longitudinal air-veſſels. When a young branch of elder, the ſtem of a lily, and many other ſtems, branches, or leaf ſtalks, are partly cut through, and their two portions gently drawn aſunder, a ſet of white ſpiral threads, of conſiderable ſtrength, are unrolled in the ſubſtance of the young wood, not in the bark. Each of theſe threads forms the ſpiral coat of a veſſel, the thread itſelf not being, as ſome perſons have ſuppoſed, pervious. Such veſſels are of ſufficient diameter to be eaſily viſible under an ordinary microſcope, and when inveſtigated with high magnifying powers, their ſtructure is readily ſeen. They are always found nearly, if not quite, empty of moiſture, and filled with air, and were therefore, by a ſimilar miſtake to what was formerly made concerning animal arteries, determined to be air-veſſels, though no communication could be traced between them and the above-mentioned round or oval air-cells. The ſap-veſſels only remained to be aſcertained. Theſe, it was thought, could exiſt only in the woody fibres, which make ſo conſiderable a part of the bulk of a tree or ſhrub, and are abundant even in herbaceous plants. But philoſophers ſought in vain for any cavity in thoſe fibres. They are diviſible without end, nor can any perforation be detected. Still it was argued that as the *vaſa propria* were always found full of ſecreted fluids, different in different plants, but all quite diſtinct from that univerſal lymph or ſap, which is nearly uniform in all; and as the ſpiral-coated veſſels were always full of air only; the ſap could have no other courſe but along the woody fibres. It was even preſumed that although theſe fibres were imperforate, the ſap might aſcend along them by capillary attraction, as through a ſpongy or cottony ſubſtance. This was Tournefort's opinion, and others have adopted it. Grew imagined that the nutritious fluids were abſorbed by plants in a highly rarified form, and in that ſtate pervaded their ſubſtance with the more readineſs and force. Du Hamel gueſſed that the paſſage of air out of the air-veſſels parallel to the woody fibres, cauſing the former to contract, muſt produce a power of ſuction in the latter, and ſo promote the conveyance of the ſap, as well as its abſorption from the earth. De la Hire went ſo far as to ſuppoſe, not only veſſels, whoſe cavities he could not diſcover, in the woody fibres, but valves in thoſe veſſels, ſome having them placed ſo as to allow the ſap to aſcend, others in a contrary poſition. This imaginary ſtructure, combined with fine theories of rarefaction and condenſation, explained every thing that was wanted. "But unhappily," ſays the more faithful and more philoſophical Du Hamel, "theſe valves, ſo commodious for all the above explanations, are a mere ſuppoſition. I have ſought them in ſome plants of the reed kind, and have ardently wiſhed to find them. I ſhall however relate plainly what I have been able to diſcover. After having ſucceeded in introducing coloured liquors in the longitudinal veſſels of the plants in queſtion, I thought I perceived in the centre of each veſſel a firm longitudinal thread pervading its cavity throughout, which was rough, or clothed with a very fine pubeſcence. Such a ſtructure is very ſimilar to what M. Mariotte has diſcovered in the *vaſa propria* of plants. Thoſe who are ſo inclined may, if they pleaſe, ſuppoſe that this downy ſubſtance, being bent one way or the other, may perform the functions of valves, but after all, the whole will be but a ſuppoſition, to which ſome degree of probability only can be granted."

We have given the above paſſage from Du Hamel to ſhew, that nothing was really known in his time, concerning the true ſap-veſſels of plants.

Nor are the *reducent* veſſels, confidently deſcribed by ſome recent writers as lodged near the pith, and which are ſuppoſed to return the ſap towards the root, with more certainty to be demonſtrated, at leaſt as far as their functions are concerned, than the valves of De la Hire, whatever may be the caſe with the *adducent* veſſels of the ſame authors, whoſe exiſtence we are not diſpoſed to deny.

But it is time to quit the regions of hypotheſis, and to recur to facts and practical obſervations.

Dr. Darwin and Mr. Knight have ſhewn by clear experiments that the real ſap-veſſels are what had hitherto been conſidered as air-veſſels, and which longitudinally pervade the *alburnum* or layer of new unhardened wood. Some of them have a ſpiral coat, others not, and theſe laſt probably are the adducent veſſels of the authors above alluded to, who retain the old opinion that the others are air-veſſels.

Young twigs of horſe-cheſnut, apple-tree, fig-tree, &c. whoſe lower ends are immerſed in water ſtained with madder, log-wood, or the ſkins of very black grapes, imbibe ſuch coloured fluids by their ſpiral-coated tubes. We have even found common ink to be abſorbed by the *Hydrangea hortenſis*, a ſhrub whoſe vaſcular ſyſtem is large and eaſily diſcernible. But the fig perhaps is preferable to moſt other things for ſuch experiments, as its white ſecreted juices, lodged in their appropriate veſſels, are ſo ſtrikingly contraſted with any coloured liquor which their ſap-veſſels may take up, and thus the courſe of the latter can be the more readily traced. Dr. Darwin purſued his obſervations to no great extent, but Mr. Knight, whoſe experiments are recorded in the "Philoſophical Tranſactions for 1801," has traced the coloured fluids, not only along the main tubes of the branch, but has diſcovered how they are conveyed, by an appropriate ſet of veſſels in every caſe, along the leaf-ſtalks into the ſubſtance of the leaves. The ſame moſt acute and ingenious philoſopher has moreover diſcovered a ſet of returning veſſels, commencing in the leaf, and conveying fluids to the young layer of bark. The fluids ſo conveyed are quite different from the ſap of which we have hitherto been ſpeaking. They poſſeſs the peculiar flavour of the plant whatever it may be, and are truly ſecreted fluid. Here then is a new and moſt ſatisfactory theory of vegetation offered to our contemplation. The nutritious fluids, imbibed from the ſoil by the radical fibres, after, poſſibly, undergoing ſome change equivalent to digeſtion, in the body of the root or baſe of the ſtem, are conveyed in the ſtate of ſap along the laſt-mentioned organ into the leaves. The ſap therefore is the blood of a vegetable, and like that of animals, is nearly ſimilar in all. In the leaf it is expoſed to the action of light, heat and air, three powerful agents, ſufficient to account for the changes it there undergoes. Much of the watery part of its compoſition evaporates by perſpiration from the leaf, nor is the main body of the ſap returned to the part, whence it was propelled, like blood to the heart, ſo that in this ſenſe vegetables cannot be ſtrictly ſaid to have a circulation of their ſap. That portion of the ſap which returns from the leaf, is impregnated with carbon from the atmoſphere, ſo as to be capable of furniſhing matter of increaſe through the bark to the body of the plant, according to the experiments of Du Hamel, Hope and others, and wood is moſt plentifully ſecreted under the inſertion of each leaf, as is apparent from the ſwelling obſervable in moſt trees thereabouts. Indeed Dr. Hales had ſhewn long ago that the bark, when cut aſunder, extended itſelf from below a leaf or leaf-bud, and not above it, ſee his "Vegetable Staticks," tab. 13.; and every body knows that all the part of a branch above a leaf dies in conſequence of being cut.

Nor does the ſap acquire in the leaves matter of increaſe only. All the peculiar ſecretions, by which one plant differs in taſte, ſmell, and medical qualities, from another, are firſt evolved in thoſe organs, though probably perfected in the bark and wood. There originate the acid or alkaline, mucilaginous or reſinous, acrid or aromatic, ſaccharine or bitter principles. How exquiſite, then, is the chemiſtry of nature, and how fine the ſtructure of the vegetable frame, to elaborate and to preſerve, in ſo ſmall a compaſs, ſuch different and diſcordant ſecretions! That portion of the ſap which is carried to the flower and fruit, undergoes no leſs remarkable changes, for purpoſes deſtined to be accompliſhed there; nor is it returned from thence, as from the leaves, in order to anſwer any further end. Hence thoſe parts, called the organs of fructification, have their own appropriate internal ſtructure, as well as external configuration. Their ſecretions of colour, ſcent and flavour, are generally very diſtinct from thoſe of the leaves, and even more remarkable.

Now the real ſap veſſels are known, it ſeems no longer very difficult to account for the propulſion of fluids along them. The ſtimulating effect of thoſe fluids, as well as of external heat, upon the living principle of the veſſels in queſtion, their ſpiral ſtructure, the agitation of the whole vegetable frame, particularly the leaves, by wind, the great perſpiration of the latter, and conſequent ſuction of fluids from the veſſels that enter their ſubſtance, are all ſurely ſufficient cauſes. Thoſe who have hitherto treated the ſubject of vegetable phyſiology, have confined their ideas too much either to mechanical or to chemical principles, without taking into conſideration the living power by which alone the vegetable, as well as animal functions, can be in any adequate degree explained; and, after all, it muſt be confeſſed that this vital principle, whoſe agency we cannot deny, proves in many inſtances rather a refuge for our ignorance, than a ſource of information.

One farther obſervation remains to be made, relative to the circulation or propulſion of the ſap, that the vaſcular ſyſtem of plants is ſtrictly annual, not only in thoſe herbs whoſe whole exiſtence is confined to one ſummer, but even in trees and ſhrubs. The layer of alburnum, along which the ſap runs in the preſent ſpring and ſummer, is in autumn added to the wood, and ſoon aſſimilated to it, while the innermoſt layer of bark, along which the returning ſap, or rather ſecretions, were conveyed, is in like manner added to the bark of preceding ſeaſons, after ſecreting materials for a new layer of bark and of alburnum. Theſe in their turn are laid aſide; and though they may reaſonably be ſuppoſed to be ſtill employed in perfecting the ſecretions lodged in their cells, they are out of the main courſe of circulation. The ſame thing takes place in the perennial roots of many plants, whoſe ſtems and leaves are altogether annual. Such roots have many layers, more or leſs diſtinctly marked, of wood and bark, and the ſecretions which thoſe parts contain are often very highly elaborated, as is the caſe with rhubarb, jalap, gentian, bryony, and many others. S.

CIRCULATION *of the ſpirits*, or *nervous juice*. That the ſpirits circulate is evinced in the ſame manner as ſome authors chooſe to prove the circulation of the blood, *viz.* that as the heart drives out every hour three or four thouſand ounces of blood, whereas ordinarily there are not above two thouſand in the whole body, there is a neceſſity for the blood driven out to return to the heart, in order to ſupply a fund to be expelled.

In like manner it is ſhewn, that there is formed each hour a large quantity of ſpirits, which are nothing but the more ſubtile parts of this blood driven out from the heart; whence it is inferred that theſe two muſt circulate.

The courſe they are ſuppoſed to take is this. The moſt ſubtile parts of the arterial blood being carried from the heart to the brain by the carotid arteries, are thrown violently into the fine net-work wherewith the bottom of the ventricles of the brain is lined; whence the more delicate parts are driven into the mouths of the choroid arteries, where they continue their rapid motion, and diſcharge themſelves at the pores where thoſe veſſels terminate around the pineal gland.

Hence they enter that gland, and there form a conſtant ſpring of ſpirits, which, being here purified, enter the cavities of the brain, and inſinuating into the pores of its ſubſtance, flow into the lymphatics, whence they are carried to the heart by two ways; thoſe from the upper parts by the ſubclavian veins, and the adjacent veſſels; thoſe from the lower, being diſcharged into Pecquet's reſervoir, proceed by the thoracic duct, and at laſt, by the deſcending veins, to the heart, whence they begin their courſe afreſh. See ANIMAL *Spirits*.

CIRCULATION, *ſubterranean*. Dr. Plott is one of the many authors who have argued for a ſubterranean circulation of water, by means of which many ſprings and rivers are ſupplied with that water which they give again to the ſea. It is probable, indeed, that many of the ſmaller ſprings are ſupplied by rains, only where the country and ſituation are favourable; but the larger rivers, and the ſprings which ſupply them, muſt have their origin from ſuch a ſubterranean circulation, ſince all the water that falls in a year in the whole earth, is not one five hundredth part the quantity of that diſcharged into the ſea at the mouths of rivers, as appears by careful and moderate calculations. There are ſome ſprings which ebb and flow with the ſea; theſe cannot be doubted as to their origin, which is evidently from that body of water whoſe motions they are influenced by. Nor is the caſe much leſs clear in regard to thoſe lakes which have ſalt water and ſea-fiſh in them, and yet have no communication with any ſea by any known cut or paſſage.

The number of ſhell-fiſh and parts of ſea-animals dug up in ſeveral places, at great depths within land, are alſo urged by ſome as proofs of ſuch ſubterranean paſſages of the ſea-water; but theſe are too univerſally diſtributed through the ſtrata of the earth to have been brought in this manner, and are therefore rather ſuppoſed to be owing to the great change made in the earth by the flood in the days of Noah. See Vapour, &c.

Circulation, in *Chemiſtry*, is an operation whereby the ſame vapour, raiſed by fire, falls back, to be returned and diſtilled ſeveral times, and thus reduced into its moſt ſubtile parts.

Circulation is performed by diſpoſing the liquor in a ſingle veſſel, ſtopped at top, called a *pelican*; or in a double veſſel conſiſting of two pieces, luted on each other; the lower to contain the liquor and its vapours.

It is performed either by the heat of a lamp or that of aſhes, or of ſand moderately hot, or in dung, or by the ſun. It uſually demands a continued heat of ſeveral days, ſometimes of ſeveral weeks, or even ſeveral months. By circulation, the fineſt part of the fluid mounts to the top of the veſſel, and finding no iſſue there, falls back again, and rejoins the matter left behind at the bottom, whence it aroſe; and thus by continuing to riſe and fall alternately in the veſſel, there is effected a kind of circulation or remixtion of the ſpirituous parts with the groſs ones, whereby the former is rendered finer and more ſubtile, and are better diſpoſed to exert their activity when ſeparated from the latter.

Circulation, in *Commerce*, denotes that reciprocal interchange of goods, money, or paper, by which the political and trading intereſts of a country are conducted and promoted.

Accordingly, ſome writers have repreſented it as the grand baſis on which the whole edifice of modern political economy reſts; as that which characterizes and diſtinguiſhes this ſyſtem of political economy from all others; and as that which determines and meaſures the population, the riches, the credit, the proſperity, and the power of nations; inſomuch that the degree of and facility of circulation being given, the degree of population, of riches, of credit, of proſperity, and of power, are neceſſarily given at the ſame time.

Dr. Smith, in his "Nature and Cauſes of the Wealth of Nations" (vol. i p. 485), obſerves, that the circulation of every country may be conſidered as divided into two branches: the circulation of the dealers with one another, and the circulation between the dealers and the conſumers. Although the ſame pieces of money, whether paper or metal, may be employed ſometimes in the one circulation, and ſometimes in the other, yet as both are conſtantly going on at the ſame time, each requires a certain ſtock of money of one kind or another to carry it on. The value of the goods circulated between the different dealers, never can exceed the value of thoſe circulated between the dealers and the conſumers: whatever is bought by the dealers being ultimately deſtined to be ſold to the conſumers. The circulation between the dealers, as it is carried on by wholeſale, requires generally a pretty large ſum for every particular tranſaction. That between the dealers and the conſumers, on the contrary, as it is generally carried on by retail, frequently requires but very ſmall ones; a ſhilling, or even a halfpenny, being often ſufficient. But ſmall ſums circulate much faſter than large ones. A ſhilling changes maſters more frequently than a guinea, and a halfpenny more frequently than a ſhilling. Conſequently, though the annual purchaſes of all the conſumers are at leaſt equal to thoſe of all the dealers, they can generally be tranſacted with a much ſmaller quantity of money; the ſame pieces, by a more rapid circulation, ſerving as the inſtrument of many more purchaſes of the one kind than of the other. Paper-money may be ſo regulated, as either to confine itſelf very much to the circulation between the different dealers, or to extend itſelf likewiſe to a great part of that between the dealers and the conſumers. When bank-notes are iſſued of a conſiderable value, *e. g.* of 10*l.*, paper-money confines itſelf very much to the circulation between the dealers. The conſumer is obliged to change it in the purchaſe of a ſmall quantity of goods, *e. g.* the worth of 5*s.* It often returns into the hands of a dealer before the conſumer hath ſpent the fortieth part of the money. But where bank-notes are iſſued for ſo ſmall ſums as 20*s.*, paper-money extends itſelf to a great part of the circulation between dealers and conſumers. By the mode of iſſuing for the purpoſe of circulation, bank-notes for very ſmall ſums, people of little real property are enabled and encouraged to become bankers: and the frequent bankruptcies to which ſuch mean bankers are liable, may occaſion a very conſiderable inconvenience, and ſometimes even a very great calamity to many poor people who had received their notes in payment. Dr. Smith ſuggeſts, that it might be better if no bank-notes were iſſued in any part of the kingdom for a ſmaller ſum than five pounds. Paper-money, he ſays, would then confine itſelf in every part of the kingdom to the circulation between the different dealers; and when this is the caſe, there will be always plenty of gold and ſilver. But when it extends itſelf to a conſiderable part of the circulation between dealers and conſumers, it baniſhes gold and ſilver almoſt entirely from the country; almoſt all the ordinary tranſactions of its interior commerce being then carried on by paper. Nevertheleſs, though paper-money ſhould be pretty much confined to the circulation between dealers and dealers, yet bankers might ſtill be able to give nearly the ſame aſſiſtance to the induſtry and commerce of the country, as they would do if paper-money filled almoſt the whole circulation. The ready money which a dealer is obliged to keep by him for anſwering occaſional demands, is deſtined altogether for the circulation between himſelf and other dealers of whom he buys goods. He has no occaſion to keep any by him for the circulation between himſelf and the conſumers, who are his cuſtomers, and who bring ready-money to him, inſtead of taking any from him. Though no paper-money, therefore, was allowed to be iſſued but for ſuch ſums as would confine it pretty much to the circulation between dealers and dealers, yet, partly by diſcounting real bills of exchange, and partly by lending upon caſh accounts, banks and bankers might ſtill be able to relieve the greater part of theſe dealers from the neceſſity of keeping any conſiderable part of their ſtock by them unemployed, and in ready money, for anſwering occaſional demands. They might ſtill be able to give the utmoſt aſſiſtance which banks and bankers can with propriety give to traders of every kind. See Bank, Commerce, Credit, Money, and Paper-money.

CIRCULATORY, Circulatorium, in *Chemiſtry*, the veſſel wherein a fluid is put to undergo the proceſs of Circulation.

There are two kinds of *circulatories*; the *diota*, or Double *veſſel*; and the Pelican.

CIRCULUS, in *Geometry*, *Logic*, &c. See Circle.

Circulus, among *Chemiſts*, is a round iron inſtrument, uſed in cutting off the necks of glaſs veſſels; which they effect thus: The inſtrument, being heated, is applied to the glaſs veſſel, and there kept till the latter grows hot; then, by a few drops of cold water, or a cold blaſt thereon, it flies even and regularly off. Thus they cut off the necks of retorts, or cucurbits.

There is another method of doing the ſame; *viz.* by tying a thread, firſt dipped in oil of turpentine, round the place where the ſection is to be; and then ſetting fire to the thread. This done, ſome cold water being ſprinkled on the place, the glaſs will be cracked through that part preciſely where the thread was tied.

CIRCUMAGENTES *muſculi*, in *Anatomy*. See Obliquus.

CIRCUMAMBIENT, an epithet denoting a thing to inveſt, or incompaſs another round. Thus, we ſay, the ambient, or circumambient air, &c.

CIRCUMCELLIONES, in *Church Hiſtory*, a ſet of illiterate ſavage peaſants, and deſperate ruffians, who adhered to the party of the Donatists towards the end of the fourth century. They aſſumed the title of vindicators of juſtice, and protectors of the oppreſſed, and maintained their cauſe by force of arms, and filled the whole province of Africa with ſlaughter and rapine. Conſtantine the Great, in order to quiet the tumults which they occaſioned, aboliſhed the laws that had been enacted againſt the Donatiſts; however, after his death, their aſſaſſinations and maſſacres were renewed, till they were defeated by Macarius at the battle of Bagnia. Many of this frantic mob were afterwards treated with great ſeverity, and the Donatiſts ſhared their ſufferings.

CIRCUMCISION, the act of cutting off the prepuce; or a ceremony, in the Jewiſh and Mahometan religions, wherein they cut away the foreſkin of the males who are to profeſs the one or the other law.

Circumciſion commenced in the time of Abraham; and was, as it were, the ſeal of a covenant ſtipulated between God and him: it was in the year of the world 2107, of the Julian period 2817, B.C. 1897, that Abraham, by divine appointment, circumciſed himſelf, and all the males of his family; from which time it became an hereditary practice among his deſcendants.

This appointment (ſee Gen. xvii. 9, &c.) was accompanied with a further injunction, that for the future all males born of him, or in his family, whether bond or free, ſhould be circumciſed on the 8th day after the birth, and alſo a declaration, that if any male remained uncircumciſed, that perſon ſhould be cut off, as a deſpiſer of God's covenant, from having any ſhare in the promiſed land deſigned for him and his poſterity.

This ceremony, however, was not confined to the Jews: Herodotus and Philo Judæus have obſerved, that it obtained alſo among the Egyptians and Ethiopians. Herodotus ſays, (lib. ii. c. 91.) that the cuſtom was very ancient among each people; ſo that there was no determining which of them borrowed it from the other. Among the Egyptians, he ſays, it was inſtituted ἀπ' ἀρχῆς, from the beginning; by which expreſſion, as Shuckford intimates (Conn. vol. i. p. 324.) he could not mean, from the firſt riſe or original of that nation, but that it was ſo early among them, that the Heathen writers had no account of the original of it. When any thing appeared to them to be thus ancient, they pronounced it to be ἀπ' ἀρχῆς. That Herodotus himſelf meant no more than this by the expreſſion is evident from his own words. For we find him querying, whether the Egyptians learnt circumciſion from the Ethiopians, or the Ethiopians from the Egyptians, and he leaves the queſtion undecided, merely concluding that it was a very ancient rite, (lib. ii. c. 104.) There had been no room for this heſitation and indeciſion, if he had before meant, that it was an original rite of the Egyptians when he ſaid it was uſed by them "from the beginning." But among the Heathen writers, to ſay a thing was ἀπ' ἀρχῆς, "from the beginning," or that it was "very anciently" practiſed, are terms perfectly ſynonymous, and mean the ſame thing.

The ſame hiſtorian relates, that the inhabitants of Colchis alſo uſed circumciſion; whence he concludes, that they were originally Egyptians. He adds, that the Phœnicians and Syrians, who lived in Paleſtine (*i. e.* as Joſephus rightly corrects him, (Cont. Apion.) the Jews) were likewiſe circumciſed; but that they borrowed the practice from the Egyptians. And, laſtly, that a little before the time when he wrote, circumciſion had paſſed from Colchis, to the people inhabiting near Thermodoon and Parthenius.

Diodorus Siculus (lib. i.) thought the Colchians and the Jews to be derived from the Egyptians, becauſe they uſed circumciſion. And again he ſays (lib. iii.), ſpeaking of ſome other nations, that they were circumciſed, after the manner of the Egyptians. Sir John Marſham is of opinion, that the Hebrews borrowed circumciſion from the Egyptians; and that God was not the firſt author thereof; citing Diodorus Siculus, and Herodotus, as evidences on his ſide. This latter propoſition ſeems directly contrary to the teſtimony of Moſes, who aſſures us, (Gen. xvii.) that Abraham, though ninety-nine years of age, was not circumciſed till he had the expreſs command of God for it.

Celſus and Julian, as we learn from Origen and Cyril, adopted the opinion, avowed by Marſham; and lord Shafteſbury in his "Characteriſtics," (vol. iii. p. 52.) has alſo expreſſed his ſentiments to the ſame purpoſe. As to the teſtimonies of Herodotus and Diodorus, they cannot be held in very high eſtimation, if we conſider, that the Heathen writers in general were very imperfectly and partially acquainted with the Jewiſh hiſtory. In the books of Joſephus (Cont. Apion) we have many inſtances of their errors and miſrepreſentations with regard to the hiſtory of the Jews; and the account which Juſtin, the epitomizer of Trogus Pompeius, gives of their original, (Juſtin. lib. xxxvi. c. 2.) evidently ſhews, that they were but very ſuperficially acquainted with Jewiſh affairs. Accordingly, Origen might juſtly blame Celſus for adhering to the Heathen accounts of circumciſion in preference to that of Moſes; for Moſes has given a clear and full account of the original of the inſtitution, whilſt they only afford us imperfect hints and conjectures. Beſides, we have (ſays Shuckford) the teſtimony of an Heathen writer unqueſtionably confirming Moſes's account of Abraham's circumciſion. We read in Philo Biblius's extracts from Sanchoniathon (apud Euſeb. Præp. Evang. lib. i. c. 10.) of a record in the Phœnician antiquities, that Ilus, who was alſo called Chronus, circumciſed himſelf, and compelled his companions to do the ſame. This Ilus, or Chronus, according to ſir John Marſham, was Noah, or at leaſt, as other writers ſuggeſt, he was a perſon much more ancient than the times of Abraham; and therefore they infer from this paſſage, that circumciſion was practiſed before the time of Abraham. To this argument, however, it may be replied, that the ſame author who gives us this account of Ilus, or Chronus, ſufficiently informs us who he was, by telling us that he ſacrificed his only ſon; and we are further informed, with reſpect to this Chronus, from the Egyptian records, that the Phœnicians called him Iſrael. Chronus, therefore, or Iſrael, who was reported to have ſacrificed his only ſon, can be no other perſon than Abraham, who is repreſented by the Heathen writers as having ſacrificed his only ſon Iſaac. Jacob was, indeed, the perſon who was called Iſrael; but the Heathen accounts aſcribe to him 10 ſons; and here we have only a trivial miſtake compared with many others which occur in the Heathen hiſtories; or that of applying the name Iſrael to the perſon, who, as they ſay, ſacrificed his only ſon, when the name really belonged to his grandſon. From this paſſage, therefore, it appears, not as ſome writers would infer from it, that circumciſion was uſed in Heathen nations for ages before Abraham, but that Abraham and his family were circumciſed;

cumciſed; and, therefore, unleſs they can produce a teſtimony of ſome other perſons being circumciſed, cotemporary with, or prior to, Abraham, we have their own confeſſion that Abraham was circumciſed at an earlier period than that in which they can produce an inſtance of any other perſon's being circumciſed in the world. Moreover, it has been alleged, that the Philiſtines, who were originally Egyptians, and gave name to the country, were circumciſed: and if we may be allowed to refer to the rabbinical commentators on this ſubject, they pretend that one of the three proofs, which Joſeph gave to the patriarchs of his being their brother (ſee Gen. xlv. 12.), was the token of circumciſion, which, as they ſay, was peculiar at that time to the family of Abraham. This he is ſuppoſed to have diſcovered, by unfolding his garment, when they ſtood near him, and bidding them regard it. Joſeph's "cauſing every man to go out (v. 1.) and praying his brethren to come near him," (v. 4.) ſeems to intimate, that he had ſome important ſecret to impart to them, a ſecret which was not to be expoſed to the ridicule or wanton curioſity of the uncircumciſed Egyptians. Otherwiſe there appears to be nothing, in this whole narration, which is told with ſo much elegance and ſimplicity, that could in any manner offend, or which, indeed, would not rather have afforded the greateſt pleaſure and ſatisfaction to the Egyptians. (See Shaw's Travels, p. 390.) It ſeems alſo to be implied (Jerem. ix. 25, 26.) that the Egyptians were not circumciſed at the time when that prophet lived, *viz.* about 627 years before Chriſt, which was not 200 years before Herodotus flouriſhed and wrote his hiſtory.

Dr. Spencer, in his learned work "De Legibus Hebræorum, &c." (lib. i. c. 5.) diſtinguiſhes between patriarchal and Moſaic circumciſion: the former was in uſe before the law, and ſealed the covenant between God and Abraham, as well as his poſterity: the latter derived a kind of new ſanction from the Moſaic law, and was deemed a primary ceremony of the Jewiſh religion. He conſiders the deſign and uſe of this inſtitution, partly as a *ſign*, and partly as a *ſeal*. As a *ſign*, it ſerved to diſtinguiſh and diſcriminate the people of God, and particularly the poſterity of Abraham, from whoſe line the Meſſiah was to proceed, from other nations; it was alſo a memorial of the covenant between God and Abraham; it figuratively denoted the purity and ſanctity which pertained to the character of thoſe who ſuſtained a relation to God; it was alſo a token of initiation, by which perſons were introduced into the Jewiſh church, and devoted themſelves to the worſhip of Jehovah; it was a kind of prophylactic, or preſervative ſign, which intimated the providential protection in which the Jews were peculiarly intereſted; and it was a political ſign, by which proſelytes were admitted into the commonwealth of Iſrael, and a participation of the external privileges and honours pertaining to the Jewiſh people. Circumciſion, as a *ſeal*, ſerved to indicate and to ratify the covenant ſubſiſting, under the patriarchal diſpenſation, between God and the deſcendants of Abraham, and, under the Moſaic economy, between God and the Jewiſh people. On the part of God, it betokened and enſured the grant of peculiar bleſſings, and on the part of men, abſtinence from idolatry, and a ſtedfaſt adherence to the worſhip and ſervice of Jehovah. This learned writer proceeds to enumerate a variety of reaſons, natural, moral, and ceremonial, for the particular mode in which this rite was performed, and he intimates that at the time of its performance it was uſual to give a name to thoſe who were the ſubjects of it. In an elaborate inquiry concerning the origin and antiquity of this rite, he ſtates the arguments for and againſt its derivation from the Egyptians; and without abſolutely determining the queſtion, he ſeems to incline to the opinion adopted by ſir John Marſham and others. The evidence, however, as we have already obſerved, ſeems to preponderate on the other ſide; and it is generally allowed that the practice of circumciſion, among the Hebrews, differed very conſiderably from that of the Egyptians. Among the firſt it was a ceremony of religion, and was performed on the eighth day after the birth of the child: among the latter, it was a point of mere decency and cleanlineſs; and, as ſome will have it, of phyſical neceſſity; and was not performed till the thirteenth year; and then on girls as well as boys.

Among the Jews, circumciſion was performed with a knife made of ſome kind of ſtone, as being thought leſs dangerous than other inſtruments of iron or ſteel. But nothing is ordained, in the original inſtitution of this rite, with reſpect to the perſon by whom, or with what inſtrument, or in what manner the ceremony was to be performed; only that the foreſkin ſhould be cut off on the eighth day; ſo that it was left to the option of the parent, either to perform it himſelf, or to employ ſome other perſon, either a prieſt, a ſurgeon, or a friend. In this laſt capacity, it was conſidered as a high compliment to be choſen to that office. The ceremony, the mode of performing which it is needleſs minutely to deſcribe, was uſually accompanied with great rejoicing and feaſting; and it was at that time, as we have already obſerved, that the child was to be named by the parents, in the preſence of the company. Theſe names were generally ſignificant of ſomething relating to the parents or the child, or to ſome other circumſtances of time or place. The Iſraelites ſet aſide the practice of circumciſion, during the forty years of their paſſage through the wilderneſs; becauſe, as ſome have argued, circumciſion being intended as a mark of diſtinction between the Jews and the Gentiles, it was not neceſſary to make any mark at all, in a place wherein there was nobody to mix with them. Other reaſons, however, have been aſſigned for the diſcontinuance and revival of this rite, of which it will be proper to give ſome account. After the Iſraelites had paſſed the river Jordan, Joſhua encamped at Gilgal, on the eaſt ſide of Jericho, and here God directed him to revive the right of circumciſion; for the Iſraelites had circumciſed none of their children that were born, after the exit from Egypt, until this time. In order to account for this neglect, it has been alleged, that the covenant which the Iſraelites made with God at Horeb was to do and obſerve all the things which the Lord ſhould command them (ſee Exod. xix. 8. xxiv. 3. 7. Deut. v. 27. xxvi. 17.); and they were to avoid the introduction of any religious rite, without a divine command: and, therefore, though God had ordered Abraham to circumciſe himſelf and children, and to enjoin the uſe of this rite on his poſterity; yet, when God was giving to the Iſraelites a new law by the inſtrumentality of Moſes, they could not warrantably aſſume any rite, however ancient or cuſtomary, as a part of it, unleſs God himſelf gave them a command for it. God, indeed, had given them a command for circumciſion. We find it among the laws given after the death of Nadab and Abihu, the ſons of Aaron (Lev. xii. 3.), who were killed by fire from the Lord, for offering incenſe in a manner which he did not command (Lev. x. 1); and this incident muſt ſerve as admonition to the people not to mingle any of their own fancies in the performance of any divine inſtitutions, and rendered them particularly cautious in every matter of this kind. Although the paſſover was a feaſt which they were commanded to obſerve throughout their generations by a perpetual ordinance (Exod. xii. 14.); yet we find that they did not attempt a ſecond celebration of it, without an expreſs command from God for the purpoſe (Numb. ix. 1, 2, 3. 7.); nor did they venture to proceed in a caſe of doubt, which occurred in relation to the men, who were defiled by a dead body, but waited till Moſes heard what the Lord would command concerning them. (Numb. ix. 6, 7, 8.) Thus alſo, as the law for circumciſion required the males to be circumciſed at the age of eight days (Lev. xii. 3.), and was not given till within the ſecond year of the Exodus, when there muſt have been in the camp a great number of children uncircumciſed, who were paſt the day of age at which this rite was to be performed, a doubt would ariſe, when or how theſe were to be put "under the law;" and as the Iſraelites did not receive directions from God how to act, they might reaſonably heſitate in proceeding without ſpecial inſtruction. The reader, who conſults Poli Synopſ. Critic. in loc. will find various reaſons aſſigned by critics and commentators for the omiſſion of circumciſion during the period already noticed. But Shuckford, (ſee his Conn. of Sacred and Prophane Hiſt. vol. ii. p. 156.) thinks they have not ſucceeded in aſſigning the true one. We find (he ſays) no fault imputed to the Iſraelites for their neglect of it, and God himſelf now "rolled away the reproach of Egypt from off them," (Joſh. v. 9.); ſo that the Iſraelites had long eſteemed it a reproach to them, that they did not practiſe this rite; but it had been their misfortune, that God had not yet given them orders how or when to begin it, and, therefore, they were under a neceſſity of living in the omiſſion of it. Shuckford ſuggeſts that the expreſſion here uſed has been miſunderſtood. A ſtate of circumciſion is called the "reproach of Egypt," that is, as ſome ſay, the Egyptians thought it a reproach to them who lived in it: and, indeed, it is neceſſary to take the words in this ſenſe, if we would infer from them that circumciſion was originally an Egyptian rite, and that the Hebrews learned from them the uſe of it. But the writer, whoſe obſervations are now cited, is of opinion, that the true meaning of the expreſſion "the reproach of Egypt," is directly contrary to the ſenſe which theſe writers would give to it. "My reproach," "my ſhame," "my diſhonour," (ſee Gen. xxx. 23. 2 Sam. xiii. 13. Pſ. lxix. 19.) do all ſignify, not what I may have to impute to others, but what others may object to me; and, in like manner, "reproach of Egypt," or "Egyptian reproach," ſignifies not what the Egyptians might think a diſrepute to others, but what other nations eſteemed a blemiſh and defect in them. We find an expreſſion of like import thus uſed by one of the moſt elegant claſſics. (See Hor. Carm. l. iv. od. 12.) The ſwallow is ſaid to be

"—— Cecropiæ domûs
Æternum opprobrium,"

the "everlaſting reproach of the houſe of Cecrops," not as hinting any thing, for which the deſcendants of Cecrops might reproach others; but upon account of facts that were a laſting diſhonour to this family. Thus alſo, they were not the Egyptians at this time, but the Iſraelites, who thought uncircumciſion a diſreputable thing, and accounted all nations profane, that did not uſe this inſtitution; and the Egyptians at this time, not obſerving this rite, this, in the judgment of the Iſraelites, was their reproach, a thing opprobrious or diſgraceful to them: and, therefore, when God here appointed the Iſraelites to be circumciſed, he "rolled away the reproach of Egypt from off" them; he removed from them that ſtate of uncircumciſion, which they thought an infamous defect in the Egyptians. With regard to the revival of circumciſion by Joſhua, our author makes the two following obſervations; the firſt is, that the Iſraelites muſt hence derive full conviction that all their fathers were dead, againſt whom God had denounced, that their carcaſes ſhould fall in the wilderneſs (Numb. xiv.); for, upon this renewal of circumciſion, none having been circumciſed from the time of the Exodus till now (Joſh. v. 5.), it became evident how many of the camp had been in Egypt; and, by computing the age of thoſe who had been there, it would appear, that no perſons were then alive except Caleb and Joſhua, who were twenty years old, when the poll was taken in the year after the Exodus. (Numb. xxvi. 64, 65.) Secondly, as the Iſraelites were now in an enemy's country, in the neighbourhood of a powerful and populous city, and could not be ſecure for one day, that the Canaanites might not attempt to march againſt them, Joſhua, without an expreſs order from God, could never have thought this a proper time to diſable any part of the camp by circumciſing them; and, therefore, he muſt certainly have had a command from God to this purpoſe.

M. Fleury obſerves, that the Jews were not unanimous as to the neceſſity of circumciſion; ſome holding it an eſſential, others only as a circumſtance.

Among the Jews, the father is obliged to have his ſon circumciſed on the eighth day; it may not be ſooner: but the child's weakneſs may allow of its being deferred longer. There is a god-father to hold the child, and a god-mother to carry it from the houſe to the ſynagogue, and to preſent it there. He who circumciſes is called in Hebrew *Mohel*; any perſon is choſen for the purpoſe indifferently, provided he be but capable of the function, which, among the Jews, is a title of great merit. The manner of the ceremony, as related by Leo de Modena, is as follows.—Two ſeats are prepared in the morning with ſilken cuſhions, one for the god-father, who holds the child, the other, as they ſay, for the prophet Elias, whom they ſuppoſe to aſſiſt inviſibly. The perſon who is to circumciſe brings the neceſſary utenſils; the razor, ſtyptic, linen, fillet, and oil of roſes; to which ſome add a ſhell full of ſand, to put the preputium in. A pſalm is ſung till the god-mother brings the child, attended with a crowd of women, and delivers it to the god-father, none of them entering the door: the god-father, being ſeated, ſets the child on his lap; then the circumciſer, taking the razor, and preparing the child for the operation, ſays, "Bleſſed be thou, O Lord, who haſt injoined us circumciſion," and in ſo ſaying cuts off the thick ſkin of the preputium, and with his finger-nails tears off another finer ſkin remaining, ſucking the blood two or three times, as it breaks out, and ſpitting it out into a glaſs full of wine; then he lays dragon's blood on the wound, with powder of coral, and other things, to ſtaunch the blood; and laſtly, a compreſs of oil of roſes; and thus binds up the whole: this done, he takes a glaſs of wine, and, bleſſing it, adds another benediction for the child, and impoſes the name.

Circumciſion, though it be not ſo much as once mentioned in the Koran, is yet held by the Mahometans to be an ancient divine inſtitution, confirmed by the religion of Iſlam, and though not ſo abſolutely neceſſary but that it may be diſpenſed with in ſome caſes, yet highly proper and expedient. The Arabs uſed this rite for many ages before Mahomet, having probably learned it from Iſmael, though not only his deſcendants, but the Hamyarites, and other tribes, practiſed the ſame. The Iſmaelites, we are told (Joſeph. Ant. b. i. c. 23.), uſed to circumciſe their children, not on the 8th day, according to the cuſtom of the Jews, but when about twelve or thirteen years old, at which age their father underwent that operation (Gen. xvii. 25.): and the Mahometans imitate them ſo far as not to circumciſe children before they be able, at leaſt, diſtinctly to pronounce that profeſſion of their faith, "There is no God, but God, Mahomet is the apoſtle of God;" but they fix on what age they pleaſe for the purpoſe between ſix and ſixteen. Although the Moſlem doctors are generally of opinion, conformably to the Scripture, that this precept was originally given to Abraham, yet ſome have imagined that Adam was taught it by the angel Gabriel, to ſatisfy an oath he had made to cut off that fleſh, which, after his fall, had rebelled againſt his ſpirit; whence an odd argument has been drawn for the univerſal obligation of circumciſion. (See the apocryphal Goſpel of Barnabas, c. 23.). It cannot be ſaid, indeed, that the Jews took the lead of the Mahometans in this way, yet they ſeem ſo unwilling to believe any of the principal patriarchs or prophets before Abraham were really uncircumciſed, that they even pretend ſeveral of them, as well as ſome holy men who lived after his time, were born in a circumciſed ſtate, or without a foreſkin; and that Adam, in particular, was ſo created; whence the Mahometans affirm the ſame thing of their prophet; but as the practice was in uſe among the Arabs long before, the prophet muſt have been circumciſed many years prior to his pretended miſſion. See "Pocock, Spec." and "Abulfed. Vit. Mahom." cited by Sale in the Preliminary Diſcourſe to the Koran. Among the Mahometans they have a tradition, that their prophet declared circumciſion to be a neceſſary rite for men, and for women honourable. This tradition makes the prophet declare it to be "Sonna," which Pocock renders a neceſſary rite, though Sonna, according to the explanation of Reland, does not comprehend things abſolutely neceſſary, but ſuch as, though the obſervance of them be meritorious, the neglect is not liable to puniſhment. Aſſemani aſſerts, that the Turkiſh children receive their name at the inſtant of circumciſion, as the children of Chriſtians do at baptiſm: and with reſpect to the circumciſion of Chriſtian proſelytes, that they are previouſly obliged to trample and ſpit three times on a croſs preſented to them for that purpoſe, and then three arrows being ſhot off into the air by three of the attendants, the name of the new convert is pronounced before the arrows fall to the ground. "The two laſt circumſtances," ſays Dr. Ruſſell (Hiſt. of Aleppo, vol. i. p. 407.), are unknown at Aleppo; and the firſt is certainly a miſtake; for the child is named almoſt as ſoon as it comes into the world; and at Conſtantinople alſo, the naming of the child is not deferred till the time of circumciſion. The circumciſion of females is not known at Aleppo; and Dr. Ruſſell is of opinion, that circumciſion is not abſolutely neceſſary in that climate on a phyſical account; nor does it appear to prevent any inconveniences which might not be obviated by leſs violent means. At Aleppo the boys are circumciſed between the age of ſix and ten, ſometimes later, but very ſeldom earlier. From that period their heads are ſhaved, and they aſſume the turban, inſtead of the handkerchief, which they wore during infancy. The ceremony is performed at the father's houſe, where noiſy rejoicings are made for ſeveral days. The boy receives preſents from his kindred, as well as from others who have been invited to the feaſt. He is dreſſed in new clothes, his turban is decked with flowers and tinſel, and for five or ſix days he wears a kind of large ſilk apron faſtened upon one ſhoulder, as a badge of the operation he has undergone. In this dreſs he is led on horſeback, in proceſſion through the ſtreets, preceded by the caſtle-muſic and ſeveral men armed with ſcymitars and ſhields. A number of female relations cloſe the proceſſion, and, after every ſtop made for the mock champions to combat, the women ſhout in their uſual manner while the men huzza. It is cuſtomary for people of condition to have two or three of their dependants' children circumciſed at the ſame time, which adds to the pomp of the cavalcade. Sonnini (ſee his "Travels in Upper and Lower Egypt," p. 337), deſcribes proceſſions on a ſimilar occaſion, which he frequently witneſſed in the ſtreets of Siout.

The Turks, before the operation of circumciſion, ſqueeze the ſkin with little pincers, to deaden the ſenſation; they then cut it off with a razor, and apply a certain powder which heals the wound and takes off the pain. They never circumciſe till the ſeventh or eighth year, and ſometimes the eleventh or twelfth, as having no notion of its being neceſſary to ſalvation.

The manner of circumciſing among the Turks differs from that of the Jews; for the former, after they have cut off the ſkin, meddle no farther; but the laſt tear off the edge of the remaining ſkin in ſeveral places with their thumb-nails, which is the reaſon why the circumciſed Jews are cured much ſooner than the Turks.

Thoſe among the Jews who perform the operation of circumciſion are diſtinguiſhed by the length of their thumb-nails.

The Perſians circumciſe their children ſometimes within ten days after their birth, and ſometimes at ten years of age: that of girls is unknown: the wound is healed with cauſtic or aſtringent powders; and burnt paper is very generally uſed, which, according to Chardin, is the beſt remedy. This author tells us, "that the operation, when performed on grown perſons, is attended with conſiderable pain; that they are obliged to confine themſelves to the houſe for three or four weeks, and that death is ſometimes the conſequence."

Thoſe of Madagaſcar cut off the fleſh at three ſeveral times, and the moſt zealous of the relations preſent catches hold of the preputium and ſwallows it.

In the Maldivia iſlands, children are circumciſed at the age of ſeven years. In order to render the ſkin ſoft, the children are bathed in the ſea ſix or ſeven hours before the operation.

Herrera tells us, there is a kind of circumciſion among the Mexicans, though they are very far both from Judaiſm and Mahometaniſm; they cut off the foreſkin of the virile member, and the ears, as ſoon as the child is born, with great ceremony.

Among all the nations ſeated on the genuine Maranon in America, circumciſion is practiſed among the men, and exciſion among the women. Among the latter it is uſed at the age of ſeven, eight, or nine years, as in Arabia.

There is a kind of circumciſion practiſed at Otaheite, one of the newly diſcovered iſlands in the South Seas. The operation is performed by a prieſt, and conſiſts in ſlitting the prepuce through the upper part, to prevent its contracting over the glans. The practice ſeems to have taken its riſe from motives of cleanlineſs. Hawkeſworth's Voyages, vol. ii. p. 241.

Circumciſion is very generally practiſed in Abyſſinia, (ſee Abyssinia.) The Abyſſinians have a tradition among them, which merits ſome conſideration in the inquiry into the origin of this rite; *viz.* that they were, in the earlieſt time, circumciſed, before they left their native country and ſettled in Tigré. On this point Mr. Bruce obſerves, that if circumciſion was originally a Jewiſh invention, it ſeems very extraordinary, that all thoſe nations to the ſouth ſhould be ignorant of it, while others towards the north were ſo early acquainted with it: for none of thoſe nations up the Nile (except the ſhepherds) either know or practiſe it to this day; though, ever ſince the 1400th year before Chriſt, they have been in the cloſeſt connection with the Jews. Hence this writer infers, that the rite of circumciſion migrated northward from the plain of Mamre, for it certainly made no progreſs ſouthward from Egypt. As many nations contiguous to Egypt never received circumciſion from it, it ſeems, ſays Mr. Bruce, an invincible argument, that this was no endemial rite or cuſtom among the Egyptians; and it was of no uſe to this nation, as the reaſons mentioned by Philo and others, of cleanlineſs and climate, are abſolute dreams, and are now exploded; and that they are ſo is plain, becauſe otherwiſe, the nations more to the ſouthward would have adopted it, as they have univerſally done the cuſtom of female circumciſion, which Mr. Bruce calls "exciſion." Circumciſion then, ſays this author, (Travels, vol. iii. p. 346.) having no natural cauſe or advantage, being in itſelf repugnant to man's nature, and extremely painful, if not dangerous, could never originate in man's mind wantonly and out of free-will. It might have done ſo indeed from imitation, but with Abraham it had a cauſe, as God was to make his private family in a few years numerous, like the ſands of the ſea. This mark, which ſeparated them from all the world, was an eaſy mode of ſhewing whether the promiſe was fulfilled or not. They were going to take poſſeſſion of a land where circumciſion was not known, and this ſhewed them their enemy diſtinct from their own people. And it would be the groſſeſt abſurdity to bind Sampſon to bring, as tokens of the ſlain, ſo many foreſkins or prepuces of the Philiſtines, if, as Herodotus ſays, the Philiſtines had cut off their prepuces a thouſand years before.

Circumciſion among the ancient Egyptians was conſidered as indiſpenſable. Whether it was really ſo in their climate, Sonnini (Travels in Upper and Lower Egypt, p. 263.) does not undertake to reſolve; although he thinks, that if it be not altogether neceſſary, it is at leaſt of very great utility among a rude and ſlovenly people. It is likewiſe in uſe among the Copts, who, not thinking themſelves ſufficiently ſure of admittance into paradiſe by virtue of the baptiſm they receive as Chriſtians, reckon it alſo neceſſary to ſubmit to circumciſion, following, in this reſpect, as well as in ſeveral others, the precepts of the religion of the Mahometans, among whom they live.

In Egypt circumciſion is not peculiar to the men; but the women alſo undergo one of a ſomewhat ſimilar nature. This ſort of circumciſion, called indeed by Bruce "exciſion," as we are informed by Strabo (lib. xvii.), was practiſed by the people of ancient Egypt. He ſays, the Egyptians circumciſed both men and women "like the Jews." It does not appear that any ſuch operation ever obtained among the Jewiſh women; nor is it any where pretended to have been a religious rite, but to be introduced from neceſſity, in order to avoid a deformity to which nature has ſubjected particular perſons, in particular climates and countries. All the Egyptians, as Mr. Bruce informs us, the Arabians, and nations to the ſouth of Africa, the Abyſſinians, Gallas, Agows, Gafats, and Gongas, make their children undergo this operation, at no fixed time, indeed, but always before they are marriageable. Belon ſays the practice prevailed among the Coptæ; and P. Jovius and Munſter ſay the ſame of the ſubjects of Preſter John.

The greater number of thoſe who have written on the practice of female circumciſion, have conſidered it as the retrenchment of a portion of the nymphæ, which are ſaid to grow, in the countries where the practice obtains, to an extraordinary ſize. Others have imagined that it was nothing leſs than the amputation of the clitoris, the elongation of which is ſaid to be a diſguſting deformity, and to be attended with other inconveniences, which rendered the operation neceſſary.

Sonnini ſays, that before he had an opportunity of aſcertaining the nature of the circumciſion of the Egyptian women, he imagined it conſiſted in the amputation of the excreſcence of the nymphæ or of the clitoris, according to circumſtances, and according as theſe parts were more or leſs elongated. He adds, that it is even very probable, that theſe operations take place not only in Egypt, but likewiſe in ſeveral countries of the Eaſt, where the heat of the climate, and other cauſes, may produce too great an increaſe of theſe parts. This author, ſuſpecting that there muſt be ſomething more than an exceſs in thoſe parts, an inconvenience, which, far from being met with in all women, could alone have given riſe to an ancient and general practice, determined to ſubmit the matter to the teſt of experience. Having examined a young girl of Egyptian origin, about 8 years old, he found a thick, flabby, and fleſhy excreſcence, covered with ſkin, which grew from above the commiſſure of the labia and hung down it about half an inch. In ſize and ſhape it reſembled the caruncle pendent from the bill of a turkey-cock. This ſingular excreſcence was cut off by a female operator, without giving much pain to the patient, and without touching either the nympha or the clitoris, which parts were not viſible. The only topical application was a pinch of aſhes, although the wound diſcharged a conſiderable quantity of blood. This operation ſeems to be neceſſary, as this ſort of elongated caruncle increaſes in proportion to a girl's age, and if ſuffered to remain, would entirely cover the os externum. The excreſcence now deſcribed is peculiar to women of Egyptian origin, all others, according to Sonnini, being exempt from it, though belonging to nations that are ſettled in the country, and in a manner naturalized. The operation is commonly performed on the Egyptian girls at the age of 7 or 8 years. The women of the Saïd are thoſe who are accuſtomed to perform the operation; and they go about the towns and villages, crying in the ſtreet, "circumciſor! who wants a circumciſor?" A ſuperſtitious tradition has fixed the period in which circumciſion is to be practiſed, at the commencement of the increaſe of the Nile. In this excreſcence, which is a diſtinguiſhing characteriſtic of the women indigenous in Egypt, we may diſcover ſome reſemblance of that which is peculiar to the inhabitants of the other extremity of Africa. Indeed there is reaſon for believing, that this appendage is not reſtricted to the Egyptian women only, but extends from their country as far as the Cape of Good Hope, by a line which includes merely the tawny women, and not the female negroes, who have no ſuch characteriſtic.

Circumcision, in *Surgery*, is an operation to which practitioners have recourſe on ſeveral emergencies, *viz.* when the prepuce is ſo much elongated as to become inconvenient;—when it is cloſely contracted, ſo as not to admit a free diſcharge of the urine;—when there is an ulcer or excoriation under the prepuce, requiring the uſe of ſome medicated application, and which cannot be done without removing the foreſkin;—when warty excreſcences are formed in a conſiderable quantity around the glans penis;—or, when the prepuce itſelf becomes ſo altered in its ſtructure as to threaten more ſerious conſequences than would ariſe from its exciſion.

In females, eſpecially thoſe reſiding in hot countries, the preputium clitoridis is often ſo much enlarged as to need a ſimilar operation; and this fact is mentioned both by the Arabian and Greek phyſicians, particularly by Paulus Œgineta, Œtius, Avicenna, Albucaſis, &c.

This operation requires but little ſkill in the performance, except in guarding againſt any accident to the glans, and in taking care to divide the inner as well as the outer fold of the prepuce. The ſtate of the diſeaſed parts may occaſion ſome diverſity in the mode of circumciſing, but, in general, one of theſe two methods is expedient:

Firſt, to draw forward the prepuce, and hold it between a pair of forceps; then to cut off the projecting portion of ſkin with one ſtroke of the ſcalpel: or, *Secondly*, to introduce a narrow biſtory, concealed within a deep director, until it reaches the top of the corona glandis; next, after puſhing the biſtory through the upper part of the foreſkin, and bringing it along to the extremity, cut around the whole prepuce nearly in a circular direction, till the ſuperfluous portion is removed. But in making this latter inciſion, it is neceſſary to avoid touching the frænum and glans, leſt the patient ſhould ſuffer unneceſſary pain and ſubſequent injury from the ſurgeon's careleſſneſs in operating.

The firſt method of circumciſing is not eligible, if it be deſigned to expoſe the whole ſurface of the glans, although we may ſometimes be required to take away only a ſmall part of the prepuce, or even to lay it open without removing any. The after-treatment is very ſimple, provided the parts are not diſeaſed. The ſofteſt and leaſt irritating dreſſings are moſt proper. The patient ſhould keep in bed, or recline on a couch, for a few days, and ſhun all cauſes of inflammation. See Phymosis, Warts, Lues Venerea, and Syphilis.

Circumcision is alſo the name of a feaſt celebrated on the firſt of January, in commemoration of the circumciſion of our Saviour. This day was anciently kept a faſt, in oppoſition to the Pagan ſuperſtitions, who feaſted on it in honour of the god Janus.

CIRCUMFERENCE, formed from *circum*, *about*, and *fero*, *I carry*, in *Geometry*, the curve line that incloſes a circle, or circular ſpace; called alſo the periphery.

All lines drawn from the centre of a circle to the circumference, called *radii*, are equal.

Any part of the circumference is called an *arc;* and a right line drawn from one extreme of the arc to the other, a *chord*. See Arc and Chord.

The circumference of every circle is ſuppoſed to be divided into 360 equal parts, which are called *degrees*. See Degree.

The angle at the circumference is double that at the centre. See Circle.

The circumferences of circles are to each other as their radii. See Circle.

And, ſince the circumference of one circle is to its radius, as that of any other circle to its radius; the ratio of the circumference to the radius is the ſame in all circles. For the method of eſtimating the proportion of the diameter to the circumference, ſee Diameter, Rectification, and Quadrature.

CIRCUMFERENTOR, a mathematical inſtrument uſed by land-ſurveyors, for taking angles by the magnetic needle. It is an inſtrument (where great accuracy is not deſired) much uſed in ſurveying, in and about woodlands, commons, harbours, ſea-coaſts, in the working of coal-mines, &c. &c. where a permanent direction of the needle is of the moſt material conſequence in ſurveying.

In *Plate* II. of *Surveying*, *fig.* 1. repreſents the general form of the modern circumferentor. It is made of braſs, and, in its moſt ſimple ſtate, conſiſts of the following parts. A, a braſs compaſs box, about five inches diameter, or more. On the plate of the box, are engraved and lettered the principal points of the compaſs, divided into four quarters of 90 degrees each, two of the quarters being figured from the ſouth point, and terminated by 90 degrees at the eaſt and weſt; and the other two quarters from the north point, terminating alſo at the eaſt and weſt. On the circumference of the plate, is fixed a ring, divided into 360 degrees, numbered from 0 to 360; the obſerver may therefore take his angles, as bearing from the north and ſouth towards the eaſt and weſt; or, by that which is the moſt uſual method, the whole circumference of a circle of 360 degrees, commencing from the north point. A magnetic needle of the uſual kind turns upon an iron point, fixed in the centre of the compaſs plate. A ſtop and trigger wire is applied to the compaſs box, to throw the needle off its centre when not in uſe, in order to preſerve the fineneſs of the centre point. A glaſs and braſs ſpring ring covers the needle and cloſes the box. To the under ſide of the compaſs box, at the N. and S. points, is connected the bar B B, about 15 inches long from end to end, to each end of which is fixed a perpendicular braſs ſight C C, about five inches long, each ſight containing a long ſlit or perforation, and a ſight line, ſo that the obſerver may take his line of ſight, or obſervation of the line, upon the ſtation mark, at which end of the bar he pleaſes. A braſs ſocket is fixed at the centre under the compaſs box, which is fitted to and turns upon the braſs ball and ſocket of the parallel plates D *d*. The under part of the plate D is ſcrewed to the centre of the braſs plate of the folding ſtaves E. This ſcrew makes faſt the plates D *d* to the ſtaves E, and a ſimilar ſcrew makes faſt the ſocket of the circumferentor above, to the other plate, *d*. The inſtrument is levelled by turning the 4 ſcrews *a a*, &c. between the plates D D, and kept faſt. The inſtrument in the figure is repreſented as placed up in the field ready for uſe; when done with, the ſights C C may be taken off the bar B B; the parallel plates by unſcrewing the two ſcrews above mentioned, are ſeparated both from the ſtaves and circumferentor, and thus the inſtrument is packed into a portable caſe, and the ſtaves folded together in a ſmall ſpace. Improvements applied to this inſtrument, to render it more portable and increaſe its uſes, will be hereafter mentioned.

To obſerve an Angle by the Circumferentor.

Suppoſe the angular diſtance of two objects, or marks A B, *fig.* 2, be required, as ſeen by an obſerver at C. Place the inſtrument at the ſtation point C, and, looking through the ſight at the north point of the compaſs box, direct the line in the oppoſite ſight to cut the centre of the object at A, by means of the tangent ſcrew *m*. Notice the degree, and part of the degree, that the point of that end of the needle marked ſouth points to, in the diviſions of the circle of 360 degrees, which ſuppoſe to be 157½ degrees, or 157° 30′, then turn the inſtrument on its centre, by the ſcrew *m*, till you obſerve the centre point of the object B, and note the degree pointed to, which ſuppoſe to be 199° 40′. Subtracting the preceding leſs number from this greater, gives 42° 10′, the angle required. In turning from a degree between 180 and 360, to another on the commencement of the graduations, the remainder may exceed 180 degrees, if ſo that quantity taken from 360 degrees, the remainder will be the juſt angle. In this manner, any number of the interior angles of a field may be expeditiouſly taken.

To take the Plot of a Wood, Park, &c. by obſerving the Bearings of certain Station-lines encompaſſing that Wood, by the Circumferentor, fig. 3.

The inſtrument is to be placed at the firſt convenient ſtation (*a*), with the north point of the compaſs turned from you, or, which is the ſame thing, your eye placed at the ſight aperture over the ſouth point. Direct the line of ſight to the mark placed at the ſtation *b*, and note the degree of the circle, that the north point of the needle points to, which ſuppoſe to be 260° 30′. Enter this in your field book, as the bearing of the line *a b*. Meaſure onward the length of your ſtation line *a b*, noting the offſets for the irregular boundary. Move the inſtrument to the ſtation *b*, keeping the north point of the compaſs ſtill from you. Obſerve the mark at the third ſtation *c*, and the degree that the ſame end of the needle before uſed points to, ſuppoſe 292° 12′ (the 12′ being by eſtimation). This note alſo in your field book, for the bearing of the line *b c;* and in proceeding on to the ſtation *c*, meaſure the length of the line *b c*, noting the offsets. In this manner the bearings and lengths of the other ſtation lines may be taken.

If the circumferentor is placed at every other ſtation, half the trouble of ſetting it on the ground will be ſaved; but in this caſe the back as well as fore obſervations of the marks muſt be taken. Thus, if the inſtrument had been placed at *b*, the north point or ſight muſt be towards you, when you look back at the firſt ſtation (*a*), and the ſame point from you, as before, when you look towards the ſtation *c*, to make the bearings the ſame as if taken by the preceding method. Yet as the length of all the ſtation lines muſt be meaſured with the chain, no trouble relative to them can be avoided; and, in general, it may prove the beſt way, to ſet the inſtrument down at every ſtation, which will afford you the better opportunity of detecting an error in the juſt direction of the needle, or in obſervation, as in the following manner. Suppoſe the inſtrument fixed at *a*, the ſight directed to *b*, the north point of the compaſs from you, and the north point of the needle was obſerved to point to 260° 30′ the inſtrument afterwards being moved to *b*, and the north point of the compaſs *towards* you, direct the ſight back to *a;* if the north point of the needle point to the ſame 260° 30′, as before, when at *a*, there is no error either of needle or obſervation; but if it do not, the cauſe of the error muſt be aſcertained. The perfection or correct traverſing of the needle is eaſily diſcovered by the following obſervation. When the needle is in a quieſcent ſtate, obſerve the particular degree that one of its ends exactly points to, then with the approach of the blade of a pen-knife, a key, or other piece of iron, attract one of its ends 40 or 50 degrees from its poſition, leave the needle then to vibrate and ſettle, and if it reſt, pointing preciſely to the ſame degree as before, the error is not that of the needle's imperfection, but either in ſome extraneous body ſecretly influencing its direction, or in the obſervation itſelf. A blunt centre-point on which the needle turns, imperfect centre-cap of the needle, or iron particles in the caſt braſs of the compaſs-box, are cauſes which ſometimes prevent the juſt action of the needle and conſtitute a bad circumferentor. The beſt and moſt perfect ſort of needles have a ſmall poliſhed agate ſtone fixed in their centre.

In ſurveying by the circumferentor, the lengths of the offſets from the ſtation lines to the irregular boundaries are to be meaſured and entered in the field book as uſual in the other methods of ſurveying.

To protract the above-mentioned Survey as taken by the Circumferentor.

Suppoſe the bearings and lengths to be as follow:

St.	L.	Bearings.		Lengths.
a	*b*	260°	30	1242
b	*c*	292	12	1012
c	*d*	331	45	1050
d	*e*	59	00	1428
e	*f*	112	15	645
f	*a*	151	30	1806

The ſurveyor muſt provide himſelf with a braſs protractor about 6 or 7 inches in diameter, either of the circular, or ſemi-circular form, divided into degrees and half degrees. The circular form is moſtly uſed, as ſaving time and cauſing leſs chance of error, in protracting expeditiouſly. The order of the numbering of the 360° ſhould be in the contrary way to that of the circumferentor, but moſt protractors have a double row of figures, commencing in order from the oppoſite ends of the diameter.

Draw ſeveral lines over the intended draught, *fig.* 3, at a diſtance from each other not greater than the diameter of the protractor, marking their extremities with the letters N. and S. for the north and ſouth points. Conſider in which direction the plot will extend. Aſſign a point in one of the parallel lines to repreſent the firſt ſtation *a;* to which point lay the centre of the protractor with the diametrical or fiducial edge to coincide with that line. Look into the field book for the bearing of the firſt ſtation-line, *a b*, 260° 30′, at that number on the limb of the protractor, make a point or mark, and through that mark from the aſſigned point *a*, draw the line *a b*, on which line by your plotting ſcale of equal parts ſet off $12^{c}\ 42^{lks}$ as noted in the field book; hence will the line *a b* on the paper have a ſimilar bearing to that of the ſame ſtation-line taken in the field. The offsets are next to be made, and the true boundary of that ſide of the wood will be given.

If the protractor be a ſemicircle, it ſhould be numbered firſt on the outer edge on to 180°, and then on the inner circle, with numbers increaſing the ſame way to 360°. Theſe inner numbers are for bearings greater than 180°, and the 0 of the numbers muſt be laid northward or ſouthward, as the degrees of bearing are leſs or more than 180°.

Next lay the centre of the protractor on the point *b*, with its diameter upon a parallel with the north and ſouth line, and mark off on its limb 292° 12′, through which from *b* draw the line *bc*, mark its length 1010^{lks}, or 10 chains 10 links. Set off the offsets, and thus will that ſide of the wood be determined. Proceed on in the ſame manner for the other lines *c d*, *d e*, &c. and the laſt line *f a* will terminate exactly or very nearly ſo at the point *a*, if the obſervations have been correctly made.

Of the Improved Circumferentor.

From what has been obſerved, the reader will underſtand, that by the circumferentor, as originally conſtructed, the angles can be taken but by the needle only, and which from the uncertainty of the accurate poſition of the needle, is not ſufficient for ſome ſurveys where the accuracy of an angle is of great importance. Several years back Mr. Wm. Jones, optician, of Holborn, publiſhed a contrivance of an improvement on the circumferentor, whereby it might ſerve the purpoſe of a common theodolite, as well as a circumferentor, that is, to take the angles by a moveable nonius turning againſt the divided circle of degrees, independent of the needle, and like a common theodolite, ſerving as an occaſional check upon the poſition of the needle. It was rendered uſeful alſo as a ſpirit-level, and to give angles of altitude and depreſſion, with other advantages, as will be ſeen by the following deſcription. *Fig.* 1 contains the repreſentation of the improvements. The outſide braſs rim A, of the compaſs-box, is fixed to a circular plate placed under that of the compaſs, but moving independent of it, to which the baſes of the ſights B B are ſcrewed. Within ſide of the rim, under the glaſs, is ſcrewed a ſmall braſs nonius ſcale-piece, *g*, on which is divided a nonius ſcale adapted to the diviſions of the circle of 360°, and ſubdividing it into 5 or 3 minutes of a degree, as may at firſt be deſired. The centre of this ſcale is placed exactly in the line of ſight. When the inſtrument is to be uſed as a circumferentor only, the under moving-plate and the compaſs-plate are kept together with a braſs pin, and turning upon the ball and ſocket within the parallel plates D*d* as before deſcribed. When the angle is to be taken in degrees and minutes, independent of the needle, as in a theodolite, this pin is taken out, and the ſights with the nonius-ſcale moved round the compaſs-circle in the ſame manner as the index limb of a theodolite, and the angle in degrees and minutes read off by this nonius. The directions for taking a ſurvey by this inſtrument are the ſame as are given under the article Theodolite.

To uſe this inſtrument as a level, an opening is cut in the ſide of the ſocket to admit of the pin of the ball, when the compaſs box A is turned into a vertical poſition. The level direction of the ſight hole is made, by turning the whole inſtrument vertically on the centre of the ball, by the ſcrews *aa*, &c. till the air bubble of the ſpirit level F, ſcrewed to and adjuſted under the compaſs box, reſt exactly in the middle. If angles of altitude or depreſſion are to be taken, the centre of the compaſs is to be ſcrewed faſt to the ball, then the pin connecting the two plates being taken out, the ſights and nonius ſcale may be moved either above or below the horizontal poſition, till the object be ſeen through the little ſight hole *b c*, and the angle in degrees and minutes read off by the poſition of the nonius ſcale at the circumference of the circle. For a more accurate motion of the plate and index *B B*, the edge of the compaſs plate is in ſome inſtruments cut with teeth, and a pinion, adapted to theſe teeth, is fixed to the under moveable plate, ſo, that by turning the pinion, the ſights may be carried round to the mark in the moſt ſteady and accurate manner. To render the inſtrument more portable, the ſights, with their baſes *B B*, are kept to the plate under the compaſs box, when in uſe, by two finger ſcrews, one of which is ſhewn at G, and when not in uſe, taken away by unſcrewing the ſame ſcrews, ſo as to admit the whole inſtrument with its ball and ſocket without the ſtaves, to pack into a caſe but ſeven inches ſquare, and three inches deep.

For a more extenſive application of circumferentors in land-ſurveying, particularly in a method uſed by Mr. Gale, we refer the reader to Mr. William Jones's edition of the late Mr. George Adams's Geometrical and Graphical Eſſays, 1803, page 290, *et ſeq.*

CIRCUMFLEX, in *Grammar*, an accent, ſerving to note or diſtinguiſh a ſyllable of an intermediate ſound between acute and grave; and generally ſomewhat long. See Accent.

It is ſeldom uſed among the moderns, unleſs to ſhew the omiſſion of a letter which made the ſyllable long and open; a thing much more frequent in the French, than among us: they write *pâte*, for *paſte; tête* for *teſte; fûmes* for *fuſmes*, &c. They alſo uſe the circumflex in the participles; ſome of their authors write *conneu, peu;* others *connû, pû*, &c. Father Buffier is at a loſs for the reaſon of the circumflex on this occaſion.

The form of the Greek circumflex was anciently the ſame with that of ours, viz. ˆ; being a compoſition of the other two accents ʌ in one.—But the copyiſts changed the form of the characters, and introducing the running hand, changed alſo the form of the circumflex accent, and inſtead of making a juſt angle, rounded it off, adding a daſh, through too much haſte; and thus formed an *s*, laid horizontally, which produced this figure , inſtead of this ˆ.

CIRCUMFLEXA *femoris externa*, and *interna*, in *Angeiology*, two branches of the arteria profunda femoris. See Artery.

Circumflexa *humeri*, *anterior*, and *poſterior*, two branches of the axillary artery. See Artery.

CIRCUMFLEXUS *palati mollis*, one of the muſcles belonging to the ſoft palate. See Deglutition.

CIRCUMGYRATION, the wheeling motion of any body round a centre.

CIRCUMINCESSION, in *Theology*, a term whereby the ſchoolmen uſe to expreſs the exiſtence of three divine perſons in one another, in the myſtery of the Trinity. See Person.

The ſchool divines are not the firſt authors of this term; Damaſcenus, in the eighth century, having uſed the word περιχωρησις, which ſignifies the ſame thing, in his explication of that text, *I am in my Father, and my Father is in me.*

CIRCUMLOCUTION, from *circumloquor*, *I ſpeak about*, in *Oratory*, denotes a circuit, or compaſs of words; uſed either when a proper term for expreſſing any ſubject naturally and immediately does not occur, or when a perſon wiſhes to avoid ſomething diſagreeable, inconvenient, or improper to be expreſſed in direct terms, and conveys the ſame ſenſe in a kind of paraphraſe, ſo formed as to ſoften or break the force of the ſubject.

Thus Cicero, unable to deny that Clodius was ſlain by Milo, owns it with this circumlocution, "Milo's ſervants being prevented from aſſiſting their maſter, who was reported to be killed by Clodius; they, in his abſence, and without his privity, or conſent, did what every body would expect from their own ſervants on ſuch an occaſion."

CIRCUM-POLAR *Stars*, are ſuch ſtars as, being pretty near our north-pole, move round it; and in our latitude, never ſet, or go below the horizon.

CIRCUMPOTATIO, in *Antiquity*, a funeral feaſt, provided in honour of the dead.

This was very frequent among the ancient Romans, as well as among the Athenians. Solon, at Athens, and the decemviri at Rome, endeavoured to reform this cuſtom, thinking it abſurd that mirth and drunkenneſs ſhould mingle with ſorrow and grief.

CIRCUMSCRIBED *figure*, in *Geometry*. See Circumscribing.

Circumscribed *hyperbola*, one of the ſecond order, according to Sir Iſaac Newton, which cuts its aſymptotes, and contains the parts cut off within its own ſpace. See Hyperbola.

CIRCUMSCRIBING, in *Geometry*, denotes the deſcribing of a polygonous figure about a circle, in ſuch manner as that all its ſides are tangents to the circumference.

The term is ſometimes alſo uſed for the deſcribing of the circle about a polygon; ſo as that each ſide is a chord. But in this caſe, we more uſually ſay, the polygon is inſcribed, than the circle circumſcribed. See Polygon and Circle.

The ſide of a hexagon is equal to the radius of a circumſcribed circle. See Hexagon. For the method of circumſcribing a circle about any given regular polygon: See Polygon. For the method of circumſcribing a ſquare or any regular polygon about a circle: See Square and Polygon. See alſo Quadrilateral, Pentagon, Hexagon, Dodecagon, &c.

CIRCUMSPECTE' *agatis*, the title of a ſtatute made ann. 13 Edw. I. relating to prohibitions, preſcribing certain caſes to the judges, wherein the king's prohibition lies not.

CIRCUMSTANCES, the incidents of an event, or the particularities that accompany an action.

The circumſtances of the actions of men, are expreſſed in this Latin verſe:

Quis, quid, ubi, quibus auxiliis, cur, quomodo, quando.

Quis, who, denotes the quality, ſtate, age, &c. of the perſon.

ſon. *Quid*, what, the greatneſs, ſmallneſs, multitude, fewneſs, &c. of the thing. *Ubi*, where, the place. *Quibus auxiliis*, with what aſſiſtances, the inſtruments, means, &c. *Cur*, why, on what account, with what view. *Quomodo*, how, the quality of the action, as to intention or remiſſneſs, deſignedneſs or caſualty, ſecrecy or openneſs. *Quando*, when, the time; as on a holiday, at the hour of prayer, &c.

CIRCUMSTANTIAL *evidence*, in *Law*, or the *doctrine of preſumption*, takes place next to poſitive proof: circumſtances which either neceſſarily or uſually attend facts of a particular nature, that cannot be demonſtratively evinced, are called preſumptions, and are only to be relied on till the contrary be actually proved. See EVIDENCE and PRESUMPTION.

CIRCUMSTANTIBUS, in *Law*, is uſed for the ſupplying, and making up the number of jurors (in caſe any impannelled appear not; or appearing, be challenged by either party), by adding to them ſo many of the perſons preſent, or ſtanding by, as will ſerve the turn. Stat. 35 Hen. VIII. c. 6; and Stat. 5 Eliz. c. 25, for Wales.

CIRCUMVALLATION, in *Fortification*. A line of circumvallation is a work conſiſting of a ditch and parapet, with redans, or baſtions, from diſtance to diſtance, with their ſaliant angles towards the country or the field thrown up by the beſiegers of a place, againſt any attempts of the enemy from without. It differs from a line of contravallation, or countervallation, in this reſpect, that the latter is thrown up between the beſieger's camp and the place beſieged, to prevent any attempts of the beſieged from within, and is ſeldom made quite ſo ſtrong as the line of circumvallation.

The reſolving upon ſieges, or the coming to a determination to beſiege places, which is an affair of the cabinet, unleſs the general who commands the operating army has ſo far the confidence of his ſovereign and his miniſters, as to be at liberty to act as he thinks, or according to his own diſcretion, is the natural conſequence of that ſuperiority which we ſuppoſe ourſelves to poſſeſs over our enemies. But the carrying of them ſucceſsfully into execution, if the places be bravely and ably defended, is an undertaking that may juſtly be regarded as one of the moſt ſerious, important, and difficult parts of war, and therefore requires much precaution, preparation, prudence, and circumſpection. Their ſucceſs depends on the obſervance of various meaſures; of which the following may be conſidered as the principal.

1ſt. Secrecy, without which it is very difficult to ſucceed.

2dly, A ſufficient number of forces for attacking your enemy's places, and for defending your own.

3dly. A knowledge of the diſpoſitions of the enemy. For if they are re-united, and in as great force as yourſelves, they can prevent you from undertaking any ſieges.

4thly. That the magazines neareſt to the places you mean to inveſt, are abundantly ſupplied, and in a favourable condition for your purpoſe.

5thly, To ſeize on the moſt favourable times and ſeaſons for carrying on your operations; for all times are not proper for ſieges, nothing being more ruinous to an army than thoſe that are carried on in winter. That ſeaſon ought, therefore, to be avoided as much as poſſible.

Laſtly, An eſtimate and knowledge of the expence that will attend them; for money being the ſinew of war, no military operations of conſequence can be carried on without it.

Theſe are the principal objects of conſideration beforehand, and for which the neceſſary meaſures ſhould be taken at leiſure. And after all, when we ſuppoſe them to be well taken, it frequently happens that the whole fails; for the enemy, who ſeldom or ever takes the ſame view of things that we do, may interrupt us, by being, in the firſt place, as ſtrong as we are, and obſerving our motions and proceedings in due ſeaſon; or, ſecondly, by forming the deſign of undertaking ſome enterpriſe againſt places which it is of more conſequence to us to preſerve, than the conqueſt of thoſe we intend to attack; or, thirdly, by being in a condition to over-run our country, or part of it, and carry deſolation into the ſame, whilſt we are occupied with the ſiege of ſome place, the capture of which, that may be doubtful or uncertain, would not by any means compenſate for the loſs we ſhould thereby ſuſtain; or, laſtly, by having it in his power to give us battle before we can eſtabliſh ourſelves before the place we wiſh to attack.

All theſe conſiderations ought to be well weighed before we undertake the ſiege of a place; and the time for the ſame ſhould be ſo judiciouſly choſen, that the enemy cannot fall upon us ſuddenly, before we eſtabliſh ourſelves in the enterpriſe, by ſecuring our beſieging army with a line of circumvallation, or even countervallation. The beſt plan is to have a ſuperior force to that of the enemy, and to have two armies when it is practicable, viz. one to beſiege the place, and the other to watch and obſerve. The beſieging army confines itſelf within its lines, whilſt the army of obſervation only moves about, keeps a look-out, and occupies the avenues, or approaches, by which the enemy can approach or preſent himſelf; or takes poſts, and there retrenches himſelf; or if the enemy moves to a little diſtance, follows him, keeping always in ſight of him, but conſtantly poſting itſelf between him and the beſieging army ſo advantageouſly as not to be under the neceſſity of fighting, contrary to his wiſh or inclination. If we can only gain a few days' time at the commencement of a ſiege, it is of very great advantage.

Theſe two armies, viz. the beſieging army and the army of obſervation, ought always to keep themſelves within reach of each other, particularly during the commencement of a ſiege, in order to be able to ſuccour or ſupport each other, and keep the enemy at a diſtance, who on his part ought to be apprehenſive of approaching too near to the place, for fear the two joining together, if they be ſtronger than he is, falling upon him and attacking him with advantage.

The army of obſervation is, beſides, of great advantage to that which carries on the ſiege, as it watches for its ſafety, and favours its operations by eſcorting its convoys, furniſhniſhing it with faſcines, and performing other neceſſary duties and ſervices. And the beſieging army can reciprocally, in caſe of need, reinforce the army of obſervation after the firſt ſix or ſeven days of opening the trenches, when it has well taken its advantages and precautions againſt the place inveſted.

It is alſo a very favourable circumſtance to be able to attack before the enemy is in a condition to take the field with all his forces, or in the fall, when part of his troops are retired or withdrawn, and he is no longer in ſufficient force to oppoſe our enterpriſes.

To take advantage of the firſt of theſe circumſtances, it is neceſſary to have large magazines of forage within reach of the places you wiſh to inveſt, and always to have an army of obſervation, if poſſible.

We have already obſerved, that it is neceſſary to have magazines near to and within reach of the places we deſign to inveſt, and particularly of forage, if we mean to attack them before the enemy can take the field with all his forces. But we have not attempted to mention the number, or deſcribe the natures of the different magazines, or the quantity of each ſpecies of ſtores, they ought to contain. For to aſcertain this is difficult, and in attempting to do ſo one can only be regulated by a reference to the relative degrees of ſtrength, importance, &c. of the places to be attacked. If the place be conſiderable and of conſequence, one ſhould reckon on a ſiege ſufficiently long for one month at leaſt of open trenches. For it rarely happens that a place cannot hold out that time if it be tolerably well garriſoned, and be defended by intelligent officers, who wiſh to do their duty. A ſurplus of ammunition and ſtores at command, occaſions no loſs or inconvenience, but a deficiency may make the enterpriſe miſcarry.

Beſides having from 8 to 900,000 weight of powder, according as the place is more or leſs ſtrong, there ſhould be from 40 to 60,000 large bullets; from 16 to 20,000 ſmaller ones; from 12 to 16,000 ſhells; from 30 to 40,000 grenades; from 8 to 10.000 matches; from 150 to 180,000 weight of lead; 100,000 muſquet flints, ſtrong and well choſen; 50,000 ſacks of earth; 30 000 ſmall charges of powder ready made up; ſpare timber for bridges of communication, and other purpoſes; a ſufficient number of horſes for the artillery; cannon or guns of various ſizes, for the defence of the lines, and other ſervices; mortars for throwing ſhells and ſtones; ſhot, ſhells, grenades, leaden bullets, matches, flints; platforms complete for guns and mortars; ſpare carriages for guns; ſpare beds for mortars; ſpare ſponges, rammers, and ladles; intrenching tools; carpenters' ditto; ſling carts and carriages of different deſcriptions, &c. &c.

When all the neceſſary preparations are made, and the meaſures well taken, when the ſiege of a place is reſolved on, and the armies in ſhort are in the field, and in a condition for acting, the general ſhould, by his movements, do his utmoſt to remove the ſuſpicions which the enemy may entertain of his deſigns, and to direct them towards other objects as much as he is able. Sometimes this conſideration will carry him ſo far as to inveſt a place which he has no wiſh to attack, in order to make the enemy change his notions and meaſures, and thereby lead him to weaken the garriſon of the place he really means to beſiege. It was in this manner that the allies, in 1710, appearing to menace Ipres, occaſioned the beſt part of the garriſon of Tournay to be withdrawn from it, which being itſelf inveſted next morning, was not of conſequence in a condition to make the reſiſtance that might have been expected from it, though it was at that time one of the ſtrongeſt places in the Low Countries. Sometimes they preſs on the enemy during ſeveral days to drive him to a diſtance from the place intended to be attacked; after which, and when matters are brought to the point deſired, the firſt thing they ought to do is to inveſt the place, which is commonly done by a detachment of 4 or 5000 cavalry, more or leſs, according to the ſtrength of the garriſon, commanded by a lieutenant-general and two or three major-generals. Theſe troops ſhould march day and night, till they come within a league or two of the place, where halting they regulate their particular arrangement, and the diſpoſitions of the inveſtiture, in ſuch a manner, that they may all of them be able to arrive at the ſame hour to nearly the diſtance of cannon ſhot from the place.

Theſe occupy and command all the avenues favourable for throwing ſuccours into the place, and ſhut it up as cloſely as poſſible, by ſeizing on poſts all around it, puſhing on detachments to the very gates to carry off men, cattle, and whatſoever elſe they can find without the works, that may be ſerviceable to the garriſon. During the day, they keep themſelves out of the reach of the cannon of the place; but at night they approach to the diſtance of about muſquet ſhot from the works, in order to be able to form round it a circle, ſo furniſhed with troops, as to leave no, or but ſmall intervals, or empty ſpaces between them. In this ſituation they turn their backs on the place, and poſt ſmall guards both in front and rear of them to prevent ſurpriſe. They diſpoſe of themſelves, in ſhort, in ſuch a manner, as to be ready to make head againſt the enemy, on whatever ſide he may preſent himſelf, keeping always half the cavalry appointed to ſupport them mounted, whilſt the other half of them is diſmounted to give both the men and horſes ſome repoſe. In the morning they retire by degrees towards the dawn of day, frequently halting as they retire till ſun riſe, when they return to their quarters or former poſts, placing the ordinary guards towards the place and ſtronger ones in the avenues on the ſide of ſuccours; after which the ſquadrons who are not on guard, retire to the camp to repoſe themſelves, without taking off either their own cloaths or the ſaddles of their horſes, but merely for the ſhort time neceſſary for dreſſing them, that they may be in readineſs to mount at a moment's notice.

During this time he, who commands, ſends parties to learn intelligence of the enemy; he continues to make his arrangements, and to reconnoitre the ſituation the moſt convenient for placing the camps, and fixing the directions of the lines, as ſoon as the artillery ſhall arrive. This is a point to which the engineers, who ſhould be on the ſpot as ſoon as the inveſting detachment, ought particularly to direct their attention. When thoſe, who form the inveſtiture, have ſome troops of infantry with them, they diſpoſe of them in ſmall guards on the principal avenues of the place, ſupported by larger ones poſted behind them. And when infantry is wanting, they employ dragoons inſtead of them.

Whilſt theſe diſpoſitions are making, the army makes forced marches, and commonly arrives before the place the ſecond, third, fourth, or at moſt the fifth day after the inveſtiture. The lieutenant-general, who has formed advances from his troops to the diſtance of half a league or thereabout, is to meet the general, and render him an account of his diligence, expedition, and preparations; and the general on his report makes his final arrangement for the encampment of the army round the place.

Next morning he rectifies it if neceſſary, and in company with the other general officers and principal engineers, makes the circuit of the place, reconnoitring the ground for the purpoſe of finally determining its line of circumvallation. After having agreed on the figure and circuit of the lines, which ought always to regulate the encampment, the general diſtributes all the troops, according to the quarters deſtined for them, and aſſigns to each general officer his own.

The line of circumvallation is the firſt work of any magnitude, that is thrown up after the inveſtiture of a place, and is intended not only for ſhutting it up ſo completely, as to prevent any ſupplies of men, ammunition, cannon, military ſtores, or proviſions from being thrown into it, but alſo for ſecuring the camp of the beſieging army againſt inſult or attack from without, or from the ſide of the country. As this line is calculated for protecting the beſieging army and its camp againſt any attemps of the enemy from the field; ſo the line of countervallation, which is formed in a ſimilar manner, and is made between the camp and the place, when the garriſon is ſtrong, is intended for ſecuring it againſt any attacks from the beſieged. The ſaliant angles of the line of circumvallation look externally towards the country, whereas thoſe of the line of countervallation look inwards towards the place inveſted.

In tracing both theſe lines, care ſhould be taken to occupy the moſt advantageous ground in the neighbourhood of the place, without being over ſcrupulous about its being a little too near to, or a little too far off from the ſame.

As to the camp of the beſieging army, it ought to be placed, or pitched in ſuch a manner, that the rear of it may not be within reach of the cannon-ſhot of the place. On the other hand, it ſhould not be advanced too far from the ſame into the field, but ought to occupy preciſely, if poſſible, ground at the diſtance neceſſary for its ſecurity.

Particular attention ought alſo to be paid to the avoiding of all eminences or high ſituations, that may command any part of the camp, and when this is impracticable, to take them within the line, if it ſhould not be thereby rendered too extenſive; but if it ſhould, to occupy them with redoubts or other cloſed outworks.

Advantage ſhould be taken, both in forming and ſecuring this line, of all favourable circumſtances, furniſhed by the nature of the ground and the *environs* of the place; ſuch as precipices, moraſſes, rivers, rivulets, pools, hedges, lanes, thickets, woods fit for making *abattis*, &c.

The juſtly celebrated Vauban generally made his lines of circumvallation with *redans*, and ravelins, oppoſite to the gates or ſally ports, taking care to place the ſaid works, for the flanking defences, on the higher parts of the ground, if poſſible, without minding whether the diſtance between the ſaliant angle of one *redan*, and that of the next was the cuſtomary length of 120 toiſes or fathoms, or from 10 to 20, more or leſs, if the ground required it. The openings or gorges of the *redans* were each of them about 30 toiſes or fathoms, and the capital or depth of each about 20. The gorges of the ravelins, which covered the gates or ſally ports, were commonly each of them about 30 toiſes or fathoms, and the capital of each about 20. Sometimes baſtions were employed as well as redans, particularly at the ſaliant angles of the line of circumvallation, or at the angles formed by the different directions of its component parts.

That famous general and engineer has given ſix different profiles for lines of circumvallation, in order to make them ſuit all ſorts of them. Theſe are the following:

Firſt Profile. See Section 1ſt.

	Ft.	inch.
Width of the ditch at the opening or top,	18	—
Width or breadth of the ſame at the bottom,	6	—
Its depth, ...	7	6
Solid content of its excavation in *toiſes courantes*,	15	—
Solid content in cubic toiſes, . .	$2\frac{1}{2}$	—
Thickneſs of the parapet at top, . .	8	—
Height of ditto within, . . .	$7\frac{1}{2}$	—
Height of ditto without, . . .	6	—

Second Profile. See Section 2d.

	Ft.	inch.
Width of the ditch at the opening or top, .	16	—
Width of the ſame at the bottom, . .	5	4
Depth of the ſame, . . .	7	—
Solid content of its excavation in *toiſes courantes*,	$12\frac{4}{5}$	—
Solid content in cubic toiſes, . . .	$2\frac{2}{27}$	—
Thickneſs of the parapet at top, . .	7	—
Height of ditto within, . . .	$7\frac{1}{2}$	—
Height of ditto without, . . .	6	—

Third Profile. See Section 3d.

	Ft.	inch.
Width of the ditch at the opening or top, .	14	—
Width of the ſame at the bottom, . .	4	8
Depth of the ſame, ...	6	6
Solid content of its excavation in *toiſes courantes*,	$10\frac{7}{24}$	—
Solid content in cubic toiſes . .	$1\frac{103}{144}$	—
Thickneſs of the parapet at top, . .	6	—
Height of ditto within, . . .	$7\frac{1}{2}$	—
Height of ditto without, . .	6	—

Fourth Profile. See Section 4th.

	Ft.	inch.
Width of the ditch at the opening or top, .	12	—
Width of the ſame at the bottom, . .	4	—
Depth of the ſame, . . .	6	—
Solid content of the excavation *par toiſes courantes*,	8	—
Solid content *par toiſes cubes*, . . .	$1\frac{1}{3}$	—
Thickneſs of the parapet at top, . .	6	—

Fifth Profile. See Section 5th.

	Ft.	inch.
Width of the ditch at the opening or top,	10	—
Width of the ſame at the bottom, ...	3	4
Depth of the ſame, ...	5	6
Solid content of its excavation *par toiſes courantes*	$6\frac{19}{72}$	—
Solid content *par toiſes cubes*, . . .	$1\frac{19}{72\times 6}$	
Thickneſs of the parapet at top, . .	6	—

Sixth Profile. See Section 6th.

	Ft.	inch.
Width of the ditch at the opening or top, .	8	—
Width of the ſame at the bottom, . .	2	8
Depth of the ſame, ...	5	—
Solid content of its excavation *par toiſes courantes*	$4\frac{4}{9}$	—
Solid content *par toiſes cubes*, . , .	$\frac{40}{54}$	—
Thickneſs of the parapet at top, ...	4	—
Height of ditto within, ...	$7\frac{1}{2}$	—
Height of ditto without, . . .	6	—

Vauban conſiders theſe profiles as ſufficient for all the different ſorts of lines, of which one may have occaſion to make uſe. They ought to be regulated according to circumſtances and neceſſity. For inſtance, if you are reſolved to wait the enemy within your lines, they ſhould be made good and ſubſtantial, according to the firſt profile. But if you have taken the reſolution of meeting him, you may make them as you think proper. It is, however, always ſafeſt to make them good and ſtrong.

The firſt and ſecond profiles are good, the third and fourth middling, and the fifth and ſixth are calculated for the lines of ſmall ſieges, where you do not however ceaſe to be under the neceſſity of taking precautions.

As to lines of countervallation, they are of the ſame nature, faſhion, and form as thoſe of circumvallation, except in this circumſtance, that they are not ſo large or ſtrong. They ought not to be neglected, particularly at the ſieges of places, which have ſtrong garriſons, whilſt the beſieging armies are not very numerous. The circuit of the countervallation ſhould be carried in rear of the camps, at double the diſtance nearly from the ſame of the line of circumvallation from the heads or fronts of them. The camps or quarters then of the different parts of a beſieging army lie between the lines of circumvallation and countervallation, but about twice as diſtant from the latter as from the former. The beſiegers by the line of countervallation ſhut up the place as cloſely and as near to it as they can, without expoſing themſelves to the fire of its artillery. They ſhould avail themſelves of every favourable ſituation of ground that preſents itſelf. In this line they commonly have paſſages formed with barriers of the ſame faſhion with that of the line itſelf. But it is not neceſſary either to have many of theſe, or to cover them with outworks.

The depth of the camp is generally about 30 fathoms, and its diſtance from the line of circumvallation about 120.

The diſtance therefore between the line of circumvallation and that of countervallation is commonly about 390 or 400 fathoms.

It has been generally alleged and ſuppoſed, that if the camp of the beſieging army be about 1200 toiſes or fathoms from the covert-way of the place beſieged, it will be without the reach of cannon-ſhot fired from the ſame. This ſuppoſition however will not always hold good. For guns may be caſt of ſuch calibres as to throw both ſhot and ſhells to a much greater diſtance. Let d then repreſent the greateſt diſtance in fathoms to which the beſieged can throw either a ſhot or ſhell from the covert-way; ſuppoſe the rear of the beſiegers' camp to be 200 fathoms farther from the ſame, its depth to be equal to 30 fathoms, and the diſtance of its front from the line of circumvallation to be 120 fathoms. Then the diſtance from the covert-way to this line will be equal to $\overline{d + 350}$ fathoms. Now if, for the ſake of example, we ſuppoſe the place attacked to be a regular octagon, fortified according to Vauban's firſt method, the diſtance from its centre to the covert-way will be about 250 fathoms, which being added to $\overline{d + 350}$ gives us $\overline{d + 600}$ fathoms for the diſtance from the centre of the place to the line of circumvallation. The circumference correſponding to this radius is nearly equal to $\overline{d + 600} \times \frac{710}{113}$ fathoms. But the perimeter of the line of circumvallation, which is ſometimes made with *redans* and ſometimes with *baſtions*, will exceed this circumference by about one-third, and will of courſe be equal to about $\overline{d + 600} \times \overline{\frac{710}{113} + \frac{710}{339}}$ or $\overline{d + 600} \times \frac{2840}{339}$ fathoms. See Line of Circumvallation, with camp within it, and figures repreſenting parts of the lines of circumvallation at Philipſbourg and Arras, with their ſections.

As there are no obſervations in this work under the article *Attack* that furniſh any information reſpecting the reconnoiſſance of places attacked, or their ſituations, which are inſeparably connected with the modes of attacking, and the fixing of the lines both of circumvallation and countervallation, it is perhaps the more neceſſary to make ſome here on theſe points. But before we proceed to make them, it will not be improper briefly to obſerve, that the parts of the line of circumvallation moſt expoſed to an attack by the enemy from without, ought to be well palliſaded, and even ſometimes to have outworks or a ſecond ditch, or both, and in thoſe places in front of it, where cavalry can act to advantage, to have *trous-de-loup*, or pits placed chequerwiſe 5 or 6 feet deep, and about 8 feet wide at top, with ſtakes planted in the middle of them, projecting about a foot or fifteen inches above the ſurface of the ground. And it is a maxim, which ought not to be loſt ſight of, when ſome parts of the line are naturally by the circumſtances of ground ſtronger than others, to make the reſt by art as nearly as poſſible equally ſtrong.

As to the *reconnoiſſance* of places, there are few of them at preſent in Europe of which we have not plans, that are even printed. Although ſeveral of theſe are not very exact or correct, ſome information, aſſiſtance, and lights may be drawn from them that are far from being uſeleſs. They ought not therefore to be neglected or unattended to any more than charts of the environs of places.

One finds ſometimes the means of learning ſeveral circumſtances reſpecting the condition and ſituation of places by the peaſantry, or people of the country, particularly by workmen ſomewhat intelligent, as maſons, ſtone-cutters, preparers of ſtones, terrace-makers, undertakers, and contractors. You may alſo contrive to get ſome perſon introduced into a place, who, after remaining in it for ſome time, brings you intelligence of what you wiſh to know.

In addition to all that you can learn in this way, on which much reliance ought not always to be placed, you ſhould add what you can diſcover by yourſelf. You ſhould therefore reconnoitre places and their environs in perſon, or cauſe the reconnoiſſance to be made by people truſty and intelligent, which ought to be done with but little noiſe both by day and by night.

By day you cannot approach very near, unleſs you do ſo almoſt alone, becauſe the advanced guards of the place and the cannon diſturb and moleſt you when you are accompanied by others, and prevent your approaching it.

The beſt method you can adopt is to have ſmall advanced guards behind you, concealed in fences, or in ſome ditch ſupported by others a little farther from you, by means of which you advance alone, or with very few attendants. This practice for the moſt part ſucceeds. Theſe are things, for which every favourable moment or opportunity ought to be ſeized; and the inſpection or examination ſhould be ſeveral times renewed. Such methods however of reconnoitring furniſh no inſtruction or information, but in regard to the mode of commencing and conducting the attacks, the number and ſize of the baſtions, of the cavaliers, ravelins, crown-works, redans, the covert way, &c. which to be informed of, is always to know a good deal. But if there be pits or hollows near the place, or other ſpots of cover and concealment, that can be uſeful for any purpoſe of attack, they ſhould be carefully examined. Theſe, however, as well as the dormant and running waters near the place, are in general but very imperfectly reconnoitred.

The better to diſcover and explore all theſe, you ſhould reconnoitre them by night well attended, in order to be able to approach them and touch them, as the ſaying is, with the ends of your fingers, which is not done without danger, even in the night, when your view of things is not very good or diſtinct. But towards morning, in retiring by little and little, or gradually as the light increaſes and the day advances, you diſcover, what you wiſhed to ſee, in a manner more complete. This is a matter in which nothing ought to be neglected. For great advantages are to be derived from a perfect reconnoiſſance of a place.

Beſides it is not a thing always very eaſy to diſcover the ſtrong and weak parts of a place. For reconnoitre it as much as you chooſe, both day and night, you will not be able to know what is within it, unleſs you learn this from others. Wherefore no channel or means of information ought to be overlooked or neglected.

There is hardly any place that has not its weak and ſtrong parts, unleſs it be of a regular conſtruction, of which the parts of the ſame deſcription are all equal among themſelves, and ſituated in the middle of an open level plain, which affords no advantage to one part more than another. Such is New Briſac. When this is the caſe, you may ſay the place is equally ſtrong and weak throughout. The only conſideration, then, is to determine on the attacks with a view to convenience; that is to ſay, to make them on the ſide moſt within reach of head quarters, the park of artillery, and thoſe places from which you can precure ſupplies of faſcines and gabions, and with which you can have the eaſieſt communications. But as places are ſeldom to be met with that are fortified in this manner, and as they are almoſt always regular in ſome parts, and irregular in others, as to their fortifications being generally compoſed of old and new works, they have almoſt all of them ſome defect or advantage, either in point of ſituation, greater on one ſide than on another, or with reſpect to the ground of the environs, which occaſions a diverſity that requires different obſervations. To develope this as well as poſſible, is of conſequence, and is a matter entitled to the matureſt deliberation.

If the fortification of a place have a ſide ſituated upon a rock from 25, 30, 40, 50, 60, or 70 feet high, and if the rock be ſound and ſteep, we may pronounce the place inacceſſible on that ſide. If the foot of this rock is cloſe by a river of ſmooth or rapid water, it will be ſtill worſe. If any ſide on the level ground borders on a river that is not fordable, that cannot be turned out of its natural courſe, and is bordered on the ſide of the place with a good fortification, capable of defending the paſſage of it, we may ſay the place cannot be attacked on that ſide. If the courſe of this river is accompanied by meadows, low and marſhy at all ſeaſons, it muſt appear ſtill more difficult to be attacked on that ſide.

If the place is ſurrounded partly with water, and partly with moraſſes, but acceſſible at the ſame by ſpots of dry ground that border theſe moraſſes; if theſe acceſſible avenues are well fortified; if there are works in the moraſſes which are not approachable, and can ſee in reverſe the attacks making on the firm ground adjoining them, ſuch a ſituation cannot be favourable or advantageous for the attacks, on account of theſe inacceſſible works, and becauſe it is neceſſary to be able to embrace what is attacked.

If the place be high, ſurrounded with low lands and marſhes, as is frequently the caſe in the Low Countries, and is not acceſſible but by cauſeways, it ought to be conſidered,

1ſt, If it is not poſſible to dry up the moraſſes; if they commonly become dry of themſelves, during any time of the year, and at what ſeaſon; in ſhort, if they can be drained and rendered dry.

2dly, If the cauſeways are ſtraight or winding, enfiladed by the place in whole or in part; of what extent is the part that is not, and at what diſtance it is from the place; what its width or breadth is, and whether it is poſſible to traverſe it and advance along it with trenches, without being expoſed to an *enfilade* from the enemy.

3dly, If it be poſſible to place batteries below or near it, on ſome ſpot or ſpots higher than the reſt of the ground round it, that may furniſh a croſs fire on thoſe parts of the place that are attacked.

4thly, Whether the cauſeways be ſo ſtrongly enfiladed, that there are no conſiderable croſſing or tranſverſe parts, that front the place, ſufficiently near to it, and whether there is any part that might furniſh a conſiderable cover againſt its fire, by raiſing one part of the thickneſs of the cauſeways upon another, and at what diſtance from the place all this is found.

5thly, If the cauſeways near to one another, which terminate at the place, meet or join in any particular ſpot, and if, when occupied by the attacks, they can mutually ſuccour and ſupport one another, by the bearings of cannon firing croſs ways, or in reverſe, on the works attacked.

6thly, What is the nature of the rampart of the place, and its outworks; if it has covert ways; if the cauſeways, as they approach theſe, meet or join; and whether there is any advanced ditch, full of either running or dormant water, that ſeparates them.

From all theſe conſiderations one ought to conclude, that a place ſhould never be attacked on a ſide, where there are ſo many obſtacles and difficulties to be encountered, if there be the leaſt proſpect of being able to approach it on ſome other ſide, becauſe you are always enfiladed and raked by the cannon, without having it in your power to defend yourſelf againſt them, or to render yourſelf maſter of them, or to embrace the parts of the place that are attacked.

With regard to works on plain or level ground, it is proper to examine, in the firſt place, on what ſides you can embrace the fronts of the attack, becauſe theſe are always to be preferred to others.

2dly, The number and quantity of the works to be taken before you can reach the body of the place; their natures, and thoſe of the ground on which they are ſituated.

3dly, If the place is baſtioned and reveted.

4thly, If its fortification is regular, or nearly ſo.

5thly, If it is covered by a quantity of outworks, of what deſcriptions they are, and how many.

6thly, If the covert ways are well made, countermined, and palliſaded; if their glacis are ſteep and uneven, and not commanded by the higher works of the place.

7thly, If there are advanced ditches, and of what nature they are.

8thly, If the ditches are reveted and deep; dry, or full of water; of what depth; if the water is ſtagnant or running; if there are ſluices in them, and what deſcent the running water has in them from its entering into them to its iſſuing out of them.

9thly, If they are dry, what is their depth; and whether the ſides of them are low and not reveted.

Finally, Attention ſhould be paid to this circumſtance, that the worſt of all are thoſe that are full of ſtanding water.

Ditches that are dry, deep, and reveted, are good. But the beſt of all are thoſe that are dry, but may be eaſily filled at pleaſure, with a large body of either running or dormant water; becauſe they can, in the firſt place, be defended dry, and afterwards be inundated, and have ſtrong currents or torrents excited in them, which will render the paſſage impracticable. Such are the ditches at Valenciennes, on the ſide of Queſnoy, which are dry, but can be filled by the garriſon at any time, either with ſtanding or running water, without the beſiegers having it in their power to hinder them. Such are alſo the ditches of Landau.

Places which have ſuch ditches, with reſervoirs of water that cannot be diverted from them, and which they cannot be prevented from uſing, are very difficult to be forced when thoſe who defend them know how to make a proper uſe of their advantage.

Reveted ditches, as ſoon as they have a depth of 10, 12, 15, 20, or 25 feet, are alſo very good, becauſe neither mortars nor cannon can much injure theſe revetements, and the enemy cannot enter them but by deſcents, that is to ſay, in defiling one by one, or two by two at moſt, which is ſubject to many inconveniences. For the beſieged can practiſe various ſallies or ſorties, againſt the beſieger's paſſage, and the lodgments of his miners, which occaſion much retardation and loſs. Beſides, when an attack is made or determined on, it cannot be ſupported but feebly, as all thoſe employed on it muſt go through one or two paſſages, and always by defiling, with much inconvenience.

Care ſhould alſo be taken to examine if the ditches are cut in a rock, and if the rock is hard and continuous. For, if it is hard and difficult to be worked, the beſiegers will be obliged to fill the ditches quite up to the level of the covert way, in order to make their paſſage, which is a tedious and difficult operation, eſpecially if the ditch is deep. For theſe manœuvres require much arrangement and time, and the beſieged, who ſo much as ſeriouſly think of defending themſelves, make the beſiegers ſuffer much by their attempts and contrivances, by turning aſide their materials, ſnatching away their faſcines, ſetting fire to them, and conſtantly annoying them with ſallies, and the fire of their cannon, mortars, and muſquetry; againſt all which the beſiegers are obliged to take every precaution, as a heavy fire from a ſhort diſtance is very dangerous, and reduces them to the neceſſity of ſilencing it by one ſtill greater, well diſpoſed.

After you are well informed in regard to the nature of the fortifications of the place you wiſh to attack, you ſhould ſee if there are any eminences, cover, hollow way, or inequality of ground, that will favour your approaches, and ſave you the trouble of opening part of one end of the trenches; and if there is no commanding ſituation, from which you can derive advantage, you ſhould examine if the ground through which you muſt conduct your approaches is ſoft and eaſily turned up, or if it is hard and mixed with ſtones, flints, ſhells, and bare rocks, into which you cannot ſink a trench at all, or to but a ſmall depth at moſt.

All theſe differences are conſiderable. For if the ground is eaſily wrought, it will not be difficult to open good trenches in it, without much riſk and in but little time; whereas if it be mixed with ſtones or flints, the opening of them will be much more difficult and dangerous, as cannon ſhot fired through or along ſuch ſoil are apt to do much miſchief.

If it is a hard and naked rock, in which you cannot open a trench, you muſt lay your account with bringing to the ſpot all the earth and other materials, of which you may ſtand in need; and you will be obliged to make three-fourths of the trench with faſcines and gabions, and even with bales of hair and wool; which will be attended with much loſs of time and fatigue, without making your approaches proof againſt cannon or even muſquet ſhot. Such labour and attacks ſhould therefore be avoided as much as poſſible. See Marſhal Vauban's "Attack and Defence of Places."

CIRCUS, in *Antiquity*, an edifice in uſe among the Romans for the exhibition of chariot races, and other games. The circenſian games appear to have been adopted by the Romans from the Etruſcans in the earlieſt ages. Romulus eſtabliſhed the games at the circus almoſt as ſoon as his power, and the rape of the Sabines, which took place at the firſt exhibition of theſe games, probably led him to dedicate them to Conſus, the giver of good counſels. The circus at firſt was a wooden encloſure, in which the ſpectators ſtood, a few ſeats being placed for the moſt diſtinguiſhed perſons. It is ſaid, that in the earlieſt periods of theſe exhibitions, the goals or terms, round which the chariots were obliged to turn, were armed with ſeveral ſwords, preſenting their points towards the horſes, thus increaſing the intereſt of the conteſt by the dangers to which it was expoſed. This circumſtance has given riſe to a ſingular etymology, adopted by Caſſiodorus and Iſidorus, *ludi circenſes quaſi circum enſes*.

The firſt permanent circus at Rome was built by Tarquinius Priſcus in the valley Murcia, between the Aventine and the Palatine hills. This edifice which obtained the appellation of *Circus Maximus* from its great ſuperiority in ſize to thoſe of a later date, was for a length of time the only circus in Rome; ſome have ſuggeſted that it derived its name from its being appropriated to the celebration of the greater games; and others ſeek the origin of the appellation in its having been conſecrated to the great gods, *viz.* to Vertumnus, Neptune, Jupiter, Juno, Minerva, and the Dii Penates of Rome. It was enlarged by Julius Cæſar, and rebuilt and richly ornamented by Auguſtus. At this period it is deſcribed by Dionyſius of Halicarnaſſus as ſurrounded by a portico, and having numerous ſtaircaſes, ſo well diſtributed as to avoid any confuſion of the ſpectators in entering or returning; and he adds, that it was 3½ ſtadia in length, and 4 jugera broad; which according to the meaſure given by Pliny of the Roman ſtadium, 625 feet, will give for the length 2187 Roman feet, or ſomewhat more than three Engliſh furlongs, and its breadth, allowing for each of the jugera 240 Roman feet, will be 960 feet; and it contained 150,000 perſons. This great magnificence, however, was not ſufficient for the ſucceſſors of Auguſtus, ſince Tiberius, Caligula, Claudius, and Nero, all made additions to it. In the time of the elder Pliny, the Circus Maximus had been ſo much enlarged as to be capable of containing 260,000 ſpectators; and Trajan ſo much increaſed its dimenſions, that an inſcription placed over the great gate, of which Dion Caſſius has given a tranſlation in Greek, expreſſed that this emperor had rendered it capable of containing the Roman people. Conſtantine alſo added new porticoes, and his ſon Conſtans ornamented it with the great obeliſk, at preſent at the Lateran. Of this ſuperb edifice there only remain ſome indeterminate veſtiges on a level with the ground. Tradition has preſerved its remembrance, for at Rome the place is ſtill called *Cerchi*, which marks the ſite of this enormous pile at preſent occupied by gardens and the cemetery of the Jews.

The other circuſes at Rome are the following.—

The *Flaminian* circus, which muſt have been a conſiderable edifice, as it is ſo often mentioned by ancient authors. According to Livy, it was founded by Flaminius, the unfortunate antagoniſt of Hannibal. Dion Caſſius relates that Auguſtus exhibited in this circus a chace of crocodiles, in which there were thirty-ſix killed. Under ground, and among the ruins of vaſt arcades, there is ſtill a conſiderable ſtream of water which ſupplied this circus. Its only remains are ruins hid beneath the preſent pavement of the city, which is conſiderably raiſed in that part; and the church and convent of Santa Caterina de Funari, the two palaces of the Dukes Mattei, and ſeveral adjacent buildings, are erected on its ſite.

The modern Piazzi Navona occupies a great part of the area of the *Agonal* circus, of which the name Navona ſeems to be a corruption. The curved direction of the houſes ſituated at its northern extremity, indicates that they are founded upon the circular end of the circus, oppoſite to the carceræ.

The right ſide of the great baſilica of the Vatican is placed upon the walls of a circus, which, begun by Caligula and terminated by Nero, was one of the moſt remarkable at Rome. To this belonged the ſuperb obeliſk which at preſent ornaments the place of St. Peter's. This circus muſt have been deſtroyed as early as the time of Conſtantine, ſince the former baſilica of St. Peter, founded by him, occupied the ſame ſituation as the preſent edifice. Its direction may be ſeen in a print given by Fontana, *Il Tempio Vatic.* page 245, by which it appears that the circus was longer than the modern church with the colonnade.

There was another circus begun, as it is ſuppoſed, by Nero, in the gardens of his aunt Domitia, and finiſhed by Adrian. In ſome late excavations conſiderable remains were diſcovered, with many antique paintings.

Heliogabalus alſo built a circus beyond the Porta maggiore, from which was taken the obeliſk at preſent erected in the interior garden of the Vatican.

In the Salluſtian gardens there was a very fine circus, which it is ſaid might be filled with water for the exhibition of naumachiæ.

Very little is known of the circus of Flora on the Quirinal, except that the exhibitions were given by the courteſans of Rome.

Uncertain traces remain of ſome other circuſes, which

Panvinius has marked in his plan of Rome. But one circus, which is ſubject to no doubt, is that which is ſituated beyond the Porta Capena, at preſent Porta S. Sebaſtiana, and whoſe ruins have been, by an uniform tradition, deſignated as the circus of Caracalla. Of this, which is the only one that preſerves any conſiderable traces of its ancient form, we ſhall give a detailed deſcription in a ſubſequent portion of this article.

Beſides theſe, there are the traces of three circuſes in Spain, at Tarragona, Merida, and Saguntum, now called Marviedro; at Niſmes, at Milan and Antioch, and alſo at Conſtantinople the Hippodrome.

Although the circuſes were conſtructed for the exhibition of chariot races, they were alſo uſed occaſionally for various other purpoſes: for beſides the exerciſes of wreſtling, pugiliſm, and the foot race, which made a part of the ludi circenſes, the magiſtrates frequently aſſembled there, and exerciſed thoſe public functions, which, on account of the great multitude of the people, could not be held in the temples and baſilicas. The Agnaninians having to aſſemble a general council, appointed it in their circus, where they declared war againſt the Romans. Cicero informs us, that many harangues were pronounced in the Flaminian circus. Plutarch ſays that Lucullus exhibited his triumph in this circus; and it was in the ſame place that Auguſtus pronounced the funeral oration of Druſus. The circuſes were alſo a kind of public places which charlatans, diviners, and other people of that claſs frequented.

We ſhall now proceed, with the aſſiſtance of figures, to deſcribe the general and particular forms of circuſes. See *Plate* of architecture, in which is repreſented a ground plan of the circus of Caracalla, the only circus of which the remains are ſufficient to ſhew the real form and proportions of theſe edifices.

A A A, area of the ſtadium or ſpace upon which the chariots ran. B B B, the *carceræ*, or ſtarting poſts. They were not diſpoſed in a ſtraight line making right angles with the ſides of the circus, as they have frequently been repreſented, but upon the arc of a circle of which the centre is at the point *c*; the reaſon of this oblique and circular diſpoſition appears obviouſly to equalize the diſtance which each chariot had to run. The carceræ, which were open behind and cloſed in front by latticed gates, had only the width neceſſary for five horſes abreaſt, and the length of a car with the horſes harneſſed to it. D D, *agere* or *ſpina* round which the chariots raced. This ſpine was a ſolid platform of maſonry of about 20 feet wide and 132 toiſes long; it was placed nearly upon the right line which may be called the axis of the circus. E E, the *metæ* or goals; E 1 the firſt, E 2, the ſecond meta; the firſt meta was at a determinate diſtance from the carceræ, that is at a little more than half the length of the ſpine. F F F, circumference of the circus, upon the width of which were diſtributed the ſeats for the ſpectators. G, principal gate of the circus, called alſo the triumphal gate. H H, two lateral gates which ſeparate the ſides of the circus from the carceræ. I, gate between the carceræ ſomewhat wider than theſe, but of the ſame height. K, *porta libitinaria* or *ſandapilaria*, a gate for the purpoſe of carrying out the bodies of thoſe who died in the area. L L, towers at the extremities of the carceræ.

Some of the circuſes at Rome were ſurrounded exteriorly with vaſt porticoes, except on the ſide where the carceræ were placed; others were merely enloſed with a wall having doors and windows, as is the caſe with the circus of Caracalla. The porticoes not being neceſſary for the uſes of the circus, were only added to give magnificence to the exterior, or to ſerve as a place of retreat to the ſpectators in bad weather. The lower part of the circumference of the circus beneath the ſeats, together with the porticoes, formed long galleries of arcades or *fornices*, ſerving in part for an acceſs to the ſtaircaſes leading to the ſeats, and in part for the ſhops of various traders, among whom were particularly reckoned the courteſans.

The diſtribution and diſpoſition of the interior ſtaircaſes depended upon the will of the architect; thoſe of the circus of Caracalla are very ingeniouſly diſpoſed. The principal ſtaircaſes led to a number of little doors in the *podium*, which was a long open platform or paſſage, leading quite round the edifice, at an elevation of ſome feet from the area of the circus. The podium was conſidered as the place of honour, into which only the principal magiſtrates, the pontiffs, veſtals, and perſons of the imperial family, entered. It ſeems that the ſeats on the podium were not permanent, ſince it was the privilege of thoſe who had places there to ſend their magiſterial chairs. Behind the podium there was a low wall or precinction, in which were diſtributed the little doors before mentioned. The ſeats roſe above one another their whole height, in the manner of the ſteps of a ſtaircaſe; they were ſupported on the inclined vault of the gallery or portico beneath them, and aſcended from the podium to the top of the external wall. The ſeats of the circus of Caracalla are to the number of ten, and it is calculated that they might contain about 18,000 ſpectators; thus it can only be reckoned one of the ſmaller or private circuſes.

The great circuſes as well as the theatres and amphitheatres were divided into ſeveral ranges of ſeats for the purpoſe of placing the ſpectators according to their condition. The ſeats began from the wall at the back of the podium, and after ſetting off a number ſufficient to place perſons of the firſt rank, the ſtaircaſe of ſeats was interrupted by the omiſſion of two or three; this interruption produced neceſſarily a platform or ambulatory altogether ſimilar to the podium, in which thoſe ſpectators remained, who, coming too late to the exhibition, found the ſeats occupied; behind the paſſage was erected a wall or precinction from which the ſeats recommenced. The ambulatory was called *via*, and, according to Vitruvius, its width was to be equal to the height of the precinction. The ranks of ſeats were called *mœniana*, and of courſe there were as many precinctions and ambulatories as ranks of ſeats. Separate ſtaircaſes led to each via through doors in the precinction, which entrances were called *vomitoria*. As the ſpectators entered by theſe paſſages at the top of the ranges of ſeats, they would have to deſcend to occupy the firſt rows of each mœniana, but the ſeats themſelves were too high to ſerve as ſteps for this purpoſe; accordingly there were ſtaircaſes provided, called *ſcalares*, formed by cutting down a ſeat into two ſteps, thus giving to the ſtep half the height and width of a ſeat. Theſe ſcalares were placed exactly oppoſite the vomitoria, and beginning from the via, deſcended to the lower ſeat of each range, which was thus divided into a number of compartments called *cunei* in the theatres and amphitheatres, as from the curved form of theſe buildings the compartments of ſeats were longer above than below, and thus acquired a wedge ſhape. In the circuſes, the ſides being ſtraight, theſe diviſions were rectangular, but from cuſtom were called cunei.

Above the ſeats there was generally a portico or covered gallery for the lower claſs of people.

To maintain order in ſuch a concourſe of people as attended the exhibition, there were perſons called deſignators, who were to aſſign to every one his place that there might be no mixture of perſons of different ranks, a point in which Roman pride was very jealous. Tarquin divided his circus into thirty compartments, a number equal to that of the curiæ, into which the people of Rome were at that time divided.

All the ſeats were covered with wood, which circumſtance accounts for the fires which are mentioned to have happened in theſe edifices. It was alſo cuſtomary for women to bring cuſhions, and ſtools to place their feet upon. The boards which covered the ſeats were divided by fillets into places for one perſon.

It remains to mention the place of the emperor and the imperial family; this was called the *pulvinar*, and appears to have been a magnificent open loggia. The ſituation of the pulvinar is not known, but it ſeems probable that it was placed between the carceræ and the firſt metæ, whence the emperor might give the ſignal for the ſtarting of the cars, and obſerve the beginning and termination of the race. Auguſtus, in a letter to Livia, ſays that he does not wiſh Claudius, young at that time, to go to the pulvinar to ſee the games, as he was too much in the ſight of the people. This prince having ſhewn ſigns of ſtupidity from his earlieſt years, Auguſtus did not like that he ſhould be ſo ſoon known to the people. Trajan took away the pulvinar from the Circus Maximus, and Pliny praiſes him for having thus, by a rare clemency, familiarized himſelf with the people.

The extremity of the circus oppoſite to the ſemicircular end was called the *oppidum*; this conſiſted of a ſeries of thirteen arcades contiguous to one another, but without communication. At each extremity there was placed a tower which roſe conſiderably above the reſt of the edifice. The arch in the middle, wider than the others, but of the ſame height, ſerved as an entrance to the circus. This combination of arches and towers, ſeen at a diſtance, gave the idea of a caſtle, from which circumſtance it derived the name of oppidum. The twelve remaining arcades were the carceræ, whence the chariots begun the race. The diviſions of the arcades on the interior front were ornamented with hermas ſupporting a cornice in the manner of caryatides; the carceræ were cloſed with grated doors to the height of the ſpringing of the arch, and the ſemicircular opening above was filled with a marble lattice. Two of theſe lattices, very elegantly ornamented, are at preſent in the ſecond court of the palace Mattei, which is founded upon a part of the Flaminian circus. Each carcera was diſtinguiſhed by a number, and as ſome were leſs advantageous than others, the place of the cars was determined by lot. Diocles, a celebrated charioteer, voluntarily took the worſt place during 24 years, to diſplay his ſuperior ſkill. The top of the carceræ formed a terrace, upon which was placed the tribune of the conſul. It is not known what was the purpoſe of the towers of the oppidum. Bianconi ſuppoſed that in the upper part was placed a band of muſic, while the lower might ſerve to receive machinery for opening the doors of the carceræ.

The *ſpina* was the moſt reſpectable part of the circus, or, in fact, the ſanctuary, ſince it was dedicated to the gods; this was a bank or platform, nearly $\frac{2}{3}$ of the length of the circus, which, running down the middle of the arena, divided it into two nearly equal parts, thus reſembling the ſpine of a fiſh; upon the ſpina were placed a great variety of objects which we ſhall proceed to deſcribe as nearly as poſſible.

At the two extremities of the ſpina were placed the metæ or goals, which conſiſted of three cones placed in a triangle. They were at firſt made of wood, but afterwards of marble, and even gilded. On the ſummit of each was placed a large egg in memorial of the eggs of Caſtor and Pollux. The metæ reſted upon the vault of a ſemicircular temple or chapel, a little wider than the ſpina; the circular part of theſe little chapels was at the firſt goal turned towards the carceræ, and at the ſecond towards the triumphal gate, and their entrances were placed in paſſages between them and the ſpina. The firſt of theſe temples, according to Tertullian, was dedicated to the goddeſs Murcia; the altar of the god Conſus, who is ſaid to be the ſame as the equeſtrian Neptune, was alſo placed here. The long extent of the ſpina was ornamented with columns, ſtatues, and altars. The ſun was the deity to whom it appears the circuſes were principally dedicated; this great luminary had a temple on the middle of the ſpine, but after the conqueſt of Egypt, Auguſtus having tranſported ſeveral obeliſks to Rome, this circumſtance gave riſe to the idea of placing an obeliſk upon the ſpine in honour of the ſun, inſtead of the former temple, which became a univerſal practice. One of the many obeliſks at Rome bears this inſcription on its baſe, "AEGYPTO IN POTESTATEM POPULI ROMANI REDACTA SOLI DONUM DEDIT." The emperor Conſtans brought from Egypt the largeſt obeliſk at Rome, which he cauſed to be erected in the Circus Maximus, near to that placed by Auguſtus.

According to ſome baſſo relievos and medals, the ſtatue of the goddeſs Iſis or Cybele ſeated on a lion, was placed on the ſpina near the obeliſk; there were alſo many columns, on ſome of which were placed little ſtatues of the gods to which they were dedicated. The columnæ meſſiæ, ſeſſiæ, and tutelinæ, were among the number, and one column ſupported a ſtatue of Victory. Before the columns were placed altars, among which Tertullian diſtinguiſhes thoſe dedicated to the three gods of Samothrace, who were called great, powerful, and valiant. There were alſo columns ſupporting an architrave, on which were placed ſeven dolphins, probably of wood, dedicated to Neptune. Theſe were moveable, and ſerved to mark the number of turns which the chariots made round the metæ; on another architrave were placed eggs, which probably ſerved a ſimilar purpoſe.

It ought to be remarked, that the ſpina was ſituated not exactly in the middle of the arena, nor parallel to the ſides of the circus, but in an inclined direction, ſo that the courſe was wider on the right ſide of the circus where it began than on the left, and was gradually diminiſhed all the way. The reaſon of this deviation appears to be, that the chariots ſtarting altogether, required more room in the firſt courſe than when they came in ſeparated by the conteſt.

The area of the circus was of earth, but probably beaten. Caligula and Nero carried their extravagant luxury ſo far as to cover the area with chryſocolla and minium diſpoſed in regular figures.

In ſeveral of the circuſes the arena was ſurrounded at the foot of the podium with a canal called *euripus*; this was 10 feet in width and the ſame depth. The euripus ſeems to have been intended for the defence of the ſpectators in thoſe caſes where the podium was not ſufficiently elevated; it does not, however, appear to have been abſolutely neceſſary, ſince Nero had it covered over to enlarge the area of the Circus Maximus. On one occaſion, it is ſaid, that Heliogabalus filled the euripus with wine. There is no euripus in the circus of Caracalla.

After the deſcription of the circuſes, that of the games exhibited in them will naturally find a place. Theſe games were celebrated regularly on certain fixed days, and were named from various deities, as Apollo, Flora, Ceres, Saturn, Conſus, Bacchus, &c. They were more or leſs magnificent, according to the ritual; ſome were celebrated only once in a century, and were therefore called ſecular. Some were inſtituted for the birth-day of the emperor; others for every luſtrum, which were called *vota quinquennalia;* and others for ten years, or *decennalia.* The games ſometimes laſted ſeveral days. There were public funds appropriated to defray the expence, but they were frequently given by individuals who aſpired to popular favour. In the lower ages the conſuls and principal members of the imperial family generally gave the games and often at a ruinous expence. There is in Gruterus an inſcription, in which we read that Aponia Montana, prieſteſs of the god Auguſtus, gives the Circenſian games *ob honorem ſacerdotii*, and in another inſcription L. Lucretius Fulvianus gives the games *ob honorem pontificatus*.

The games of the circus, which ſome call "Circenſian Games," were combats celebrated in the circus, in honour of Conſus, the god of councils; and thence alſo called "Conſualia."

They are alſo called Roman games, "Ludi Romani," either on account of their antiquity, as being coëval with the Roman people, or becauſe eſtabliſhed by the Romans: and the games held there, the great games, *ludi magni*, becauſe celebrated with more expence and magnificence than others; and becauſe held in honour of the great god Neptune, who was their Conſus. Thoſe who ſay they were inſtituted in honour of the ſun, confound the *pompa circenſis*, or proceſſion of the circus, with the games. The games of the circus were inſtituted by Evander, and re-eſtabliſhed by Romulus: the pomp, or proceſſion, was only a part of the games, making the prelude thereof, and conſiſting of a ſimple cavalcade of chariots.

Till the time of the elder Tarquin, they were held on an iſland of the Tiber, and were called Roman games: after that prince had built the circus, they took their name therefrom, as being conſtantly held there.

There were ſix kinds of exerciſes in the circus: the firſt was wreſtling, and fighting with ſwords, with ſtaves, and with pikes; the ſecond was racing; the third ſaltatio, dancing; the fourth, diſci, quoits, arrows, and ceſtus; all which were on foot: the fifth was horſe-courſing; the ſixth, courſes of chariots, whether with two horſes or with four.

In this laſt exerciſe, the combatants were at firſt divided into two ſquadrons or quadrils; then into four; each bearing the names of the colours they wore; and they were denominated *albati, ruſſati, praſini*, and *venati.* At firſt there were only white and red; then green was added, and blue. Domitian added two more colours, but they did not continue. It was Oenomaus who firſt invented this method of diſtinguiſhing the quadrils by colours. Theſe four factions ſoon acquired a legal eſtabliſhment; and their fanciful colours were derived from the various appearances of nature in the four ſeaſons of the year; the red dog-ſtar of ſummer, the ſnows of winter, the deep ſhades of autumn, and the cheerful verdure of the ſpring. Another interpretation preferred the elements to the ſeaſons, and the ſtruggle of the green and blue was ſuppoſed to repreſent the conflict of the earth and ſea. Their reſpective victories announced either a plentiful harveſt, or a proſperous navigation; and the hoſtility of the huſbandmen and mariners was ſomewhat leſs abſurd than the blind ardour of the Roman people, who devoted their lives and fortunes to the colour which they had eſpouſed. Such folly was diſdained, and yet indulged by the wiſeſt princes; but the names of Caligula, Nero, Vitellius, Verus, Commodus, Caracalla, Elagabalus, were enrolled in the blue or green factions of the circus. The follies of ancient Rome were adopted by Conſtantinople; and the ſame factions which had agitated the circus, raged with redoubled fury in the hippodrome. Whilſt a ſecret attachment to the family or ſect of Anaſtaſius was imparted to the greens; the blues were zealouſly devoted to the cauſe of orthodoxy and Juſtinian.

The great Circenſian games conſiſted of a ſolemn proceſſion, called *pompa*, which was terminated by various ſacrifices upon the ſpina, and a courſe of a hundred chariots for the diverſion of the public.

The exhibition began by the pompa, which deſcended from the capitol, and, croſſing the Forum Romanum, proceeded towards the Circus Maximus, through the ſtreet called *Velabrum;* during this time it was unlawful for any perſon to appear at the windows of the houſes. The proceſſion being arrived at the circus, which was already filled with ſpectators, entered by the great gate; firſt went the magiſtrates in their ſolemn coſtume, they were followed by a company of children of ſenatorial and equeſtrian families divided into centuries, and marching in the ſame order that they obſerved in their paleſtric exerciſes. After theſe a hundred aurigæ diſplayed their cars with two or four horſes each car, being accompanied by a light horſeman. Wreſtlers and athletæ followed, together with dancers and players on muſical inſtruments, who performed pyrrhic and ſatyric dances. Then came another muſical choir, with thoſe who carried the incenſers, and other inſtruments of ſacrifice, when the flamens impoſed ſilence in their uſual form, *favete linguis, favete animis*, upon which it was only permitted to applaud by clapping hands, as the ſtatues of the divinities were carried by. The firſt deity that appeared was Victory, to whom the Romans were ſo much indebted; then followed Neptune, to whom the games of the circus were particularly dedicated, and Mars, the father of Romulus and Remus; the Sun and Moon, Minerva, Ceres and Bacchus, Caſtor and Pollux, Venus and Cupid, with many others followed. In later ages, the ſtatues of deified emperors and their wives were introduced into the circenſian pomp. The proceſſion was terminated by the victims deſtined for the ſacrifices, preceded and followed by the pontiffs, prieſts, augurs, aruſpices, flamens, and other miniſters of religion: then the ſacrifices being performed with all the neceſſary ceremonies, the perſons compoſing the proceſſion took their places on the ſeats of the circus, and every thing was prepared for the races.

Each exhibition conſiſted of twenty-five courſes, and each courſe of four chariots; thus the whole number of chariots required was one hundred; theſe were divided into four factions, which were diſtinguiſhed by different colours, white, red, green, and blue. For each courſe there were drawn by lot the names of four charioteers, one of each colour, together with the number of the carceræ aſſigned to each, that there might not be any complaint of partiality.

The chariots had at firſt only two horſes, and were called *bigæ.* In proceſs of time there was added another horſe, which was called *funarius*, becauſe he was attached to the car by a rope; at length one more horſe was added, and the car became a *quadriga*, which was the moſt general practice. But ſometimes the directors of the games added to each car a fifth horſe, with a rider; and in the inſcription relating to Diocles, there are even mentioned ſix and ſeven horſes abreaſt. Such races muſt have been perſonal challenges between the moſt diſtinguiſhed charioteers, for the regular courſes were performed with four horſes.

The light cars uſed in the Circenſian games had two wheels, and were nearly balanced upon the axle; the front, which was circular, had a kind of parapet, about the height of the drive-knee: this parapet was gradually diminiſhed on the ſides, till it ended in a point, and the back of the car was left open; thus the charioteer mounted behind, and ſtood upon the floor of the chariot.

The horſes deſtined for the Circenſian courſes were preſerved entirely for this purpoſe; and the greateſt care was taken to maintain the vigour and purity of the race: their keepers were called *conditores gregis*. It is remarkable, that theſe horſes, as appears by various baſſo-relievos and moſaics, had their tails cut ſhort. As all the turns round the metæ were made to the left hand, the funarius horſe on that ſide became the leader, and was never changed. The horſes were ſo well accuſtomed to the conteſt, that they often ran without the whip. Pliny relates, that once a charioteer, having fallen from his car, the horſes performed the courſe in the uſual manner, and gained the palm.

The aurigæ were men accuſtomed to the employment, who had no other occupation. They were generally ſlaves, though ſometimes perſons of rank and fortune exerciſed this art for their amuſement. Nero frequently exhibited himſelf as a charioteer in the public games. The buſineſs of an auriga required great addreſs, agility, and practice, and demanded infinite pains to learn it perfectly. They were dreſſed in the colour of their faction; but their only cloathing conſiſted of a light tunic, without ſleeves, which did not reach below the knees. They wore a round helmet, faſtened under the chin, to defend their heads in caſe of a fall: the tunic was cloſely and ſtrongly girded with belts, probably of leather, which covered the cheſt and ſtomach. An antique torſo at the Muſeo Pio-Clementino, gives a very clear repreſentation of this part of the coſtume. A crooked knife ſtuck among the belts was an eſſential part of their equipment; for as the reins were faſtened round the middle of the driver, he would, if he happened to fall from the chariot, have been expoſed to the danger of being dragged round the circus, if he had not had the means of delivering himſelf by cutting the reins.

Now the charioteers and horſes, ſhut up in the carceræ, eagerly expected the moment of departure. In winter the breath of the horſes was ſeen coming through the lattice of the gates, and they were heard to beat with their hoofs the hardened ground. The prætor gave the firſt ſignal, on which the gates of the carceræ were opened all at once by means of ſome machinery; this ſignal was different at different times, anciently it was a lighted torch; in the time of Nero a piece of white cloth thrown from above was the ſignal; at the ſecond and laſt ſignal, the ſound of a trumpet, a cable which croſſed from one herma to another fell, the chariots left the carceræ, and advanced towards the right ſide of the circus. Tending to the ſame centre by ſo many radii, the chariots could not encounter till they entered into the courſe; but from this time there was a continual ſtruggle and conflict among the cars to obtain the neareſt place to the ſpina, and turn the goals as cloſe as poſſible. The whole courſe conſiſted of ſeven turns, and he, who after the ſeventh turn, arrived firſt at the meta oppoſite the carceræ was the conqueror. Thus, the object was not only to run as faſt as poſſible, but to ſhorten the way, by keeping cloſe to the ſpina, and turning ſhort round the meta, without, however, touching, or even grazing, for the ſmalleſt ſhock would overturn the car. This accident, in Circenſian phraſe, was called a ſhipwreck. The charioteers were permitted to claſh with and overturn their adverſaries, provided it did not happen before they entered into the courſe, that is, before they had paſſed the ſpace between the carceræ and the firſt meta. It appears, that a white chalk line was drawn acroſs the circus, to mark the beginning and termination of the courſe.

If, in commencing the courſe, there was reaſon to ſuſpect any trick, or foul play, it was lawful for the people to require that it ſhould be recommenced: this demand was made by ſhaking their togas; and when this ſign was general, the prætor was obliged to comply.

There were twenty-five courſes, as before obſerved, and the uſual number of cars was four; there were, however, exceptions from theſe rules. At the celebration of the ſecular games, Domitian, inſtead of 25, gave 100 courſes in one day; but the chariots, inſtead of ſeven, made five turns. Commodus frequently had ſix cars run at once; and on a ſepulchral bas-relief at Foligno nine chariots are repreſented in full career. The victor obtained a palm, and, in later times, a crown. He was called *bravium*, which term is apparently the origin of bravo, and brave, in modern languages. The ſecond and third charioteers were not without ſome reward, but the fourth had only the diſgrace of being vanquiſhed.

After the chariot races, the charioteers ran foot races in the arena; and the athletæ and wreſtlers finiſhed the exhibition of the day.

The Roman people were exceſſively attached to the games of the circus. To this purpoſe is the verſe of Juvenal,

> " — Atque duas tantum res anxius optat,
> Panem et Circenſes ——— "

Theſe words *panem et circenſes*, formed the cry of the multitude, who frequently remained whole nights and days in the circus, expoſed to the weather, and without leaving their places to take any refreſhment. At Conſtantinople this paſſion was more violent than ever, and the factions of the circus endangered the empire. Bianconi "Deſcrizione del Circo di Caracalla." "Moſaique d'Italica."

Circus, in *Ornithology*, a name by which Bellonius, Geſner, and Aldrovandus diſtinguiſh the moor buzzard, *Falco æruginoſus* of Linnæus and later authors. The name circus has been likewiſe applied to other birds of the falco tribe: Briſſon, for example, calls the *Falco gallinarius*, *Circus major*, and the Gmelinian falco braſilienſis, or Braſilian kite, *Circus braſilienſis*.

CIRE', in *Geography*, a town of France, in the department of the Lower Charente, and diſtrict of Rochefort; 2½ leagues N. of it.

CIRELLA, a town of Naples, in the province of Calabria Citra, near which were formerly mines of gold, ſilver, and lead, ſome traces of which are now viſible; 8 miles E.S.E. of Scalea.

CIRENCESTER, or **Ciceter**, a borough and market town of Glouceſterſhire, England, was formerly the ſeat of a Roman colony, and is ſuppoſed to have been the metropolis of the Dobuni. The circumſtance of the junction of the three Roman roads, called the Foſs-way, the Irmin-ſtreet, and the Icknield-way, on this ſpot, evinces its eligibility for a Roman ſtation: numerous ancient remains have at various times been diſcovered, and ſcarcely a year elapſes, but ſome memorial of antiquity is found in the vicinity. The ancient city was incloſed by a wall and a ditch, the remains of which demonſtrate the circumference to have been upwards of two miles. It is ſuppoſed that the fortifications were razed ſoon after Henry IV.'s reign; but that they were not wholly obliterated, appears from the following authorities. Leland obſerves that "a man may yet, walking on the bank of Churne, evidently perceyve the compace of foundation of towers ſumtyme ſtanding in the waul. And nere to the place wher the right goodly clothing mylle was ſet up a late by the abbate, was broken down the ruine of an old tower, towards making of the mylle waulles, in the which place was fownd a quadrate ſtone fawllen down afore, but broken in many pieces, wherin was a Roman inſcription, of the which one ſcantlie letterd that ſaw yt, told me that he might perceyve PONT. MAX. Among divers coins found frequently there, Diocleſian's be moſt faireſt." The abbot of Cirenceſter informed Leland that he had found in the ruins arched ſtones, ſculptured with large Roman letters. Hearne obſerves that coins with a figure holding a patera in the right hand, and a palm-branch in the left, were found here in his time; and he had been informed of the diſcovery of a pavement before the year 1711, compoſed of many coloured teſſeræ. Sir Robert Atkyns mentions a ſubterraneous building, fifty feet long, forty broad, and about four high, ſupported by an hundred pillars curiouſly inlaid. Dr. Stukeley mentions a moſaic pavement dug up here in Sept. 1723; and adds, that a vault was diſcovered ſixteen feet by twelve, ſupported by pillars of Roman brick, three feet ſix inches high, on which was a ſtrong floor of terras; ſeveral other vaults adjoining, were ſhaded by cherry trees; and broken pillars, mouldings, cornices with carved medallions, baſes, capitals, &c. were found indiſcriminately ſcattered. Theſe remains have been recently aſcertained to belong to a Roman hypocauſt. A teſſelated pavement, about ſixteen feet ſquare, was found in 1777, beneath a warehouſe in Dyer-ſtreet; another, and more beautiful fragment, was diſcovered in digging a cellar in the ſame ſtreet; and the Bull-ring in the Querns is ſuppoſed to have been an amphitheatre.

The caſtle of Cirenceſter is firſt mentioned in hiſtory as being garriſoned by the earl of Glouceſter for the empreſs Maud againſt king Stephen, by whom it was taken. In the reign of Henry III. it was garriſoned by the barons; but being recovered by the king, he ordered its total demolition. The town, notwithſtanding, appears to have been a place of ſtrength, and is celebrated for the ſuppreſſion of the conſpiracy of the nobles againſt Henry IV. Cirenceſter was formerly celebrated for its rich abbey, which aroſe from a decayed college of prebendaries of ancient Saxon foundation. Rumbaldus, dean of this college, and chancellor to Edward the Confeſſor, witneſſed a grant of that monarch to the abbey at Weſtminſter. Leland mentions a "ſepulchre croſſe," of white marble, as remaining in the abbey church. This building, as appears from Leland and William of Worceſter, was of the Saxon ſtyle of architecture, 280 feet in length, and of proportionable dimenſions. At the diſſolution, the ſite of the abbey was granted to Roger Baſing eſq. on condition that all the buildings within the precincts ſhould be pulled down and carried away; which was ſo effectually executed, that the ſpot occupied by the church cannot now be exactly aſcertained. The ſeat of Thomas Maſter, eſq. now called the abbey, includes the ſite of moſt of the monaſtic buildings. The pariſh church at Cirenceſter, is one of the moſt magnificent parochial edifices in the kingdom. It was completed but a few years prior to the ſuppreſſion of the abbey, yet the regular ſtyle of the fifteenth century prevails in every part. The interior conſiſts of a nave, ſide aiſles, a choir or chancel, and five chapels; at the weſt end is a handſome embattled tower, 134 feet high, ornamented with pinnacles and ſtatues: and on the ſouth ſide is a beautiful porch richly decorated externally with groteſque figures, carved niches, canopies, oval windows, ſculptured cornices, and open-worked battlements; and internally adorned by radiant tracery, ſpreading over the roof in eight circular fan-ſhaped compartments, which riſe from ſingle pillars and meet in the centre, where the lozenges formed by the extremes of the circles, are ornamented with quatrefoils. The porch is 38 feet in length, by 50 in height. The inſide of the church contains two rows of cluſtered columns, five in each; which, with two pilaſters at each end, ſupport the roof. The windows were formerly filled with painted glaſs, but a conſiderable part has been mutilated or miſplaced. Of the chapels, that on the north ſide, dedicated to St. Catherine, is worthy of particular notice, from the ſculptures in the compartments of the roof. In Trinity chapel are two marble monuments, to the memory of Allen, earl Bathurſt, and his ſon the lord chancellor.

Cirenceſter has ſeveral ſchools: the moſt ancient is the free grammar ſchool, founded by biſhop Ruthall, who was a native of this town, and privy counſellor to Henry VII. Queen Mary added 20*l.* to the endowments. Several perſons of eminence have received their education in this ſchool. There are alſo a blue-coat ſchool, and a yellow-coat ſchool, both eſtabliſhed early in the eighteenth century. Among other charitable inſtitutions, are three hoſpitals: St. John's, founded by Henry I.; St. Lawrence's, by Edith, lady of the manor of Wiggold, time unknown; and St. Thomas's, by ſir William Nottingham, attorney-general to Henry IV.

The manufactures of this town ſeem generally in a declining ſtate, with the exception of that for curriers' knives, which are held in high eſtimation throughout Europe and America, and are made by three or four houſes here, by one at Glouceſter, and ſcarcely any where elſe in the kingdom. There are alſo a clothing-houſe, a ſmall carpet manufactory, and two breweries.

The markets, which are held on Monday and Friday, are much frequented, and well ſupplied, eſpecially with corn and meat. Great quantities of wool were formerly brought from Buckinghamſhire, Berkſhire, Northamptonſhire, and Oxfordſhire, and ſold at the Booth-hall, where large rooms were provided for the reception; but the modern practice of dealers travelling to make their purchaſe, has effectually deſtroyed this market. Three fairs are annually held, and two mops, or ſtatute markets, on the Mondays preceding and following the tenth of October. Great numbers of farmers and others attend theſe markets to hire labourers and ſervants, who wear, in their hat or boſom, badges of whip-cord, wool, or cow-hair, thus diſtinguiſhing themſelves as candidates for the offices of carter, ſhepherd, dairy-maid, &c.

The diſtrict called the hundred of Cirenceſter included, at the Domeſday ſurvey, ſeven villages; but Henry IV. made the town a diſtinct hundred, as it ſtill remains, excluding the abbey, almery, and Spiringate lane. He alſo made it a corporate town, to be governed by a mayor, two conſtables, &c.; but his charter was cancelled 37 Eliz. The hundred conſiſts of ſeven wards; the ſteward of the manor annually appoints two high conſtables and two petty conſtables for each ward, with the other neceſſary officers. Repreſentatives were ſent from this borough to a great council 11th Edward III.; but the firſt regular return to parliament was made under a grant of 13 Eliz. Different deciſions of the Houſe of Commons have confined the right of election to the inhabitant houſeholders not receiving alms; the number is about 500.

The town conſiſts of four principal, and ſeven ſmaller ſtreets, with ſeveral lanes, extending over an area of about two miles in circumference. The buildings are chiefly of ſtone; and the more reſpectable houſes are generally detached. The ſtreets, excepting the ſouth ſide, have a gradual declivity from the centre to the extremities. The population has increaſed but little ſince the beginning of the laſt century; the inhabitants amounting then nearly to 4000, and being returned under the act in the year 1801 at 4130; the number of houſes 885. Cirenceſter is ſituated 89 miles W. from London. It is very near to the grand ridge of England; and not far from the famous Sapperton tunnel, by which the Thames and Severn canal croſſes it: a ſhort branch of this canal is conducted up to the town of Cirenceſter. See Canal.

Ricardus Corinienſis, or Richard of Cirenceſter, ſo called from being a native of this town, was the compiler of the celebrated Itinerary, part of which, relative to England, was publiſhed under his name by Dr. Stukeley.

Oakley Grove, the ſeat of Henry earl Bathurſt, lies on the weſt of Cirenceſter. The manſion is only at a ſmall diſtance from the town, the view of which is intercepted by a lofty wall lined with perennial trees. It was built early in the laſt century; and, though very ſpacious, is more convenient than grand. Lyſons' Glouceſterſhire Antiquities. Rudder's Hiſtory of Glouceſterſhire. Rudge's Hiſtory of Ditto, 2 vols. 8vo.

CIRENZA, a town of Naples, in the province of Calabria Ultra, 12 miles N. of Girace.

CIREY, a town of France, in the department of the Meurthe, and diſtrict of Luneville, 8 miles E. of Blamont.

CIRIE, a town of Italy, and capital of a marquiſate, in the principality of Piedmont, comprehending the towns of St. Maurice, Nolli, and Robaſome, ſeated near the foot of the Grecian Alps, in the Doria; 8 miles N.N.W. of Turin.

CIRIS, in *Ornithology*, the painted bunting of Pennant and Latham, a ſpecies of *emberiza*, which ſee.

CIRKNITZ, in *Geography*, a ſmall village of Carniola, ſeated on a lake called the "Cirknitz ſea," ſurrounded with ſteep and rugged mountains; 14 miles S.S.W of Laybach, and 168 S. S.W. of Vienna. In winter this lake is very extenſive, and overflows a conſiderable part of the adjacent fields, which, in ſummer, are quite dry, and fit for tillage; whence it is commonly ſaid, that a perſon may ſow and reap, hunt and fiſh, in this lake, within the ſpace of a year. When it is dry the ruſhes, which it yields in great abundance, are mowed for manure and litter for the cattle; and when it remains long dry, it produces a kind of graſs which is uſed as fodder. The moſt remarkable circumſtance attending this lake is, that it generally continues to ebb for 25 days; the water during that time running off by holes or cavities, which are 18 in number, and are ſo many eddies or whirlpools. Inſtances have occurred of its being dried up, by the abſorption of theſe eddies, three times in a year. The lake abounds with fiſh; and in ſpring and autumn it is frequented by large flocks of wild ducks. There are three pleaſant iſlands in this lake, beſides a kind of peninſula. It is ſomewhat more than a German mile in length, and about half as broad. Its greateſt depth, excluſive of the cavities or holes, is about 24 feet. Strabo calls it Lugea palus, either from the town of Lueg, which lies near it, or from its deep and cavernous bed.

CIRL-BUNTING, in *Ornithology*. See Emberiza Cirlus.

CIRLUS Stultus, the fooliſh bunting; *Emberiza cia*, is ſo named by Aldrovandus and Willoughby; the former calls it likewiſe *emberiza pratenſis*.

CIRNA Mons, in *Ancient Geography*, *Dghibbal Iſkol*, a mountain of Africa, S.W. of the Hipponites lake, and 5 leagues from the town of Hippozaritus. It is mentioned by Ptolemy, and diſtinguiſhed by its round figure.

CIRO, in *Geography*, a town of Calabria, ſtanding on the ſite of Crimiſſa, a city founded by Philoctetes, the friend and heir of Hercules. This is a very poor place, though it contains about 6000 inhabitants; it belongs to Spinelli, prince of Tarſia, who monopolizes all the ſilk made by his vaſſals. The territory produces alſo very fine oil and corn, bad wine but good water.

CIRPHIS, in *Ancient Geography*, a town of Greece, in the Phocide territory. Strabo places it near Mount Parnaſſus.

CIRQUINCON, in *Zoology*, the name under which Buffon deſcribes the weazel-headed armadillo, *daſypus* 18-*cinctus* of Linnæus, and *tatu muſtelinus* of Ray.

CIRRADIA, or Cirrhadia, in *Ancient Geography*, a canton of India, on the other ſide of the Ganges, according to Ptolemy, who ſays that it yielded the beſt *malabathrum*. M. d'Anville places it towards the 26th degree, on the courſe of the river Catabeda.

CIRRHA, a maritime town of the Phocide territory, ſeated on the gulf of Corinth, and ſerving as a port to the town of Delphi, and 60 ſtadia diſtant from it. On an adjoining plain was an hippodrome, dedicated to Apollo. Homer calls this town Criſſa. We learn from Pauſanias, lib. ii. c. 37, that Cirrha had a beautiful temple of Apollo, Diana and Latona, in which were large ſtatues of theſe deities, which belonged to the ſchool of Athens.

CIRRHOSE, in *Botany*, a term applied to the leaves or other parts of a plant, when they throw out cirrhi or tendrils, by which they cling to neighbouring plants or other bodies.

CIRRI, Giovanni Battista, in *Biography*, a native of Italy, whoſe inſtrument was the violoncello, upon which he was a more uſeful than ſhining performer. He was a regular bred muſician, a good contrapuntiſt, and wrote correctly for ſeveral inſtruments beſides his own. He reſided in England many years. His firſt work was publiſhed at Verona in 1763, where he is ſtyled *profeſſore di violoncello*, born at Forli. In 1785 he had publiſhed in London, Paris, and Florence, 17 different works, conſiſting of quartets, trios, ſolos for his own inſtrument, and pieces for the organ.

CIRRIS, in *Ornithology*, one of the ſynonymous names of the long-legged plover, *charadrius himantopus*. Cirris is the name under which it is deſcribed by old writers; it was formerly conſidered as appertaining to the ardea or heron tribe, but is certainly by no means related to that genus. The general plumage of this bird is white, with the wings blackiſh and gloſſed with ſhining green; the legs a very beautiful red. The ſpecies is occaſionally found in England. Donov. Brit. Birds, &c.

CIRRUS, in *Antiquity*, an ornament added to the edges and borders of garments, much in the manner of fimbriæ or fringes, only that theſe were ſingle and ran along the borders of the dreſs; whereas the cirri were knotted together, and hung down from the extremities of the robe.

Cirrus, in *Botany*, a tendril or claſper, by whoſe numerous convolutious plants lay hold of other bodies for ſupport. The name refers to the naturally curling locks of a child after they have been once cut, called by the Romans previouſly *comæ*, but afterwards *cirri*, moſt probably from κειρειν, *to ſhear*. Some of the old botaniſts uſed the name of *cirri* for the *ſtamina*, and others for the fibrous crown of the root, formed of the remains of leaf-ſtalks in ſeveral plants, as *Meum athamanticum*. Linnæus, who firſt applied this term to tendrils, writes it *cirrhus*. Haller retained the old names of *capreolus* and *claviculus* for the part in queſtion. See Capreolus and Claviculus.

Tendrils are enumerated by Linnæus among thoſe appendages to a plant which he denominates *fulcra*, or props, and of which he reckons ſeven kinds. They are the only one of the ſeven to which the term he has choſen can, with ſtrict propriety, be applied. They ſerve to ſupport weak and climbing ſtems upon ſuch as are ſtrong and upright, and they are moſt abundant in annual ſtems, Bryony and the Vetch kind for inſtance, which ſpringing from ſtrong and durable roots, thrive with great luxuriance during ſummer, decorating with their foliage, bloſſoms and fruit, many, otherwiſe naked, ſtems and branches; till, having perfected their ſeeds, they no longer encumber the face of nature, and their living principle ſhrinks, as it were, into its winter quarters in the root. In the foreſts of India and America the climbers are often of a more ſhrubby kind, and aſcend to the tops of the higheſt trees, aſſiſted frequently by twining ſtems as well as by the organs in queſtion.

Tendrils generally grow ſtraight, and more or leſs horizontally at firſt, but their extremities ſoon aſſume a ſpiral ſhape, and make a certain number of turns, which being accompliſhed, they, in many inſtances, perform about as many more in the contrary direction, and even afterwards reſume their original one, by which they have ſo much the more chance of catching hold of any neighbouring branches. Some of them, as in *Vicia* and *Lathyrus*, are repeatedly branched, rendering the chances ſtill more in their favour; while others are perfectly ſimple, and turn but in one direction, as thoſe of *Glorioſa ſuperba* and *Flagellaria indica*, which are merely a ſpiral elongation of the points of their leaves, hence denominated *folia cirroſa*. In many pinnated leaves, particularly thoſe of the Vetch tribe, a *cirrus*, either ſimple or branched, terminates the common foot-ſtalk, the leaves thus circumſtanced being, of courſe, abruptly pinnated. When the *cirrus* is quite diſtinct from the leaves, it is uſually axillary, as in the genus *Paſſiflora*; ſometimes it proceeds from the flower-ſtalk, as in *Cardioſpermum halicacabum*, and *Annona hexapetala*, *Linn. Suppl.* 270. The extremity of the flower-ſtalk in the latter forms a hook, which embraces the branch, and gathering great ſtrength after the flower is paſt, ſerves to ſuſpend the large and heavy fruit reſembling a bunch of grapes, for which purpoſe the baſis or receptacle of the flower does not perhaps poſſeſs ſufficient firmneſs.

Profeſſor Willdenow has an idea that *cirri* are, "in fact, *petioli* without the leafy expanſion, but which, not having waſted their ſap in the formation of leaves, have grown the longer, and thus have become too thin and feeble to preſerve their ſtraight direction." The obſervation of the leguminous plants favours this hypotheſis, the branches of whoſe tendrils actually ſeem each to have taken the place of a leaflet. So alſo the *Glorioſa ſimplex*, a plant obſerved by Miller alone, and now generally ſuppoſed to have been a mere variety of *G. ſuperba*, deficient in the ſpiral appendage to its leaf, may be preſumed to have beſtowed all its vigour in the expanſion of the leaf itſelf, without accompliſhing more. But the *cirri* in *Paſſiflora*, *Vitis*, *Bryonia*, *Cucumis*, &c. are, unqueſtionably, diſtinct organs, which never aſſume the forms nor functions of leaves.

Willdenow further remarks, that "it appears as if the diminiſhed force of the current of air had ſome influence upon the tendril. For each plant that ſupports itſelf by tendrils, when diſtant from a wall, tree, or ſhrub, ſends out all its tendrils towards that ſide on which the plant is to attach itſelf." This ſeems to us not ſatisfactory. If the fact be true, for which we cannot vouch, it is rather to be explained by this ingenious writer's preceding theory, that part which, if ſituated where it had received more air and light, would naturally have expanded into a leaf, being in oppoſite circumſtances contracted into a tendril. We are perſuaded, however, that, except poſſibly in the above-mentioned leguminous plants, the *cirrus* and the leaves are organs totally diſtinct in their nature. The latter are ſtimulated to expand by the action of light and air, and preſent themſelves ſo as to receive thoſe ſtimulants; the former ſeem to thrive moſt from reſiſtance, and to court that reſiſtance, turning with much more vigour round any extraneous body than in a void ſpace. So the tendrils of *Hedera quinquefolia*, properly a ſpecies of *Vitis*, when they attain the trunk of a tree, or the even ſurface of a ſtone, eſpecially a ſmooth flint, no ſooner fix upon it than their extremities dilate, clinging with a ſort of appetency to what ſeems to ſtimulate them to an extraordinary exertion. Much the ſame thing may be obſerved in our common ivy, *Hedera helix*.

Tendrils ſeldom afford good ſpecific characters, being too much alike in the ſame genus to anſwer any ſuch purpoſe. In the various climbing ſpecies of Virgin's-bower, *Clematis*, there are no real *cirri*, but the leaf-ſtalks effectually perform their functions, eſpecially in the beautiful *C. cirroſa*, where thoſe ſtalks are permanent, for a year at leaſt, after their leaves are fallen, and having all the appearance of naked *cirri*, ſeem to have been taken for ſuch by Linnæus. Hence Juſſieu was induced, in the Paris garden, to change the name of this ſpecies to *pyrifolia*; but the ſemblance of *cirri* is ſufficient to juſtify the original denomination, though the Linnæan ſpecific character requires correction. S.

CIRRUS, CIRRI, in *Ichthyology*, the Linnæan term applied in general to the beard, or ſoft *appendiculæ* which hang about the mouth or jaws of fiſhes; it is alſo occaſionally employed to expreſs the ſkinny or fleſhy appendages about other parts of the body. See ICHTHYOLOGY.

CIRSELLIUM, in *Botany*, a genus formed by Gærtner, for ſome ſpecies of the Atractylis of Linnæus, with the following character. *Calyx* imbricated either with ſpinous, or with ſpineleſs ſcales. *Receptacle* beſet with briſtly chaff. *Florets* of the diſc hermaphrodite; of the ray feminine, ſtrap-ſhaped; both fertile. *Seeds* uniform; down feathered. He refers to it, Atractylis cancellata and humilis, and doubts whether A. gummifera, lancea, ovata, with Carthamus ſolicifolius, ought not to be added.

CIRSIUM, in *Botany*, (Circium; Tourn.) a genus taken up by Gærtner, with the following character. *Calyx* bellying or cylindrical, imbricated; ſcales acuminate, either with, or without prickles, but never with appendicles. *Florets* all hermaphrodite. *Receptacle* chaffy; *ſeeds* crowned with a feathery down; rays of the down filiform, nearly equal, united into a ring at the baſe. The Cirſium and Cirſellium of this author differ only in the former being without, and the latter with a ray.

CIRSOCELE, in *Surgery*, corruptly written CIRCOCELE, from κιρσος *varix*, and κηλη, *tumor*; ſometimes called *Hernia varicoſa*, though improperly, as it has no affinity to a real HERNIA, which ſee.

The cirſocele is an unequal and irregular enlargement of the ſpermatic veſſels, near the teſtis; in which are felt, as it were, hard ſtrings or varicoſe veins, of the thickneſs of a quill or even larger, involved together like a maſs of worms, and preſſing down upon the teſticle. The diſorder is moſt common in young plethoric men, and in thoſe eſpecially who are unmarried. It is more troubleſome than dangerous, and ſeldom requires any other attention than wearing a bag-truſs to ſupport the part.

The tumor is generally firſt diſcovered near the bottom of the ſcrotum; in moſt caſes it makes a gradual progreſs. At its commencement, the patient perceives a ſenſe of weight in the ſcrotum; which, as the diſeaſe increaſes, becomes more ſenſible, but diminiſhes in its bulk upon the application of a ſuſpenſory bandage, or when the patient lies upon his back. When the tumor is ſqueezed, the patient feels that peculiar ſenſation, which always is produced by preſſure applied to the teſticle. At length the tumor gradually enlarges upwards, approaches the abdominal ring, widens it, and alters its ſituation or form; ſo that nothing but a confuſed irregular maſs can be diſcovered upon examining this part.

The cirſocele may be thus diſtinguiſhed from the omental hernia, with which it has ſome ſimilarity in its advanced ſtate: viz. The omental hernia deſcends from the abdominal ring downwards, whilſt the cirſocele always commences at the bottom of the ſcrotum, and increaſes upwards. It alſo comes on very gradually, and is not attended by thoſe ſymptoms which accompany the omental hernia in conſequence of the omentum dragging down the inteſtines. The maſs which forms the cirſocele can never be puſhed into the abdomen, whereas the protruded omentum frequently may be returned. In the cirſocele, the teſticle often diminiſhes in ſize, and even waſtes entirely away; whilſt in the omental hernia, it is found to be perfect and ſound. Finally, when the tumor in an omental hernia is preſſed as above mentioned, the patient experiences no peculiar ſenſation or pain; whilſt in the cirſocele, pains are frequent even without any apparent cauſe.

The cirſocele may be diſtinguiſhed from the hydrocele, with which it has alſo much ſimilarity, by the following circumſtances: In a ſimple hydrocele, the teſticle and the epidydymis are perfectly natural and ſound, whilſt in the cirſocele theſe parts are always found to have ſome preternatural and irregular conformation: the tumor in the hydrocele is alſo of a more pyramidal figure, and when the patient lies down or ſtands up it yields to preſſure, and riſes upwards; and as ſoon as the preſſure is removed, recovers its former ſituation. Moreover in the hydrocele, the patient does not feel pain in the ſcrotum, or even in the tumor itſelf, as in the cirſocele, but merely in the region of the groin: the more the hydrocele increaſes, the more the teſticle is concealed, and can only be felt at the bottom; but when the diſeaſe has attained its height, it entirely diſappears, as in the cirſocele. Finally, the elaſticity and fluctuation perceived upon preſſing the tumor between the fingers, are ſymptoms by which the hydrocele may readily be diſtinguiſhed from the cirſocele.

The cirſocele is frequently combined alſo with other diſeaſes of the male organs of generation, from which however it may readily be diſtinguiſhed.

The cauſes of this diſeaſe are: hypochondriaſis, obſtructions or irregularities of the hæmorrhoidal diſcharge, immoderate laſciviouſneſs, redundance of ſemen, &c. The diſeaſe conſiſts in a tumefaction of the ſmall veſſels compoſing the teſticle, which protrude out of the proper membrane of the teſticle, and mix themſelves with thoſe of the epidydymis. Frequently the diſeaſe is occaſioned by preſſure on the upper part of the ſpermatic chord by a rupture-bandage, or a ſcirrhous tumor. (See the article Truss.) Sometimes it is occaſioned merely by a relaxation of the veſſels of the ſpermatic cord; in which caſe a ſuſpenſory bandage, the horizontal poſture, cold bathing, and the external application of a ſolution of alum produce beneficial effects. When theſe remedies do not entirely remove the tumor, they at leaſt check its further progreſs.

The mode of cure ought properly to be regulated according to the different cauſes that have produced the diſeaſe. Antiphlogiſtic remedies are chiefly to be employed. (See Inflammation.) Above all, the patient ſhould keep in a horizontal poſture, and uſe a ſpare diet. In proportion to the ſtrength of the ſubject, local bleeding *muſt* be employed, and ſometimes repeatedly. Emollient and anodyne glyſters, as alſo gentle and cooling laxatives, are likewiſe ſerviceable. The ſcrotum ſhould be conſtantly ſupported by a ſuſpenſion bandage; and water cooled with ice may be frequently daſhed over it, in order to reſtore the tone of the parts.

Some of the ancient ſurgeons have recommended to lay the diſeaſed parts bare, and either to tie or extirpate the tumefied veins; but probably when obſtructions of the hæmorrhoidal veſſels have cauſed this diſeaſe, it might be effectual, without laying bare the ſpermatic chord itſelf, merely to apply leeches under the abdominal ring, and thus produce a topical evacuation of blood. The advantage of this practice is the more to be expected, as it is known that the ſpermatic veins anaſtomoſe with the veins of the external ſurface.

Should all the remedies we employ be of no effect, we are told there may be even danger of cancer, and that caſtration muſt follow; but this operation ſhould not be haſtily performed, as we have never ſeen any ſuch conſequences, and are inclined to doubt the propriety of this advice in any caſe of ſimple cirſocele. (See Cancer.) The doctrine of cirſocele terminating in cancer, has particularly been inſiſted on by the German ſurgeons.

CIRSOPHTHALMIA, from Κιρσος, *varix*, and οφθάλμια, Ophthalmia varicoſa, varicoſitas conjunctiva: a varicoſe dilatation of the veſſels of the tunica conjunctiva. In this diſeaſe there appear red varicoſe veſſels diſtended with blood upon the tunica conjunctiva of the eye: they are generally in the form of bundles, uniting commonly near to one of the angles of the eye, where they form a kind of trunk, on which account this diſeaſe has ſometimes been termed *Ophthalmia angularis*. At the point where the ſmall veſſels join, a ſmall tubercle is obſerved, which is actually varicoſe; ſometimes this tubercle burſts and is changed into a ſmall troubleſome ulcer. From the angles of the eye the veſſels ſpread themſelves further towards the cornea, and diverge more from each other; ſometimes ſeveral of them croſs the cornea, and ſenſibly impede viſion, or in ſome inſtances entirely obſtruct it. (See Ophthalmia.)

Theſe veſſels may now and then be made to diſappear by the long-continued external application of cold water, or a ſolution of alum in water, a ſolution of white vitriol, or a weak ſolution of pure kali, &c. The laſt mentioned remedies are to be applied ſeveral times a day, by means of a ſmall hair-pencil, or a few drops of them let fall into the eye.

Mr. Janin recommends an ointment containing white precipitate of mercury, &c. When the ſmall point at which the veſſels of the bunch unite, has already changed into a ſmall ulcer, the ſame remedies are to be uſed as in other ulcers of the conjunctiva: but when theſe remedies are inſufficient, the veſſels muſt be cut through with the point of a cataract knife or lancet; and in order that the divided veſſels may not reunite, they muſt be cut completely through, and the inciſion repeated ſeveral times in the ſame line, ſo that it may penetrate quite through the conjunctiva coat, and the ends of the veſſels muſt be removed from each other with the point of the knife. It is alſo proper that the inciſion ſhould be made ſomewhat longer than the breadth of the bunch, as in that caſe, the ends of the veſſels may be more eaſily removed from each other. Should the veſſels re-appear after a few days, the operation muſt be repeated, their bleeding ſhould be promoted by bathing them with warm water, and we may afterwards apply a ſolution of white vitriol, or ſome other aſtringent remedy.

CIRSOTOMY, from κιρσος, *varix*, and τεμνω, *ſeco*, the operation for varices. This operation was formerly in uſe for evacuating the contents of deep-ſeated varices; and is ſtill ſometimes practiſed. (See Varix.) The teguments over the varix are cut open, and the varix ſeparated from the ſkin and neighbouring parts, by means of a probe or other blunt inſtrument; after which the vein is tied above and below the varix, in the ſame manner as the artery in caſes of aneuriſm. See Aneurism.) The tumor, ſituated between the two ligatures, ſeparates itſelf together with the ligatures in the courſe of a few days; or we may divide it at firſt, or only ſeparate its anterior part with the ſciſſars. When the varix is ſituated near to a bone, it is not neceſſary to tie the vein; but as ſoon as the integuments have been divided we may immediately extirpate the whole tumor, and ſtop the hæmorrhage by compreſſion upon the bone. When the ſkin, as ſometimes happens, adheres ſo ſtrongly to the varix that it cannot be ſeparated, we muſt cut out the adhering portion. If the operation has been performed by ligature, we muſt wait for the ſeparation of the threads, and then promote the union of the wound. Now and then this operation has been followed by inflammation, and even death!

CIRTA, or Cirtha, in *Ancient Geography*, a town of Africa in Numidia, or in the eaſtern province of Algiers, now called Conſtantina, anciently the Mauritania Cæſarienſis. It derived its name, according to Bochart, from קרתא *cartha*, *i. e.* city; which denotes that it was formerly a conſiderable place. It was ſeated on an eminence, about 48 miles from the ſea, and became the capital of the kingdom of Numidia, and the royal reſidence. Its magnitude and ſtrength may be inferred from the extent of its ruins, and from its particular ſituation; the greateſt part of it being built upon a peninſular promontory, inacceſſible on all ſides, except towards the S. W. where it was joined to the continent. This promontory was computed by Dr. Shaw (Trav. p. 60.) to be a good mile in circuit, lying a little inclined to the ſouthward, but towards the north it terminated in a precipice, at leaſt 100 fathoms perpendicular, from whence is a beautiful landſkip, over a great variety of vales, mountains, and rivers, which lie to a great diſtance before it. Eaſtward the proſpect is bounded by an adjacent range of rocks much higher than the city; but towards the S. E. the country is more open; and in this direction the peninſular promontory is ſeparated from the continent by a deep narrow valley perpendicular on both ſides, where the Rummel or Ampſaga conveys its ſtream. The neck of land to the S. W. where ſtood the principal gate of the city, is about the breadth of half a furlong, being entirely covered with broken walls, ciſterns, and other ruins, which are continued quite down to the river; and carried on from thence over a ſtrip of plain ground, that runs parallel with the abovementioned valley. The preſent city has not the ſame dimenſions, being confined to the peninſular promontory only. Near the centre of the city there ſtill remain thoſe capacious ciſterns which received the water brought thither from Phyſgeah by an aqueduct, a great part of which ſubſiſts and is very ſumptuous; they are about 20 in number, and form an area of 50 yards ſquare. The gate conſiſts of a beautiful reddiſh ſtone, not inferior to marble, well poliſhed and ſhining; an altar of pure white marble makes part of a neighbouring wall, and the ſide in view preſents a well ſhaped ſimpulum in a bold relief. The gate towards the S. E. reſembles the other, though ſmaller, and lies open to a bridge that was built over this part of the valley; the bridge is much extolled; the gallery and columns of the arches being adorned with cornices and feſtoons, ox-heads and garlands. The key-ſtones of the arches are charged with caducei and other figures. Below the gallery, betwixt the two principal arches, is ſeen in bold relief, well executed, the figure of a lady treading upon two elephants, with a large eſcallop ſhell for her canopy. Below the bridge the Rummel turns towards the north, and runs near a quarter of a mile through a rocky ſubterraneous paſſage, laid open in ſeveral places for the convenience of drawing up the water, and cleanſing the channel. To the S. W. of the bridge is ſeen among the ruins the greateſt part of a triumphal arch called "Coſſir Goulah," or the caſtle of the giant, conſiſting of three arches, the mouldings and frizes of which are curiouſly embelliſhed with the figures of flowers, battle-axes, and other ornaments. Under the great precipice without the precincts of the city, are ſeveral ſepulchral inſcriptions, one of which is upon a "Cippus" with the figure of a loaded beeve in baſſo relievo above it, and of a crab below it. Beeves are ſtill uſed in Numidia as beaſts of burden. The Rummel at a ſmall diſtance falls in a large caſcade from its ſubterraneous channel, and above it lies the higheſt part of the city, from whence criminals are precipitated into the river, as they uſed to be in former times.

This place was very conſiderable in the time of Syphax. Strabo ſays, that Micipſa eſtabliſhed in it a colony of Greeks; and it afterwards became ſo flouriſhing as to be able to raiſe 10,000 horſe and 20,000 foot. After the conqueſt of Numidia by the Romans, Sittius Nucerinus revolted againſt the republic, made himſelf maſter of it, and gave it his name, "Cirta Sittianorum." Upon Cæſar's carrying his arms into Africa, it revolted to the republic, which ſent a colony thither, and the city took the name of "Cirta Julia." This city having been ruined A. D. 311 by the conqueſts of the tyrant Alexander, was re-eſtabliſhed by order of Conſtantine the Great, and aſſumed the name of "Conſtantina." Juſtinian repaired its fortifications. The name of Conſtantina is ſtill preſerved in the weſt; but the people of the country call it Cucuntia. Count Caylus has engraved the veſtiges of an ancient tomb which are ſtill to be ſeen near this city. Mem. de Lit. t. xxvi. p. 334.

CIRTIPUR, in *Geography*, a city of India in the kingdom of Nepal, ſeated on a hill of the ſame name, containing about 8000 houſes, about a league's diſtance from Catmandu. The inhabitants of this town vigorouſly reſiſted the repeated attacks of the king of Gorcha; but, after a ſiege of ſeveral months, the army of the enemy was treacherouſly introduced into the town; and the people, on the faith of promiſed amneſty, ſurrendered themſelves priſoners. In ſhameful violation of this promiſe, an order was iſſued to put the principal inhabitants to death, and to cut off the noſes and lips of every one, even infants, who were not found in the arms of their mothers; and it was likewiſe required that the noſes and lips which had been cut off ſhould be preſerved, for the purpoſe of aſcertaining how many ſouls they were; and that the name of the town ſhould be changed into "Naſkatapur," ſignifying "the town of cut-noſes." The order, it is ſaid, was carried into execution with every mark of horror and cruelty, none eſcaping but thoſe who could play on wind-inſtruments; although father Michael Angelo, who, without knowing that ſuch an inhuman ſcene was exhibited, had gone to the houſe of the perſon who had received the ſavage order, and interceded much in favour of the poor inhabitants. Many of them put an end to their lives in deſpair; others applied to the Roman miſſion for medicines; "and it was moſt ſhocking," ſays father Giuſeppe, prefect of the miſſion, "to ſee ſo many living people with their teeth and noſes reſembling the ſkulls of the deceaſed." Aſiatic Reſ. vol. ii. p. 319.

CIS, a hill of Paleſtine, in the tribe of Juda, ſituated at the N.W. of the Dead Sea, at ſome diſtance from the mouth of the brook Cedron.

CISALPINE, any thing on this ſide the Alps.

The word is formed from the prepoſition *cis*, on this ſide, and *Alpes;* which, though properly confined to the mountains ſeparating Italy and France, yet is uſed by authors for any very high mountains.—Thus Auſonius ſpeaks of the Alps of the Pyreneans, the Alps of the Apennines, &c.

The Romans divided Gaul and the country now called Lombardy into *Ciſalpine* and *Tranſalpine*.

That which was *Ciſalpine*, with regard to the Romans, is *Tranſalpine* with regard to us. See Gallia.

Cisalpine, (rather *Tranſalpine*, or *Paduan*), or as it has been ſince denominated, the Italian *Republic*, in *Geography*, a new ſtate formed by the union of thoſe governments which had been denominated Ciſpadane and Tranſpadane, from their ſituation on the right and left ſides of the Po, created by the French republic in the year 1796, firmly eſtabliſhed in conſequence of the peace of Campo Formio in 1797, by the 8th article of that treaty, further re-eſtabliſhed by the 12th article of the treaty of Luneville in 1801, and acknowledged by his majeſty the emperor, the kings of Sardinia, Spain, Switzerland, the pope, &c. It comprehends by the 8th article of the treaty of Campo Formio, beſide the whole of Auſtrian Lombardy, and part of the former republic of Venice, to the eaſt and ſouth of the Legner, the Bergameſque, the Breſcian, the Cremoneſque, the Modeneſe, the principality of Maſſa and Carrara, and the three legations of Bologna, Ferrara, and Romagna. In a "Geographical and Statiſtical Account of the Ciſalpine Republic, &c." tranſlated from the German by Dr. Oppenheim, 8vo. 1798, the whole territorial dimenſions of the Ciſalpine Republic are ſtated to contain 3,567 ſquare miles, and 3,447,384 ſouls; *viz.*

	Sq. Miles.	Inhabitants.
1. The Duchy of Milan - -	811	1,116,892
2. The Duchy of Mantua	185	207,331
3. The principalities of Caſtiglione and Salferino - -		
4. The acquired provinces formerly belonging to the Republic of Venice, *viz.* the Bergameſco, the Breſciano, and the territories of Verona and Rodigo, ſituated on the right bank of the Adige, the White Canal, the Tartaro, the canal Poliſella, and the Po -	463	666,000
5. The Duchy of Modena, with the principalities of Maſſa and Carrara	431	460,000
6. The lands obtained from the duke of Parma, the duchy of Guaſtillo, Sabionetta, and Bozzolla -	27	18,000
7. The three legations, Ferrara, Bologna, and Romagna, formerly Papal - - - - -	1152	775,861
8. The territories of the Griſons, belonging to Worms, Cleves, and the Valteline - -	324	100,000
9. The four (commonly called) Italian Bailiwicks - - - - -	174	103,000
Total - -	3,567	3,447,084

The conſtitution of this republic was eſtabliſhed at a conſulta, aſſembled at Lyons in January 1802, when the name of Italian republic was ſubſtituted for that of *Ciſalpine*, and the magiſtracy was veſted in Buonaparte, the firſt conſul of France, who attended on the occaſion. This conſtitution declares the catholic religion, apoſtolic and Roman, to be the religion of the ſtate; and though it has merely the name of a republic, under the deſpotic government of Buonaparte, the ſovereignty was pronounced to reſide in the whole body of the citizens. The territory of the republic is divided into diſtricts, departments, and communes. The rights of citizenſhip belong to thoſe who are born of Ciſalpine fathers, and reſide in the republic. Strangers holding landed property, or being concerned in commercial or manufacturing eſtabliſhments, and who have reſided ſeven years, may be naturalized; and alſo perſons of eminent talents, by a ſpecial act of favour.

There are three electoral colleges; the college of the poſſidenti, of the dotti, and of the commercanti. They are to meet once in two years at leaſt, on the invitation of the government, to complete their number, to appoint the members of the conſulta, of the legiſlative body, of the tribunal of reviſion and appeal, and the commiſſaries of finance. Their ſeſſion is to continue fourteen days. They are to deliberate, but not to diſcuſs. Their determinations are to be by ſecret ballot; and one-third of the members conſtitute a houſe. The members of the colleges forfeit this right, 1ſt, by bankruptcy; 2d, by abſence during three ſucceſſive ſeſſions; 3d, by accepting any employment under a foreign government; 4th, by continuing in a foreign country ſix months after being recalled.

The college of poſſidenti conſiſts of three hundred citizens, choſen from ſuch as poſſeſs an annual income, from land, of 8000 livres at leaſt. The place of its meeting, for the firſt ten years, is Milan. Every department may ſend members to this college in the proportion of one to thirty thouſand inhabitants.

The college of the dotti conſiſts of two hundred citizens choſen from amongſt the moſt eminent in the arts, ſciences, and various branches of literature Its place of meeting, for the firſt ten years, is Bologna.

The college of commercanti conſiſts of two hundred citizens, alſo choſen (as the name imports) from among commercial men.

The cenſurati is a committee of twenty-one members nominated by the colleges, of whom ſeventeen is a quorum. Its ſitting is only for ten days.

The government reſides in the preſident, vice-preſident, a conſulta of ſtate; in the miniſters and legiſlative body. The preſident retains his office for ten years, and is re-eligible. With him all laws originate; and he has the ſole conduct of all diplomatic negociations. He is excluſively inveſted with the whole executive power. He appoints the miniſters, the civil and diplomatic agents, the chiefs of the army, &c. He nominates the vice-preſident, who is to repreſent him in his abſence. The vice preſident, once appointed, cannot be diſmiſſed during the preſidency of him by whom he was appointed. The ſalary of the preſident is 500,000 livres of Milan, of the vice-preſident, 100,000.

The conſulta of ſtate conſiſts of eight perſons, above the age of forty, elected for life by the colleges; one of its members is to be miniſter of ſtate for foreign affairs. This conſulta is charged with every matter relative to foreign affairs. Nothing comes, however, under their deliberation except what the preſident chooſes. In caſe of a vacancy, the conſulta elects a new preſident, and cannot ſeparate till the choice is made. Their ſalaries are 30,000 livres each.

The legiſlative council cannot be compoſed of leſs than ten members, above the age of thirty. They are appointed by the preſident, and may be diſmiſſed by him at the end of three years. They have a deliberative voice on the projects propoſed by the preſident, and are ſpecially charged with drawing up the projects of laws. Their ſalary is 20,000 livres each.

The legiſlative body is compoſed of ſeventy-five members, of above thirty years of age, choſen by each department according to its population. One half is to be taken from the colleges. One third goes out every two years. The going out of the firſt and ſecond third to be determined by lot. The government convokes and prorogues the legiſlative body; but the ſeſſion cannot be leſs than two months annually. The ſalary of the members 6000 livres of Milan.

The tribunals, civil and military, are on the model of the French. The judges are for life.

The members of the colleges, the cenſurati, the preſident, vice-preſident, conſulta of ſtate, are not reſponſible. The miniſters are reſponſible.

The freedom of religious worſhip is declared; and no impediments are admitted to induſtry and commerce, but thoſe founded in law. No armed body can deliberate. The purchaſers of national property are protected. The church is to be maintained out of a portion of the national property. The conſulta may, at the end of three years, propoſe any alteration in the conſtitution.

CISAMUS, or Cisamum, in *Ancient Geography*, a town placed by Ptolemy in the northern part of the iſle of Crete, and, according to Strabo, the port of the town of Aptera. In the Notitia of Hierocles, it is an epiſcopal town.

CISEAUX, or rather Ciseaux du Mineur, in *Military Language,* inſtruments like chiſſels, which miners make uſe of for looſening the earth, and trimming the ſides of their excavations, and which, to avoid being heard, they ſtrike with the hand.

CISERUSA, or Cisserussa, in *Ancient Geography*, an iſland of the Ægean ſea, near that of Cnidos. Pliny.

CISIPADES, a people of Africa, who occupied the weſtern ſide of the Greater Syrtis, according to Pliny.

CISLEU, in *Chronology*, the ninth month in the eccleſiaſtical year, and the third in the civil or political year among the Hebrews, containing 30 days: it anſwers to part of our November and December. An annual faſt is obſerved by the Jews to this day on the 18th of this month, in commemoration of the taking of Jeruſalem by Nebuchadnezzar.

CISMAR, in *Geography*, a town of Germany, in the duchy of Holſtein, not far from the Baltic; 17 miles N. of Travemunde. N. lat. 54° 14′. E. long. 11° 2′.

CISME. See Chisme.

CISMONE, a river of the country of Tyrol, which runs into the Brenta, near Kofel.

CISNER, Claudius, in *Biography*, a learned German, born in 1529. He ſtudied firſt at Heidelberg, and afterwards at Straſburg, where he imbibed the Lutheran tenets under Martin Bucer. At Wittemberg, he was made profeſſor extraordinary of moral philoſophy. He afterwards ſtudied the law in different cities in France, and took the degree of doctor of laws at Piſa in 1559. He ſoon after returned to Heidelberg, and was nominated profeſſor of the pandects, and counſellor to the elector-palatine. He died in 1583. Ciſner was author of many works, but the principal was his "Opuſcula Hiſt. et Polit. Philog. diſtributa in Libros IV." This collection contains ſeveral curious tracts on German hiſtory, together with poems, orations, and epiſtles.

CISPADANA, in *Ancient Geography*, an epithet uſually annexed by the Romans to Gallia, when they wiſhed to denote, in Gallia Ciſalpina, that part which was ſituated, with regard to Rome, on this ſide of the Po, or Padus. See Gallia.

CISPIUS, the name, according to Feſtus, of one of the ſix hills of Rome, which formed the Eſquiline mount. Varro ſays, that Ciſpius had ſeven ſummits near the temple of Juno Lucina.

CISSA, an iſland of the Adriatic, according to Pliny, and the Notitia Imperii.

Cissa, Crissa, or Cressa, a town in the Thracian Cherſoneſus, upon the river Ægos, which no longer ſubſiſted in the time of Pliny.

Cissa, a river of Aſia, in Pontus Cappadocia, according to Ptolemy.—Alſo, a fountain of Greece, in the Peloponneſus, placed by Pauſanias near Mantinæa.

CISSÆI, a people placed by Diodorus Siculus in Media.

CISSÆRO, or Cisseron, a mountain of Paleſtine.

CISSAMPELOS, in *Botany*, (κισσαμπελος; Dioſc. *vine of ivy.*) Linn. Gen. 1138. Schreb. 1555. Juſſ. 285. (Caapeba, Plum. Gen. tab. 29. Pareire, Lam. and Poiret in Encyc.) Claſs and ord. *Dioecia monadelphia.* Nat. ord. *Sarmentaceæ*, Linn. *Meniſpermæ*, Juſſ.

Gen. Ch. Male. *Cal.* perianth four-leaved; leaves lanceolate, obtuſe, concave, ſpreading, coloured. *Cor.* none. *Stam.* filaments five, united, inſerted into the nectary; anthers ſhort, four-lobed. *Nectary* ſhorter than the calyx, membranous, entirely coloured, a little concave, wheel-ſhaped, occupying the centre of the flower. Female. *Calyx* one-leafed, opening laterally in the ſhape of an oval ſpathe, narrowed at its baſe, inſerted into the lower part of the germ. (Linnæus conſiders it as a bracte.) *Cor.* one-petalled, egg-ſhaped, obtuſe, convex, caducous, opening laterally, half the length of the calyx, and placed in its concavity, (nectary, Linn. which he calls the lateral edge of the germ, dilated outwards.) *Piſt.* germ roundiſh, villous, fixed obliquely upon a ſhort peduncle; ſtyle upright, awl-ſhaped; ſtigma trifid. *Peric.* berry or drupe roundiſh, a little compreſſed, with one ſeed. *Seed* wrinkled, compreſſed, hard. Poiret.

Eſſ. Ch. Flowers dioicous. Male. *Calyx* four-leaved. Corolla none. Stamens four, monadelphous, attached to a nectareous diſc at the centre of the flower. Female. Calyx one-leafed. Stigmas three. Berry globular, with one ſeed.

Sp. C. *ciſſampelos*, *pareira*, Linn. Sp. Pl. 1. Mart. 1. (Clematis baccifera, Sloan. Jam. i. 200. Plum. Amer. tab. 93. Convolvulus braſilianus, Rai Hiſt. 1331. Caapeba, Marcg. Braſ. 24. Pic. Braſ. 94. β. C. ſcandens, Browne Jam. 357. Caapeba folio orbiculari umbilicato, et tomentoſo, Plum. Gen. 33.) "Leaves peltate, heart-ſhaped, emarginate, entire." Linn. 2. C. *caapeba*, Linn. Spec. 2. Mart. 2. (Caapeba folio orbiculari non umbilicato, Plum. Gen. 33. Ic. 6. fig. 2.) "Leaves petioled at the baſe, entire." Linn. We have followed Linnæus in keeping theſe two diſtinct, eſteeming the mode of the inſertion of the petiole into the leaf a ſound ſpecific character. Poiret, from a diligent compariſon of ſpecimens in the herbariums of La Marck, Juſſieu, and Commerſon, brought ſome from the Weſt, and others from the Eaſt Indies, makes them one ſpecies, which he calls C. *cocculus*, uniting with them under the ſame trivial names, meniſpermum cocculus of Linnæus and Gærtner, which produces the cocculus indicus of the ſhops. See Cocculus *indicus*. He gives the following deſcription of theſe united ſpecies, formed from the above-mentioned ſpecimens. *Stems* woody, ſarmentous, cylindrical, climbing, and twining, a little ſtriated, ſlightly villous. *Leaves* two or three inches broad, alternate, petioled, almoſt orbicular, heart-ſhaped, or ſometimes entire at the baſe, obtuſe, or ſlightly emarginate at their tip, mucronate, entire at the edges, green on the upper ſurface, cloathed underneath with more or leſs of a ſhort whitiſh down, ſoft to the touch; petioles from one to two inches long, villous, cylindrical, with a remarkable curvature near the bottom, inſerted in many individuals into the leaves at a ſmall diſtance from the baſe, ſo as to make them appear peltate or orbicular (C. pareira, Linn.), in others directly into their lower edge (C. caapeba, Linn.). Male flowers very ſmall, panicled. *Panicles* lateral, ſhort, peduncled, looſe, much branched, ſolitary or in pairs, ſome times by threes, and ſeldom more, ſhorter than the petioles, and ſituated a little above their axils; ramifications of the panicle villous, dichotomous, ſlender, almoſt capillary, forming a kind of cyme, with very ſmall, villous bractes. *Female flowers* in racemes, altogether different from the males in their mode of infloreſcence. *Racemes* elongated, narrow, ſoft, tomentous, pendulous, often longer than the petioles, and even than the leaves, axillary, from one to three in an axil. *Bractes* reſembling the leaves, but ſmaller, alternate, orbicular, mucronate, tomentous. *Flowers* very ſmall, axillar, faſcicled. *Fruit* gibbous on one ſide, ſlightly villous when young, ſmooth afterwards, about the ſize of a hazel nut. A native of the Eaſt and Weſt Indies. 3. C. *ſmilacena*, Linn. Sp. 3. Mart. 3. (Smilax lenis, Cateſ. Car. 1. tab. 51.) "Leaves heart-ſhaped, acute, angular." *Stems* ſlender, running up walls, and twining about poſts and trees. *Leaves* reſembling thoſe of common ivy. *Berries* about the ſize of ſmall peas, growing in cluſters, red. Linnæus never ſaw the fructification complete. 4. C. *fruticoſa*, Linn. jun. Supp. 432. Mart. 3. Thunb. "Stem erect, ſhrubby; leaves egg-ſhaped, petioled, entire." A native of the Cape of Good Hope. 5. C. *ovata*, Poir. 2. "Leaves egg-ſhaped, obtuſe, almoſt entirely ſmooth; racemes ſlender, elongated, pubeſcent." *Stems* woody, cylindrical, ſlightly ſtriated. *Branches* numerous, alternate, climbing, a little villous. *Leaves* about two inches long, from twelve to fifteen lines broad, alternate, petioled, mucronate, entire, firm, finely veined, green, ſmooth, and a little ſhining above, with a few ſhort hairs along the nerves underneath; petioles about an inch long, ſlender, cylindrical, villous towards their upper extremity. *Flowers* ſmall; racemes ſimple, lateral, ſolitary or in pairs, ſituated a little above the axils of the leaves; bractes villous, very narrow, almoſt awl-ſhaped, very ſhort, alternate. *Fruit* a dry berry or drupe, kidney-ſhaped, orbicular, ſmooth, ſlightly compreſſed at the ſides, about the ſize of a lentil. A native of the Eaſt Indies; obſerved by Sonnerat, who ſent ſpecimens to La Marck. 6. C. *laurifolia*, Lam. 3. "Leaves coriaceous, ovate-oblong, quite ſmooth; fruit very large." *Stems* ſarmentous, ſhrubby, ſmooth, ſtriated, yellowiſh. *Branches* pendulous. *Leaves* alternate, petioled, quite entire at their edges, with a ſtrong longitudinal nerve underneath, narrowed, and obtuſe at their ſummit, rounded at the baſe; petiole ſhort, thick. *Flowers* of the female in ſhort, axillary racemes. *Fruit* oval, much wrinkled, pulpy, dark brown when ripe. A native of America. Specimen ſent to La Marck from the iſland of St. Thomas by Richards. 7. C. *capenſis*, Poir. 4. (C. apenſis, Linn. jun.?) "Leaves ovate-acute, ſlightly obtuſe, ſmooth; petioles much ſhorter than the leaf." *Stems* woody, greyiſh. *Branches* ſlender, climbing. *Leaves* alternate, petioled, elongated into a weak point, mucronate, entire, green, reticulated, thickiſh; petioles from two to four lines long. *Flowers* panicled, about the ſize of a pin's head, nearly ſpherical, clothed with a cottony down; panicles ſmall, axillary, tomentous, whitiſh, much branched, a little longer than the petioles. A native of the Cape of Good Hope. Specimen ſent to La Marck by Bergius. 8. C. *humilis*, Poir. 5. "Leaves ſomewhat heart-ſhaped; the younger ones ſemi-orbicular; axils woolly; ſtem low, ſhrubby." *Stems* not more than from eight to ten inches high, ſlender, cylindrical, ſtriated, branched. *Leaves* alternate, petioled, obtuſe, mucronate, ſmooth; petiole ſlender, ſcarcely half the length of the leaves. *Flowers* whitiſh, in ſmall, tomentous, faſcicles. A native of the Cape of Good Hope; obſerved by Sonnerat, who ſent ſpecimens to La Marck.

Poiret obſerves, that though the ſpecies of Ciſſampelos are eaſily diſtinguiſhed from thoſe of meniſpermum by the fructification, yet as both genera reſemble each other in habit, and as the flowers of each are ſo ſmall that they cannot be eaſily diſſected in a dried ſpecimen, it is poſſible that ſome ſpecies of Meniſpermum may have been referred to Ciſſampelos, and *vice verſâ*.

CISSE, in *Ancient Geography*, a town of Africa, in Mauritania Cæſarienſis, according to Ptolemy. The Itinerary of Antonine calls it *Ciſi*, and makes it a Municipium; about 12 miles from Ruſucurrium. It was epiſcopal.

CISSENE, a mountain of Thrace.

CISSIA, a country of Aſia, whoſe capital was Suſa, marked by Philoſtratus at one journey from Babylon. Suſiana formed a part of Ciſſia, and it is now called Choſiſtan, or Khoſiſtan, which ſee. The inhabitants were called Ciſſii.

CISSII *Montes*, mountains of Aſiatic Sarmatia, where was the ſource of the river Imitys.

CISSINE, a town of Thrace, in the vicinity of the mountain *Ciſſene*.

CISSINUS, a town of Aſia in Perſia, mentioned by Æſchylus, and placed by Ortelius in the country called *Ciſſia*.

CISSITES, in *Natural Hiſtory*, a name given by the ancients to that ſpecies of the flinty *ætites*, or eagle-ſtone, which is covered with the common white coat of the flints. Pliny mentions it as found principally about Captos, and being externally of a white colour, and rattling when ſhaken.

CISSOID, in *Geometry*, a curve of the ſecond order, firſt invented by Diocles; whence it is peculiarly called the ciſſoid of Diocles.

The geneſis of the ciſſoid may be thus conceived: to the diameter A B (*Plate Analyſis*, *fig.* 1.) of the ſemicircle A O B, draw an indefinite line, at right angles, B C: then, draw the right line A H, and make A M = I H, or H M = A I; and in the other quadrant, L C = A N, or C N = A L. Thus will the points M and L be in a curve line, A M O L; which is the ciſſoid of Diocles.

If the circle were completed, with the ſame conſtruction in the other ſemicircle, we ſhould have another part of the curve A *m o l*. Sir Iſaac Newton refers this curve to the claſs of defective hyperbolas, being the 42d ſpecies in his "Enumeratio Linearum tertii Ordinis." And in his appendix "De Equationum Conſtructione Lineari," at the cloſe of his "Arithmetica Univerſalis," he gives another elegant method of deſcribing this curve, by the continual motion of a ſquare ruler.

Properties of the CISSOID.—From the geneſis it follows:

1. That the curve has two infinite legs, A M O L, A *m o l*, meeting in a cuſp A, and tending continually towards the indefinite line C B D, which is their common aſymptote.

2. That drawing the right lines P M and K I, perpendicular to A B; we ſhall have A P : K B :: A M : I H. But A M = I H; conſequently, A P = K B. And therefore A K = P B; and P N = I K.

3. After the ſame manner, it appears that the ciſſoid A M O biſects the ſemicircle A O B.

4. Again, A K : K I :: K I : K B from the nature of the circle. That is, A K : P N :: P N : A P. And again, A K : P N (K I) :: A P : P M, by the property of ſimilar triangles A K I, A P M; therefore, P N : A P :: A P : P M. Conſequently, A K, P N, A P, and P M, are four lines in continual proportion. And if P N = v, A P = x, P M = y; $x^2 = vy$. And after the ſame manner it may be ſhewn, that A P, P N, A K, and K L, are in continual proportion. Or, if the diameter A B be = a, the abſciſs A P = x, and P M the ordinate = y, as before;

fore; we ſhall have x (A P) : $a - x$ (P B) :: $y^2 : x^2$, or $x^3 = \overline{a - x} \times y^2$; which is the equation of the curve.

5. Hence, in the ciſſoid, the cube of the abſciſs A P is equal to a ſolid ariſing from the ſquare of the ſemiordinate P M, multiplied into the complement of the diameter of the generating circle P B. Conſequently, when the point P falls on B, then $x = a$, and B C $= y$; and $y^2 = \frac{a^3}{0}$. Wherefore, $0 : 1 :: a^3 : y^2$; that is the value of y becomes infinite; and, therefore, the ciſſoid A M O L, though it continually approach B C, will never meet it.

6. Whence it appears, that B C is an aſymptote of the ciſſoid.

7. The whole infinitely long ciſſoidal ſpace, contained betweeen the infinite aſymptote B C D, and the curves L O A *o l*, &c. of the ciſſoid, is equal to triple the generating circle A O B *o* A.

The ancients made uſe both of the conchoid and ciſſoid, for the finding of two mean continual proportionals between two given right lines.

Sir Iſaac Newton, in his laſt letter to M. Leibnitz, has ſhewn how to find a right line equal to one of the legs of this curve, by means of the hyperbola; but the inveſtigation which he there ſuppreſſed, may be found in his Fluxions. See more on this curve in Wallis's Works, vol. i. p. 545.

For the quadrature, ſubnormal, and ſubtangent of the ciſſoid, ſee QUADRATURE, SUBTANGENT, &c.

CISSOID *angle.* See ANGLE.

CISSUS, in *Botany*, Dioſc. from Κισσος, ivy. Linn. Gen. 147. Schreb. 192. Juſſ. 267. Vent. 3. p. 168. Lam. Ill. 228. Achit. Lam. Encyc. Claſs and order, *tetrandria monogynia.* Nat. Ord. *Hederaceæ*, Linn. *Vites*, Juſſ.

Gen. Ch. *Cal.* Perianth one-leafed, ſhort, almoſt entire, or obſcurely four-toothed. *Cor.* Petals four, ovate-oblong, ſomewhat concave, a little ſpreading; nectary, a rim ſurrounding the germ. *Stam.* Filaments four, the length of the corolla, inſerted into the nectary; anthers roundiſh. *Piſt.* Germ ſuperior, roundiſh, retuſe; ſtyle the length of the ſtamens; ſtigma ſimple, acute. *Peric.* Berry round or didymous, retuſe, ſhining, ſurrounded at the baſe by the calyx. *Seeds*, one or two (rarely three or four), boney, roundiſh, ſomewhat angular.

Eſſ. Ch. Calyx nearly entire. Petals four. Berry one or two-ſeeded, ſurrounded at the baſe by the calyx.

* *Leaves ſimple.*

1. C. *vitiginea*, Linn. 1. Mart. 1. Lam. Encyc. 1. Ill. 1612. Willd. 1. (Arbuſcula baccifera; Pluk. Mart. 27. tab. 337. fig. 2.) "Leaves heart-ſhaped, with about five lobes, tomentous," Linn. "Leaves heart-ſhaped, repand-toothed, villous underneath," Lam. A ſhrub, with the habit of a vine. *Stem* ſarmentous. *Branches* thinly covered with a ſhort down. *Leaves* two inches long, alternate, petioled. *Flowers* in compound umbels, one oppoſite to each leaf, longer than the petioles, very ſmall, numerous, cottony on the outſide; peduncles of the univerſal and partial umbels, unequal in length. *Berries* bluiſh, pear-ſhaped, about the ſize of a pea. A native of the Eaſt Indies, introduced into England about 1772. 2. C. *tomentoſa*, Lam. Ill. 1613. (C. capenſis, Willd. 2. Vitis capenſis, Thunb. 2.) "Leaves generally pentagonal, obtuſely-toothed, clothed underneath with a ferruginous down." *Root* perennial. *Leaves* ſomewhat truncated at the baſe. A native of the Iſle of Bourbon. 3. C. *angulata*, Lam. Ill. 1614. "Leaves generally pentagonal, angularly lobed, cornulate, tomentous underneath." A native of the Eaſt Indies. 4. C. *rotundifolia*, Mart. 5. Lam. Ill. 1615. (Sælanthus rotundifolius, Forſk. Ægypt. tab. 4.) "Leaves cordate-roundiſh, toothed, ſmooth." *Flowers* numerous, in oppoſite racemed umbels, about four on each common peduncle and ſimple; peduncles nearly the length of the leaves. A native of Arabia. 5. C. *cordifolia*, Linn. Sp. Pl. 2. Mart. 4. Lam. Encyc. 2. Ill. 1616. Willd. 5. Burm. Amer. tab. 259. fig. 3. (Vitis, Plum. gen. 18. Icon. 269. fig. 3.) "Leaves heart-ſhaped, quite entire," Linn. *Root* perennial. *Stems* ſarmentous, woody, clothed with a ſhort down, eſpecially the younger branches. *Leaves* terminated by a ſhort point, almoſt entire, ſlightly angular, ſmooth above, a little cottony underneath, particularly on the nerves. *Flowers* in compound corymbs, oppoſite to the leaves. *Berries* bluiſh, ſmall, almoſt pear-ſhaped, with a point at the ſummit, one-ſeeded. A native of South America. 6. C. *ſicyoides*, Linn. Sp. Pl. 3. Mart. 6. Lam. Ill. 1617. Pl. 84. fig. 1. Willd. 7. (C. latifolia β Lam. Encyc. 3. Vitis, Plum. Ic. 259. fig. 2. Bryonia; Sloan. Jam. 106. hiſt. tab. 144. fig. 1.) "Leaves egg-ſhaped, naked, ſetaceous-ſerrated," Linn. "Leaves heart-ſhaped, ſerrated, ſmooth and even on both ſides, edged with mucronate teeth," Lam. *Root* perennial. *Stem* ſomewhat woody, herbaceous at the top, climbing, branched, marked with red ſpots. *Leaves* petioled, alternate, nerved, ſomewhat ſucculent. *Flowers* yellow; petals broader at the baſe, egg-ſhaped, reflexed, deciduous; anthers orange. *Berry* oblong, black. A native of Jamaica, cultivated by Miller before 1768. The berries are ſometimes eaten by the negroes and natives. 7. C. *latifolia*, Lam. Encyc. 3. Ill. 1618. Willd. 4. (Funis crepitans major; Rumph. Amb. 5. tab. 164. fig. 1. Schunambu Valli; Rheed. Mal. 7. tab. 11.) "Leaves cordate-ovate, villous, acuminate, ſetaceous-ſerrated; branches tetragonal." *Stems* woody, knotty, ſarmentous, climbing up the neighbouring trees. *Leaves* large, at leaſt five inches broad, ſometimes a little three-lobed; petioles near three inches long; tendrils large, oppoſite to the leaves. *Flowers*, according to Rheede, ſmall, whitiſh; ſtamens none; ſtyle one. Hence La Marck conjectures this ſpecies to be monoicous. *Berries* black, ſmooth and ſhining, ſucculent. A native of woods in the Eaſt Indies and iſland of Madagaſcar. 8. C. *repanaa*, Willd. 3. Vahl. Symb. 3. p. 18. "Leaves heart-ſhaped, entire, ſometimes a little lobed, repand, ſmooth on both ſides." *Root* perennial. *Stem* cylindrical, zig-zag, jointed, tomentous when young, afterwards ſmooth. *Leaves* petioled, ſometimes terminated with a ſhort obtuſe point; ſtipules egg-ſhaped, membranous, acute, oppoſite, deciduous. *Flowers* in a dichotomouſly branched umbel of three rays, oppoſite to the leaves. *Berries* pear-ſhaped, the ſize of a pea, mucronate with the permanent ſtyle. A native of the Eaſt Indies. 9. C. *ovata*, Lam. Illuſt. 1619. Brown. tab. 4. fig. 1, 2. "Leaves egg-ſhaped, acuminate, ſparingly toothed, ſmooth and even on both ſides." A native of Guadaloupe. 10. C. *caneſcens*, Lam. Ill. 1620. "*Leaves* ovate-oblong, oblique, finely toothed, ſomewhat tomentous, grayiſh." Reſembling the preceding in the form of its leaves. A native of Peru, obſerved by Dombey. 11. C. *umbellata*, Mart. 15. Lour. Cochin. 84. "Leaves egg-ſhaped, quite entire; flowers in umbels." *Stem* ſhrubby, twining, long, branched. *Leaves* oppoſite, ſmooth. *Flowers* white, in compound terminal umbels; corolla bell-ſhaped, woolly within; calyx truncated. A native of China about Canton. 12. C. *quadrangularis*, Linn. Mant. 39. Mart. 7. Lam. Encyc 4. Ill. 1621. Willd. 8. (Funis quadrangularis, Rump. Amb. 5. tab. 44. fig. 2. Planta baccifera ſcandens, Pluk. Phyt. 310. fig. 6. Sælanthus quadrangularis, Forſk. Deſc. 33. Icon. tab. 2.) "Leaves toothed,

fleſhy, ſerrate-toothed; ſtem tetragonous, ſomewhat ſwelling." Linn. "Leaves ſomewhat deltoid, ſerrate-toothed, naked; ſtem tetragonous, jointed, fleſhy." Lam. *Root* perennial, tuberous. *Stem* very long, climbing, thickened, contracted, ſmooth and even, perennial. *Leaves* alternate, petioled, ſmooth on both ſides, acutely and remotely ſerrated; petioles cylindrical; tendrils oppoſite to the leaves. A native of Arabia and the Eaſt Indies; found alſo by Loureiro near Moſambique in Africa. The inhabitants of Bengal, and of the coaſt of Coromandel, eat the branches ſtripped of their bark, and boiled or macerated in water.

* *Leaves compound.*

13. C. *acida*, Linn. Sp. Pl. 4. Mart. 8. Lam. Encyc. 5. Ill. 1622. Willd. 9. (Scyos trifoliata, Linn. Sp. Pl. ed. 1. Irſiola, Brown. Jam. 147. Bryonia, Sloan. Jam. 106. hiſt. 1. tab. 142. fig. 6. Bryonioides, Pluk. Alm. 71. tab. 152. fig. 2. Vitis, Plum. Sp. 18. tab. 259. fig. 5.) "Leaves ternate, inverſely egg-ſhaped, ſmooth, fleſhy." Linn. *Stem* from three to five feet high, woody, and much branched, climbing; branches ſlender; tendrils ſimple. *Leaves* petioled, of a fine green colour, ſmall; leaflets oval-wedge-ſhaped. *Flowers* in umbels, ſmall, herbaceous, Lam. A native of Jamaica, in woods near the coaſt. The whole of the plant is acid. 14. C. *trifoliata*, Linn. Sp. Pl. 5. Mart. 9. Willd. 11. (C. alata, Lam. Enc. 5. Ill. 1623. Jacq. Amer. tab. 182. fig. 10. Irſiola triphylla ſcandens, Brown. Jam. 147. Bryonia, Sloan. Jam. 106. hiſt. 1. tab. 144. fig. 2.) "Leaves ternate, ſerrated; branches membranous-angular." *Stem* ſomewhat ſhrubby, climbing, with five or ſix angles, rooting, branched, green; angles ſlightly winged. *Branches* herbaceous, lax. *Leaves* on long pentangular petioles; leaflets on ſhort peduncles, egg-ſhaped, acute; the lateral ones oblique, ſerrated, nerved, ſmooth on both ſides (tomentous underneath, Lam.) ſtipules at the baſe of the petioles roundiſh. *Flowers* in four-cleft umbels, blood red, ſmall. *Berry* roundiſh, black, one-ſeeded. A native of Jamaica, where it climbs high above the branches of the trees upon the mountains. C. 15. C. *obtuſifolia*, Lam. Encyc. 7. Ill. 1625. "Leaves ternate; leaflets inverſely egg-ſhaped, obtuſe, toothed, pubeſcent." Nearly allied to the preceding, and perhaps only a variety. A native of the Eaſt Indies, obſerved by Sonnerat. 16. C. *cinerea*, Lam. Ill. 1624. "Leaves ternate; leaflets pubeſcent, toothed, lateral ones ſomewhat heart-ſhaped; petioles cylindrical. Perfectly diſtinct from the preceding. A native of the Eaſt Indies. Sonnerat. 17. C. *cirrhoſa*, Willd. 10. (Vitis cirrhoſa, Thunb.) "Leaves ternate, villous; leaflets egg-ſhaped, ſerrated." A native of the Cape of Good Hope. 18. C. *carnoſa*, Lam. Encyc. 11. Ill. 1626. Willd. 14. (Tſjori-valli, Rheed. Mal. 7. tab. 9.) "Leaves ternate, egg-ſhaped, obtuſe, ſerrated, ſmooth; branches and petioles cylindrical." Vahl. "Leaves ternate; leaflets ovate-acute, ſerrated, naked; root thick." Lam. Whole plant ſmooth. *Branches* ſtriated, cylindrical. *Leaves* petioled; leaflets petioled, fleſhy; lateral ones ſmaller, an inch long; common petiole the length of the leaves. *Flowers* ſmall, reddiſh brown, umbelled; univerſal umbel with three rays; partial one with dichotomous divaricating branches; general peduncle longer than the leaf. *Berries* blackiſh, a little flattened above, with three or four ſeeds. A native of the Eaſt Indies. 18. C. *microcarpa*, Willd. 12. (Vitis, Plum. Ic. tab. 259. fig. 4.) "Leaves ternate, oblong, ſerrated, ſmooth, membranous." *Branches* angular, but winged with a decurrent membrane as in C. trifoliata. A native of the Weſt Indies. 19. C. *crenata*, Mart. 10. Willd. 13. (Vitis trifolia, Linn. Sp. Pl. Folium cauſſonis, Rumph. Amb. 5. tab. 166. fig. 2.) "Leaves ternate; leaflets roundiſh, crenate." *Branches*, petioles, younger leaves and peduncles villous. *Tendrils* oppoſite to the leaves, compound. *Leaves* petioled; leaflets petioled, an inch long; lateral ones ſmaller and narrower on one ſide; the crenatures remote and mucronate; ſtipules ſmall, oblong, obtuſe. *Flowers* in dichotomous cymes; peduncles longer than the leaf and oppoſite to it; calyx minute; petals arched; filaments ſhorter than the corolla. A native of the Eaſt Indies. 20 C. *obovata*, Mart. 12. Willd. 15. Vahl. Symb. 3. p. 19. "Leaves ternate; leaflets inverſely egg-ſhaped, quite entire, ſmooth." *Stem* climbing, ſmooth. *Tendrils* oppoſite to the leaves, and of the ſame length, bifid. *Leaves* petioled, alternate; leaflets mucronate, membranous; lateral ones ſmaller and ſeſſile; middle one petioled, three times the ſize of the others. *Peduncles* axillary, ſolitary, longer than the leaves, ſmooth, trichotomous; branchlets three-flowered, flowers pedicelled. Vahl. A native of the iſland of St. Crux and other parts of the Weſt Indies. 21. C. *digitata*, Lam. Ill. 1627. (Sælanthus digitatus, Forſk. Ægyp. tab. 3.) "Leaves fingered, egg ſhaped, ſerrated; lower ones with five leaflets, upper ones with three." A native of Arabia. 22. C. *pentaphylla*, Willd. 17. (Vitis pentaphylla, Thunb. Jap. 105.) "Leaves quinate; leaflets undivided, ſerrated." *Stem* herbaceous, filiform, climbing, furrowed, ſmooth. *Leaves* alternate, petioled; leaflets egg-ſhaped, attenuated at the baſe, acuminate, thin, ſmooth; lateral ones leſs, about an inch long. *Flowers* very ſmall, remote, in axillary racemes longer than the leaf; petioles two inches long. Thunb. A native of Japan. 23. C. *heptaphylla*, Mart. 14. Retz. Obſ. 5. tab. 52. "Leaves with ſeven leaflets, ſerrated; hiſpid." A ſarmentous, climbing ſhrub. *Branches* pubeſcent. *Tendrils* oppoſite to the leaves, bifid. *Leaves* alternate, petioled; leaflets ovate-lanceolate, acuminate. *Flowers* ſmall, panicled; panicles faſtigiate, brachiate, peduncled, oppoſite to the leaves. Sent by Koenig from Calcutta. 24. C. *pedata*, Mart. 13. Lam. Enc. 10. Ill. 1628. Willd. 18. (Belutta-tsjori-villi, Reed. Mal. 7. tab. 10.) "Leaves pedate, with nine leaflets; leaflets ovate-lanceolate, ſomewhat toothed, pubeſcent underneath." *Stems* cylindrical, villous. *Tendrils* oppoſite to the leaves, bifid. *Leaves* alternate, on petioles three inches long; leaflets from five to nine; leaflets petioled, green above, pubeſcent underneath, cottony on the nerves and petioles. *Flowers* in axillary dichotomous cymes, ſmall, pubeſcent on the outſide. *Berries* whitiſh, round, a little flattened at the top, ending in a ſmall point. *Seeds* from one to four. A native of the Eaſt Indies. 25. C. *japonica*, Willd. 16. (Vitis japonica, Thunb. Jap. 104.) "Leaves pinnate, ſomewhat pedate, ſmooth; leaflets crenate, crenatures awned." A native of Japan. 26. C. *orientalis*, Lam. Ill. 1629. Pl. 84. fig. 2. "Leaves ſomewhat bipinnate; leaflets egg-ſhaped, ſerrated; ſtem rather ſhrubby." The habit of vitis arborea, but larger, the leaves leſs compound, and the leaflets larger. A native of the Eaſt. 27. C. *connivens*, Lam. Ill. 1630. "Leaves ſomewhat bipinnate; leaflets egg-ſhaped, rather obtuſe, ſomewhat toothed; petals connivent." Allied to the preceding, but diſtinct. Obſerved by Commerſon in the iſland of Madagaſcar. 28. C. *mappia*, Lam. Ill. 1631. "Leaves ſomewhat bipinnate, ſmooth and even; leaflets egg-ſhaped, quite entire." Obſerved by Commerſon in the Iſle of France.

Obſ. The ciſſus arborea of Forſkal is ſalvadora perſica. Dryander in Linn. Tranſ. vol. ii. p. 220.

Cissus, in *Ancient Geography*, a mountain of Macedonia. —Alſo a town of Thrace. The town and mountain are ſituated, according to Ortelius, toward the ſea, near Theſſalonica.

CISSUSA, a fountain of Greece in Bœotia, placed by Plutarch between the town of Thebes and that of Haliartes.

CISSYBIUM, in *Antiquity*, a drinking cup, moſt in uſe among country people. It was ſo called, either becauſe it was made of the wood of ivy, or was uſually crowned with its leaves.

CISTATOME, in *Surgery*, more properly written cyſtatome, from κυςις, *the bladder*, and τέμνω, *to cut*. See Cystatome.

CISTERCIANS, in *Eccleſiaſtical Hiſtory*, an order of religious reformed from the Benedictines, which formerly took its riſe from twenty one zealous monks in the monaſtery of Moleſme, in Burgundy; who, with their abbot Robert, complaining that the rule of St. Benedict was not ſtrictly enough obſerved, obtained permiſſion of Hugh archbiſhop of Lyons, and legate of the holy ſee, to ſettle in a place called Ciſteaux, in the dioceſe of Chalons, five miles from Dijon.

In this retreat, which at that time was a miſerable deſert, covered with brambles and thorns, Eudes duke of Burgundy erected for them a houſe, into which they were admitted in 1098; endowing it with a conſiderable revenue. The biſhop of Chalons gave Robert the paſtoral ſtaff, in quality of abbot, and erected the new monaſtery into an abbey. This order made a moſt rapid and aſtoniſhing progreſs; it was propagated through the greateſt part of Europe in the following century, and was not only enriched with the moſt liberal and ſplendid donations, but alſo acquired the form and privileges of a ſpiritual republic, and exerciſed a ſort of dominion over all the monaſtic orders. In about 100 years after its firſt eſtabliſhment it boaſted of 1800 abbies, and was become ſo powerful, that it governed almoſt all Europe, both in ſpirituals and temporals. Within this period after their firſt riſe, the monks of this order were diſtinguiſhed by the patronage of St. Bernard, abbot of Clairval, whence they obtained the title of "Bernardin monks;" and, in the year 1132, they were exempted from the payment of tythes, and inveſted with other privileges and immunities by Innocent II. In 1152 this order had no fewer than 500 convents, all dedicated to the Bleſſed Virgin. They came into England in the year 1128, and had their firſt houſe at Waverley in Surry. Before their diſſolution they had eighty-five houſes here.

CISTERN, is properly uſed for a ſubterraneous reſervoir of rain-water.

The word, according to ſome, comes from *cis*, and *terram*; i. e. *in terram*; others derive it from *ciſta*, a *duct*, &c.

Earthen ciſterns muſt be made with good cement, to retain the water. And the bottom ſhould be covered with ſand to ſweeten and preſerve it.

Authors mention a ciſtern at Conſtantinople, the vaults whereof are ſupported by two rows of pillars, 212 in each row; each pillar being two feet in diameter. They are planted circularly, and in radii tending to that in the centre.

Anciently there were ciſterns all over the country in Paleſtine. There were ſome likewiſe in cities and private houſes. As the cities for the moſt part were built on mountains, and the rains fell regularly in Judea at two ſeaſons of the year only, in ſpring and autumn, people were obliged to keep water in ciſterns in the country, for the uſe of their cattle; and in cities for the conveniency of the inhabitants. There are ciſterns of very large dimenſions to be ſeen at this day in Paleſtine, ſome of which are a hundred and fifty paces long, and fifty-four wide. There is one to be ſeen at Ramah of two and thirty paces in length, and eight and twenty in width. Wells and ciſterns, fountains and ſprings, are generally confounded in the ſcripture language.

If the farmers of England would fall into the method uſed in Spain, and at Amſterdam, Venice, and other places, for ſaving the rain-water for the whole year, or at leaſt ſo much of it as would be neceſſary, in ciſterns, they would have always water for their cattle in the ſummer droughts, and many thouſand acres of land, now left uſeleſs, might be turned to profit.

The beſt way of preſerving the water for the ſervice of the houſe, is in ciſterns in the cellars. Theſe may be made with brick or ſtone, joined with plaiſter of Paris, which will keep out the wet very well; or with a kind of mortar made of ſlacked ſifted lime, with linſeed oil, and tow or cotton. A bed of good ſound clay may be laid at the bottom, and on this the bricks for the floor, and then the walls may be raiſed in the ſame manner, only leaving ſpaces behind them, into which clay is to be rammed in the like manner. Thus it will be a clay ciſtern, faced with brick; and the bricks will keep the clay moiſt, and prevent it from cracking, though it be not full of water. This will do in any ſhadowy place, as well as in cellars; and thus may a ciſtern be made in a garden, in ſome ſhadowy place, and covered over, which may receive the water running from the walks, and will retain it at hand, for the ſervice of the garden, all the year.

Where there is want of water for the cattle in the fields, the way is to dig a pond in ſome place into which there is a deſcent; then cover the bottom and ſides with a double coat of tough clay, each ſix inches thick, and each very well rammed; then to cover the bottom with large ſtones, which will keep the clay moiſt, and prevent its cracking, when not covered with water. But this is a troubleſome thing; for if there happen to be a crack in any part, it is often found neceſſary to go over the whole work again, before the pond will hold a drop of water.

Another method of making a pond hold water, is to daub it over with clay and mortar mixed together, and then with mortar alone. This has an advantage over the other way, becauſe if any crack happen, it may be mended by a cement of clean hair and tallow, mixed with ſlacked lime and the yolks of eggs, well beat together. This applied to the crack, will cloſe it ſafely, without neceſſity of undoing the whole work, as in the other caſe.

In chalky countries it is common to find a low place on the downs, and, digging a hole by way of a pit there, they cover the bottom evenly with the chalk rubbiſh, and when it is wetted by the rain, they ram it well, and afterwards drive cattle into it, and fold ſheep in it; the conſequence of all ſuch trampling is, that the bottom at length becomes ſo firm, that it holds the water perfectly well. By one or other of theſe means, ciſterns or reſervoirs may be made in every part of the country; and our farmers, if they would carefully try one or the other of them, as their land moſt required, would not have ſo much to complain of from droughts.

Ciſterns are often of the greateſt advantage in a place of war, by holding large quantities of rain-water for the uſe of the garriſon and inhabitants, when their wells or fountains fail through the drought, or the courſes of their ordinary ſupplies of water are diverted by an enemy.

Cistern-*lock*, the ſame with chamber or pound-lock, a modern contrivance for raiſing or letting down boats from one canal to another, on a different level. See Canal and Lock.

CISTERNA, in *Geography*, a town of Piedmont; 12 miles E.S.E. of Turin.

CISTERNA *Nuova*, a town of Naples, in the province of Capitanata; 4 miles S. E. of Monte Angelo.

CISTERNINO, a town of Naples, in the province of Bari; 16 miles S.S.E. of Monopoli.

CISTHENA, in *Ancient Geography*, a town of Aſia ſituated in the Adramyttian gulf, in Myſia, according to Pliny. Strabo ſpeaks of it as a town that had been abandoned though it had a port, and he places it out of the gulf on the promontory of Pyrrha. Mela, as well as Pliny, places it in the gulf.

CISTHENE, a ſmall iſland of Aſia Minor, with a town of the ſame name, ſituated on the coaſt of Lycia, according to Strabo and Iſocrates.

CIST-*Hepatic*. See CYST-*Hepatic*.

CISTI, in *Botany*, (Ciſtoidæ; Vent.) one of the natural orders of Juſſieu, with the following characters: *Calyx* five-parted. *Petals* five. *Stamens* numerous. *Germ* ſimple. *Style* one. *Stigma* one. *Capſule* many-ſeeded, either one-celled and three valved, or many-celled and many-valved; valves bearing the ſeeds in the middle; receptacle either ſeptiform ſeparating the cells, or linear and not prominent. *Seeds* numerous, ſmall. *Stem* ſhrubby, or ſomewhat ſhrubby, or herbaceous. *Leaves* generally oppoſite, with or without ſtipules. *Flowers*, in ſpikes or umbellar corymbs. *Periſperm* fleſhy. *Embryo* ſpiral, or elſe the radicle ſimply curved upon the lobes. He includes under it the following genera; *Ciſtus*, *Helianthemum*, both belonging to the ciſtus of Linnæus, *Viola*, *Pirequeta*, *Piparea*, and *Tachibota*, but obſerves that the laſt four are only allied to the ciſti, differing from them in having a determinate number of ſtamens.

Ventenat has alſo the firſt three ſpecies, omitting, as uſual, the genera taken up by Juſſieu, with their barbarous names, and not very decided generic characters; but obſerves that they and Viola will probably form a new natural order, intermediate between the ciſti and rutaceæ, differing from the former, and approaching ſome ſpecies of the latter in the determined number of their ſtamens, their ſometimes three-celled fruit, and their incurved embryo.

CISTIS. See CYSTIS, and HYPO-CISTIS.

CISTOCELE. See CYSTOCELE.

CISTOIDES, in *Botany*. See MATERNIA.

CISTOPHORA, ancient ſilver coins, concerning the origin and date of which antiquarians have been much divided in opinion. M. Leblond, in a late "Hiſtory of Epheſus," has aſſigned theſe circumſtances with a great degree of probability. Among theſe coins which were ſtruck in ſix towns of Aſia, thoſe of Epheſus are diſtinguiſhed by numeral letters on the face, which are dates of years; theſe were ſtruck upon the arrival of every new Roman proconſul in Aſia; and this was a right peculiar to the Epheſians, on which they highly valued themſelves.

CISTOTOMY. See CYSTOTOMY.

CISTIC. See CYSTIC.

CISTRUM. See SISTRUM.

CISTULA CATOPTRIC. See CATOPTRIC.

CISTUS, in *Botany*, (Κιστος, Gr.; derivation uncertain), Linn. Gen. 673. Schreb. 913. Gært. 483. Juſſieu, 294. Tourn. cl. 6. ſ. 4. gen. 10. Helianthemum, Tourn. Juſſ. 294. Gært. 484. Vent. vol. iii. p. 220. Claſs and order, *polyandria monogynia*. Nat. ord. *Rutaceæ*, Linn. *Ciſti*, Juſſ.

Gen. Ch. *Cal.* either three or five-leaved; leaves roundiſh, concave. *Cor.* Petals five, roundiſh, flat, ſpreading. *Stam.* Filaments numerous, capillary, ſhorter than the corolla; anthers roundiſh, ſmall. *Piſt.* Germ ſuperior, roundiſh; ſtyle ſimple, the length of the ſtamens; ſtigma flat, orbiculate. *Peric.* Capſule roundiſh, ſurrounded by the calyx; three, five or ten-valved; one, three, five, or ten-celled. *Seeds* ſmall, numerous.

Eſſ. Ch. Calyx three or five-leaved; leaves unequal. Capſule ſuperior, angular, many-ſeeded.

Obſ. The ciſtus and helianthemum of Tournefort, Juſſieu, Ventenat, and Gærtner, certainly form one natural genus, as Linnæus has made them; but they may advantageouſly be ſeparated in two grand diviſions, as La Marck has diſtributed them. The ciſtus of Tournefort, &c. has a many-celled capſule, with as many valves as there are cells, and ſeeds affixed to the axis, and a ſpiral embryo. Theſe are either ſhrubs or underſhrubs; the leaves oppoſite and without ſtipules; flowers in umbels, with very unequal calyx-leaves, either purple or white, commonly large and ſpecious. Helianthemum has a one-celled, three-valved capſule, with ſeeds fixed to the valves, and a curved embryo. They are ſhrubs, underſhrubs, or herbaceous, their leaves oppoſite or rarely alternate, either with or without ſtipules; their flowers in terminal ſpikes or racemes, moſt frequently yellow, ſmaller than thoſe of Tournefort's ciſtus, but very deciduous in both.

* *Ciſti*, Tournefort.
Without ſtipules.
Capſule five or ten celled, with the ſame number of valves.

1. C. *capenſis*, Linn. Sp. Pl. 1. Mart. 1. Willd. 1. Vahl. Sym. 3. p. 68. "Arboreſcent; leaves ovate-lanceolate, petioled, three-nerved, finely toothed, naked on both ſides." *Branches* cylindrical, with a few ſcattered hairs, purpliſh. *Leaves* three inches long, remote, ciliated with long hairs; upper ones ſeſſile, not connate at the baſe; lower ones attenuated at the baſe into a very ſhort petiole, acute, with about three nerves, which become evaneſcent towards the middle of the leaf. *Flowers* yellow; peduncles terminal, trifid; partial ones three-flowered; calyx-leaves heart-ſhaped, acuminate, hairy, finely toothed, ciliated, very hairy when young. Vahl. A native of the Cape of Good Hope. La Marck has not taken up this ſpecies, and Ventenat doubts whether its exiſtence has been ſufficiently aſcertained; but Vahl's deſcription here given will, we preſume, eſtabliſh its right to "a local habitation and a name." It is diſtinguiſhed by its leaves being finely toothed. 2. C. *villoſus*, Mart. 2. Lam. 1. Willd. 2. (C. piloſus, Linn. Sp. Pl. 2. C. mas folio rotundo hirſutiſſimo, Bauh. Pin. 464. Tourn. 259.) "Arboreſcent; leaves egg-ſhaped, petioled, hairy." Linn. *Stem* woody, much branched, forming a large, buſhy head, three or four feet high. *Branches* cylindrical; the ſmaller ones villous, a little cottony and whitiſh. *Leaves* ſlightly wrinkled, of a cinereous green colour above and underneath, narrowed into a petiole towards their baſe. *Flowers* of a fine red colour, near an inch and half in diameter; peduncles an inch long or more, one-flowered. A native of Spain and Italy. 3. C. *creticus*, Linn. 9. Mart. 9. Lam. 2. Willd. 13. (C. ledon cretenſe, Bauh. Pin. 467, but not all the ſynonyms. C. ladanifera cretica, Tourn. Cor. 19.) "Arboreſcent; leaves ſpatulate-ovate, petioled, nerveleſs, ſcabrous; calyx-leaves lanceolate." Linn. "Shrubby; leaves ſpatulate-ovate, petioled, wrinkled, hairy, undulated at the edges; peduncles ſhort, one-flowered; calyx-leaves mucronate, villous." Lam. *Root* hard, woody, white within, reddiſh without, with long hairy fibres. *Stems* commonly ſeveral, a foot and half high or more, ſometimes an inch thick, brown or greyiſh, cracked. *Branches* reddiſh-brown; young ſhoots villous, whitiſh-green. *Leaves* deep green, oppoſite, thickiſh, narrowed into a petiole at their baſe, an inch or more long, eight or nine lines long; petioles three or four lines long, very villous. *Flowers* roſe-

purple, with a yellow claw, terminal, on ſhort peduncles; calyx five-leaved; petals five, roundiſh, thin, rumpled. *Capſule* egg ſhaped, obtuſe, about five lines long, hard, brown, ſurrounded with the leaves of the calyx, five-celled. *Seeds* red, angular. A native of the Levant; fouud by Tournefort in the iſle of Candy or Crete. It is from this ſhrub that the officinal drug, ladanum, or, as it is ſometimes ſpelt, labdanum, is obtained; a reſinous ſubſtance ſecreted from the leaves and branches of the plant. Three ſorts have been deſcribed by authors, but only two are now to be met with in the ſhops. The beſt and rareſt is in dark coloured maſſes, of the conſiſtence of a ſoft plaſter, and growing ſtill ſofter on being handled. The other is in long rolls, coiled up, much harder than the preceding and leſs dark. The ſoft kind has an agreeable ſmell and a lightly pungent bitteriſh taſte; the hard is much weaker, owing to its having a larger admixture of fine ſand, which in that examined by the French Academy amounted to three-fourths of the maſs. But independently of deſigned adulterations, it can ſcarcely be collected pure; the duſt blown from the looſe ſands among which it grows, being retained by the tenacious juice. It was formerly employed internally as a pectoral and aſtringent in catarrhal affections, dyſenteries, and ſeveral other diſeaſes. In England it is now wholly confined to external uſe. It is an ingredient in the ſtomachic plaſter, or emplaſtrum ladani, of the London Pharm. It is alſo uſed in the way of fumigation, on account of its pleaſant ſmell. Woodvil. Med. Bot. vol. ii. p. 249. Tournefort ſaw ſeven or eight country fellows in their ſhirts and drawers, and in the hotteſt part of the day, drawing over the plant a kind of whip compoſed of numerous long leathern thongs, and collecting the reſin, which is afterwards ſcraped clean off with a knife, and made up into cakes of different ſizes for ſale. In the time of Dioſcorides it was carefully detached from the beards aud thighs of goats who had brouſed upon the ſhrub. 4. C. *purpureus*, Lam. 3. "Shrubby; leaves lanceolate, acute at both ends, wrinkled; peduncles ſhort, one-flowered." A ſhrub four feet high or more. *Branches* numerous, a little villous, ſtraight, and rather upright. *Leaves* two inches long or more, about half an inch broad, a little undulated at the edges. *Flowers* red, large, terminal; petals with a browniſh-purple ſpot at their baſe; calyx-leaves five, egg-ſhaped, mucronate, a little villous. Cultivated at Paris by Cels, and ſuppoſed to have been brought from the Levant. 5. C. *parviflorus*, Lam. Enc. 4. Willd 14. (C. mas creticus, breviori folio, parvo flore, Tourn. Cor. 19.) "Shrubby; leaves petioled, egg-ſhaped, acute, tomentous, peduncles villous, generally one-flowered." *Root* an inch thick, hard, divided into many long and thick fibres. *Stems* ſeveral, woody, branched. *Leaves* oppoſite, of a cinereous-green colour, reticulated underneath with nerves, and generally channelled. *Flowers* only an inch broad, roſe-coloured: petals ſomewhat heart-ſhaped, yellowiſh at the baſe; calyx-leaves five, mucronate, villous on the back. Found by Tournefort in the iſle of Candy. 6. C. *complicatus*, Lam. Enc. 5. (C. folio rotundiore, incano, quaſi complicato, Tourn. Cor. 19) "Shrubby; leaves petioled, egg-ſhaped, tomentous, almoſt donbled together; peduncles ſhort, many-flowered." A ſmall tufted ſhrub, without branches near the baſe. *Leaves* ſmall, reticulated underneath, bent, growing almoſt double, ſo as to form a deep channel. *Flowers* red; common peduncles from the forks of the upper branches ſhort, bearing three or four pedicelled flowers. *Capſules* very ſmall, egg-ſhaped, brown, not angular. A native of the Levant. 7. C. *incanus*, Linn. 7. Mart. 8. Lam. 6. Willd. 12. Bot. Mag. 43. (C. mas anguſtifolius, Bauh. Pin. 464. C. mas ſecundus, Cluſ. Hiſt. 1. p. 69. Lob. Ic. ii. p. 111. C. mas 2-folio longiore, Tourn. 259.) "Arboreſcent; leaves ſpatulate, tomentous, wrinkled; lower ones ſheathing the baſe, connate." Linn. *Stem* two feet high. *Branches* villous, whitiſh towards the ſummit. *Leaves* oppoſite, ſeſſile, oblong, a little cottony on both ſides, with three nerves at the baſe. *Flowers* purple, on ſimple peduncles; petals heart-ſhaped. A native of Spain and the ſouth of France. 8. C. *brevioriſolius*, Mart. 52. (C. mas folio breviore, Bauh. Pin. 464. C. mas 3. Clnſ. Hiſt. 69.) "Shrubby; leaves ovate-lanceolate, connate, hirſute, wrinkled; peduncles longer." *Stem* three or four feet high. *Leaves* ſhorter and greener than thoſe of C. villoſus and incanus. *Flowers* deep purple, ſmall. A native of Portugal. 9. C. *luſitanicus*, Mart. 53. (C. mas luſit. fol. ampliſſimo incano, Tourn. Inſt. 259.) "Shrnbby; leaves egg-ſhaped, obtuſe, villous, nerved, and wrinkled underneath; flowers larger." *Branches* white and hairy. *Leaves* larger and rounder than thoſe of the preceding ſpecies, even on their upper ſide, rough, and full of veins underneath. *Flowers* light purple, very large. A native of Portugal. 10. C. *hiſpanicus*, Mart. 54. "Shrubby, villous; leaves lanceolate, green, connate; flowers ſeſſile; calyxes acute." *Stem* not ſo high as in either of the three preceding ſpecies, branched near the root; branches hairy, erect, with three or four terminal flowers, ſitting cloſe, without peduncles. At each joint of the ſtem there is a ſlender branch, having three pairs of ſmall leaves, of the ſame ſhape with the others, and terminated by a ſingle flower. *Flowers* deep purple. A native of Spain. 11. C. *heterophyllus*, Willd. 11. Desfont. Fl. Atl. i. p. 411. tab. 11. "Leaves ovate-lanceolate, ſheathed at the baſe, revolute at the edges; calyxes and peduncles hirſute; peduncles generally one-flowered." *Stem* two feet high, much branched. *Younger branches* cylindrical, villous, hoary. *Leaves* oppoſite, ſmooth, and rather even on their upper ſurface, paler underneath, nerved; nerves beſet with very ſhort hairs, on ſhort connate petioles. *Flowers* roſe-coloured, large, terminal, one, two, three, or four, peduncled; peduncles with two ſmall leaves proceeding from a little knot about their middle; calyx five leaved; leaves nearly equal, two inner ones acute. *Capſule* roundiſh, villous, five-celled. The ſame plant has frequently its lower leaves roundiſh, and its upper one lanceolate, whence the trivial name. Nearly allied to C. *incanus*. A native of uncultivated hills about Algiers. 12. C. *criſpus*, Linn. Sp. Pl. 11. Mart. 11. Lam. 7. Willd. 18. (C. mas foliis chamedrys, Bauh. Pin. 464. C. mas 5. Clnſ. Hiſt. i. p. 69. C. mas foliis undulatis & criſpis, Tourn. Inſt. 259.) "Arboreſcent; leaves leanceolate, pubeſcent, three-nerved, undulated." Linn. A ſmall ſhrub. *Stems* ſeveral, a foot and a half high, branched, a litttle decumbent at the baſe. *Branches* a little cottony or woolly, with many looſe hairs. *Leaves* ſmall, ſeſſile, wrinkled, whitiſh on both ſides. *Flowers* purple, nearly ſeſſile, three or four together at the ſummit of each branch, forming a head enveloped with floral leaves; calyx-leaves lanceolate. A native of Portugal. 13. C. *albidus*, Linn. 8. Mart. 10. Lam. 8. Willd. 15. (C. mas, folio oblongo incano, Bauh. Pin. 464. Tourn. Inſt. 259. C. mas 1, Cluſ. Hiſt. i. p. 68.) "Arboreſcent; leaves ovate-lanceolate, tomentous, hoary, ſeſſile, ſlightly three-nerved." Linn. *Stem* three or four feet high. *Branches* tomentous, not hairy. *Leaves* oppoſite, flat. *Flowers* purple, or roſe-coloured, large, ſpacious; peduncles ſcarcely an inch long, terminal, cottony, one-flowered; petals not emarginate; calyxes cottony. A native of Spain and the ſouth of France. 14. C. *ſericeus*, Mart. 60. Willd. 16. Vahl. Symb. i. p. 37. (C. latifolius magro flore, Barrel. Ic. 1315.) "Arboreſcent; leaves egg-ſhaped, tomentous, three-nerved; lower ones petioled; upper ones ſeſſile; peduncles hairy." *Stem* two or three feet high. *Branches* cylindrical, denſely tomentous, hoary-white. *Leaves* very ſoft, obtuſe, flat. *Flowers* purple, with a yellow ſpot in the middle; peduncle terminal, ſolitary, erect, beſet with long purpliſh hairs; pedicels ſpreading towards the ſummit; lower ones three-flowered; upper ones one-flowered; calyx cloathed with ſoft ſilky hairs; inner leaves of the calyx three, egg-ſhaped, quite ſmooth on the inſide; outer ones lanceolate; filaments purple; anthers yellow. 15. C. *hybridus*, Mart. 61. Willd. 17. Vahl. Symb. i. p. 57. "Arboreſcent; leaves egg-ſhaped, petioled, hoary; branches ſcaly; peduncles elongated, hairy." *Stem* two or three feet high. *Branches* cylindrical, angular near the tip, hoary, covered with yellowiſh ſcales. *Leaves* half an inch long, nerved, eaſily broken. *Flowers* purple, in a terminal raceme; outer calyx leaves caducous; germ villous. A native of Spain. 16. C. *vaginatus*, Mart. 57. Willd. 5. Hort. Kew. ii. p. 232. Jacq. Hort. Schoenb. iii. p. 17. tab. 282. (C. ſymphytifolius, Lam. 9.) "Shrubby; leaves petioled, oblong-lanceolate, villous on the upper ſurface; petioles ſheathing at the baſe, connate." Lam. "Arboreſcent; leaves oblong, hairy, reticularly wrinkled underneath; petioles united at the baſe, ſheathing, furrowed." Hort. Kew. *Stem* five or ſix feet high. *Branches* rough, reddiſh, grey, villous, white and almoſt cottony near the top. *Leaves* oppoſite, four or five inches long, nearly two broad. *Flowers* reddiſh, large, terminal; ſtamens yellow. A native of Africa. 17. C. *cordifolius*, Mart. 55. "Shrubby, leaves oblong, heart-ſhaped, ſmooth, petioles longer." *Stem* four or five feet high. *Branches* woody, ſlender, with a ſmooth brown bark. *Flowers* white, terminal, on long peduncles, cultivated by Miller. 11. C. *faſciculatus*, Mart. 56. "Leaves in bundles." *Stem* about nine inches high. *Leaves* narrow and fine, growing in cluſters. *Flowers* pale ſtraw-coloured, lateral and terminal, on ſlender peduncles; petals falling off in about two hours after opening. A native of the Cape of Good Hope; ſent to Miller from Holland by Dr. Adrian Van Royen. 19. C. *ſalvifolius*. Linn. Sp. Pl. 10. Mart. 7. Lam. 10. Willd. 10. C. femina, folio ſalviæ; Bauh. Pin. 464. C. femina; Cluſ. Hiſt. i. p. 70. Jacq. Collect. 2. p. 120. tab. 8. Hall. Helv. 1031. "Arboreſcent; leaves egg-ſhaped, petioled, hairy on both ſides." Linn. "Shrubby; leaves petioled, egg-ſhaped, wrinkled, ſomewhat hairy; peduncles long, one-flowered." Linn. *Stem* from one and a half to three feet high, much branched, in ſome varieties procumbent. *Leaves* oppoſite, obtuſe, greeniſh on the upper ſurface, with abundance of very ſhort hairs, whitiſh, green, and almoſt cottony underneath. *Flowers* white, ſometimes pale yellow. *Capſules* egg-ſhaped, pentagonal, five-celled, ſurrounded by the calyx. A native of Italy, Switzerland, the ſouth of France, and Spain. There is a variety mentioned by La Marck, C. Cobarienſis of Pourret, with leaves almoſt heart-ſhaped, acute, leſs villous, much wrinkled, and viſcous, which may be the C. cordifolius, n. 17. Cultivated by Miller, and inſerted in his dictionary, without any indication of its native country. 20. C. *populifolius*. Linn. Sp. Pl. 3. Mart. 3. Lam. 11. Willd. 3. C. ledon foliis populi nigræ major et minor; Bauh. Pin. 467. Tourn. 260. Ledon latifolium majus et minus; Cluſ. Hiſt. i. p. 78. Lob. Ic. ii. p. 121.) "Arboreſcent; leaves heart-ſhaped, even-ſurfaced, acuminate, petioled." Linn. "Shrubby; leaves petioled, heart-ſhaped, acute, veined underneath; peduncles bracteated, many-flowered." Lam. *Stem* three or four feet high, branched, with a brown even bark. *Branches* brittle; younger ones, petioles and peduncles beſet abundantly with looſe hairs. *Leaves* oppoſite, ciliated when young. *Flowers* white, large; peduncles axillary, with three or four pairs of oblong bractes; petals not ſpotted, but ſlightly ſtained with purple at their edges; calyxes trigonous before the flowers open; calyx-leaves five, almoſt heart-ſhaped, acute, the two inner ones coloured and tranſparent, Lam. A native of Portugal. 21. C. *longifolius*, Lam. 12. "Shrubby; leaves nearly ſeſſile, ovate-lanceolate, villous and undulated at the edges, veined underneath; peduncles many-flowered." *Branches* reddiſh brown; ſmall ones rendered harſh to the touch by looſe hairs. *Leaves* oppoſite, acute at both ends, greeniſh on both ſides; lower ones on very ſhort petioles. *Flowers* white; axillary, from two to five-flowered; calyx-leaves ſlightly villous, a little heart-ſhaped, acute. Nearly allied to the preceding, but the leaves are almoſt ſeſſile, and not at all heart-ſhaped. A native of Spain. 22. C. *laurifolius*, Linn. 4. Mart. 4. Lam. 13. Willd. 4. (C. ledon, foliis laurinis, Bauh. Pin. 467. Tourn. 360. Ledon. 1. Cluſ. Hiſt. 1. p. 77.) "Arboreſcent; leaves oblong egg-ſhaped, petioled, three-nerved, ſmooth on the upper ſurface; petioles connate at the baſe," Linn. "Leaves ovate-lanceolate, petioled, three-nerved, ſmooth above, tomentous underneath; petioles connate at the baſe; peduncles naked, many-flowered," Lam. A ſhrub five or ſix feet high. *Branches* brown, ſmaller ones beſet with fine cloſe preſſed hairs, not erect or looſe, as in the preceding ſpecies. *Leaves* oppoſite; petioles villous, ſheathing. *Flowers* white, upper ones forming an umbel; calyx-leaves three, egg-ſhaped, mucronate, concave on the inſide, pubeſcent on the out. A native of Spain. Ladanum may be procured from it. 23. C. *cyprius*, Lam. 14. (Ledon. 3. cyprium; Cluſ. Hiſt. 1. p. 78.) "Shrubby, leaves petioled, lanceolate, ſmooth above, tomentous, hoary underneath; peduncles naked, with about three flowers; flowers ſpotted." An intermediate ſpecies between the preceding and following, differing from the former in its narrow leaves, and from the latter in its three or four-flowered peduncles. A ſhrub three or four feet high, with a brown bark, emitting in warm weather from its young branches, its petioles and the upper ſurface of its branches, a viſcous humour like that of the next ſpecies, but rather leſs abundant. *Leaves* oppoſite, three-nerved underneath. *Flowers* white, peduncles ſolitary, three inches long; petals with a violet ſpot near the claw. *Capſules* ſomewhat egg-ſhaped, five-celled. A native of the iſle of Cyprus, where ladanum is collected from it. 24. C. *ladaniferus*. Linn. 5. Mart. 5. Lam. 15. Willd. 7. Bot. Mag. tab. 112. (C. ladanifera hiſpanica, ſalicis folio, flore candido.) "Arboreſcent; leaves lanceolate, even on the upper ſurface; petioles united at the baſe, ſheathing;" Linn. "Shrubby; leaves nearly ſeſſile, connate, lanceolate-linear, ſmooth above; tomentous underneath; peduncles bracteated, one-flowered; capſules ten-celled." Lam. *Stem* four or five feet high, branched. *Leaves* three inches long, about half an inch broad. *Flowers* very large, two or three inches in diameter, white, lateral, peduncles ſimple, furniſhed with bractes their whole length; bractes forming at their baſe a looſe ſheath, caducous; ſtigma ſeſſile. *Capſules* ten-celled, ten-valved. There is a variety with a purple or violet ſpot in the centre of the flower. Willdenow makes C. undulatus and C. planus of Hortus Kewenſis varieties of this ſpecies. The former has undulate, the latter flat leaves. A native of Spain. As this is not the plant by which the officinal ladanum is produced, the trivial name is not ſtrictly proper; but as it has obtained the ſanction of general uſage, it is better to retain it, than to hazard the confuſion which muſt ariſe from changing every ſpecific name which is not ſo appropriate as might be wiſhed: care ſhould be taken to diſtinguiſh ladanum from laudanum, a well known invaluable medicine from papaver ſomniferum. 25. C. *ledon*, Lam. 16.

Willd. 6. (C. ladanifera monſpelienſium. Bauh. Pin. 467.) "Shrubby; leaves nearly ſeſſile, lanceolate, nerved, connate, ſmooth on the upper ſurface; flowers in corymbs, erect; peduncles and calyxes cloathed with ſilky hairs." A low ſhrub from one to two feet high. *Leaves* oppoſite, a little ſhining, dark green above, pale or whitiſh underneath. *Flowers* white, with a yellowiſh tint at their centre, of a moderate ſize, from three to five on each peduncle. A native of the ſouth of France about Narbonne. It exudes a viſcous matter in tolerable abundance, and, according to La Marck, is the true ladaniferus of Montpelier, though not the monſpelienſis of Linnæus. 26. C. *hirſutus*, Lam. 17. (C. laxus, Hort. Kew. ii. p. 233. Willd. 9. C. ledon hirſutum, Bauh. Pin. 467. Tourn. 260. Ledon 4. Cluſ. Hiſt. i. p. 78.) "Shrubby; leaves ſeſſile, oblong, obtuſe, hirſute; peduncles many-flowered; capſules ſmall, covered by the large pyramidal calyx." A ſhrub. *Stem* a foot and a half high. *Branches* numerous, flexible, villous, whitiſh. *Leaves* oppoſite, dark green, ſoft. *Flowers* white; peduncles beſet with ſtrong hairs; capſules egg-ſhaped, ſmooth, five-valved, five-celled. A native of Spain. We have preferred La Marck's trivial name on account of its correſpondence with the ſynonyms of C. Bauhin and Tournefort. 27. C. *florentinus*, Lam. 18. (C. ladanifera florentina, Michael. Sherard.) "Shrubby; leaves narrow, lanceolate, wrinkled, reticulated underneath, nearly ſeſſile; peduncles villous, about three-flowered." *Branches* brown, ſmooth towards the bottom, pubeſcent near the top. *Leaves* an inch and half long, oppoſite, a little cottony underneath, not three-nerved. *Flowers* white; peduncles and calyxes beſet with white, very fine, almoſt ſilky hairs. Suppoſed to be a native of Italy, deſcribed by La Marck from a ſpecimen in the herbarium of Juſſieu. 28. C. *monſpelienſis*, Linn. Sp. Pl. 6. Mart. 6. Lam. 19. Willd. 8. Gært. tab. 76. fig. 10. (C. ledon foliis oleæ, ſed anguſtioribus, Bauh. Pin. 467. Tourn. 260. Ledon. 5. Cluſ. Hiſt. i. p. 79.) "Shrubby; leaves linear-lanceolate, ſeſſile, villous on both ſides, three-nerved; peduncles branched, nearly unilateral." Lam. *Stem* about three feet high, branched. *Leaves* dark green, viſcous. *Flowers* white; peduncles villous. A native of the ſouth of France. 29. C. *libanotis*, Linn. Sp. Pl. 13. Mart. 13. Lam. 20. Willd. 22. "Arboreſcent; leaves linear, revolute; flowers umbelled." Linn. "Shrubby; leaves linear, revolute at the edges; flowers ſomewhat umbelled; calyx three-leaved." Lam. α. "leaves green on both ſides." C. ledon foliis anguſtis, Bauh. Pin. 467. Tourn. 260. Ledon 6 and 9. Cluſ. β. "Leaves caneſcent; flowers ſomewhat capitate." Ledon 7. Cluſ. γ. Leaves hoary underneath." Ledon. 8. Cluſ. *Stem* about two feet high. *Branches* cinereous; young ones cottony and whitiſh near the top. *Leaves* ſeſſile, narrow, revolute like thoſe of roſemary. *Flowers* white or cream-coloured, ſmall. *Capſules* ſmall, five-celled, five-valved. A native of Spain.

* * *Helianthema*, Tourn.

Capſule three-valved, one or three-celled.

† *Without ſtipules.*

(1.) *Stem woody.*

30. C. *umbellatus*, Linn. Sp. Pl. 14. Mart. 14. Lam. 21. Willd. 23. "Somewhat ſhrubby, procumbent; leaves oppoſite, linear; flowers umbelled." Linn. "Somewhat ſhrubby; leaves oppoſite, linear, revolute at the edges; flowers at the top of the peduncle umbelled." Lam. α. "leaves hoary underneath; ſtem procumbent." β. "Leaves greeniſh on both ſides; ſtem erect. (C. ledon, foliis thymi, Bauh. Pin. 467. Helianthemum foliis thymi, floribus umbellatus, Tourn. 250. Ledon 10. Cluſ.) *Stem* ſcarcely a foot high. *Flowers* white, numerous, partly lateral on the peduncle, partly terminal in a kind of umbel; calyx three-leaved. The *branches* of var. α. are procumbent, ſlender, regular, whitiſh; its *leaves* rolled back at the edges like thoſe of C. libanotis, white underneath, green above, a little ciliated at the edges. The ſtems of var. β. are erect; its leaves not white underneath, narrower, the edges more rolled back, and ſcarcely ciliated when completely open. A native of Spain and the ſouth of France. 31. C. *ocymoides*, Mart. 66. Lam. 22. Will. 30. Vahl Symb. 3. p. 68. (C. folio ſampſuci incanos, Bauh. Pin. 465. Cluſ. Hiſt. i. p. 72. Lob. Ic. ii. p. 114. Helianthemum folio ſampſuci, Tourn. 250.) "Leaves inverſely egg-ſhaped, three-nerved; thoſe of the ſmall branches hoary on both ſides, reflexed at the tip; flowers in racemes; peduncles and calyxes quite ſmooth." Vahl. "Somewhat ſhrubby; leaves petioled, keeled, hoary, very ſmall; peduncles branched, umbel panicled." Lam. *Stem* about a foot high. *Branches* ſlender, cinereous. *Leaves* numerous, oppoſite. *Flowers* white, with a dark purple ſpot in the centre; peduncles long, ſlender. There is a variety in which the leaves are whiter, and the branches abundantly cloathed with rather long looſe hairs. C. ſampſucifolius. Cav. Ic. tab. 366. A native of Spain. 32. C. *halimifolius*, Linn. Sp. Pl. 12. Mart. 12. Lam. 23. Willd. 20. "Two of the calyx leaves linear." Linn. "Shrubby; oblong-ovate; ſomewhat acute, leſſening into the petiole, hoary on both ſides; peduncles long, branched, ſomewhat panicled." Lam. *Stem* two or three feet high, much branched. *Branches* forming a regular head. *Leaves* larger than thoſe of the preceding ſpecies, but not more than ſeven or eight lines long, and three or four lines broad, oppoſite. *Flowers* yellow, with a purple ſpot in the centre. There is a variety in which the leaves are obtuſe and almoſt rounded at the tip. A native of Italy and Spain. 33. C. *algarvenſis*, Bot. Mag. 627. (C. laſianthus, Lam. 26. Helianthemum algarvienſe, Tourn. Inſ. 250.) Arboreſcent; ſtem aſcending; leaves hoary, ovate-lanceolate; peduncles ſomewhat panicled; calyxes three-leaved, acute, hirſute." Bot. Mag. "Somewhat ſhrubby; leaves oblong-obovate, keeled, tomentous, peduncles ſhort, about one-flowered; calyxes very hirſute." Lam. *Stems* a foot and half high, much branched. *Branches* darkiſh grey, cottony towards the ſummit. *Leaves* rather ſmall, oppoſite, almoſt ſeſſile, obtuſe, cottony on both ſides, without being white but only grey. *Flowers* yellow, with a purple ſpot in the centre, terminating the ſmall lateral branches, remarkable for the long hairs with which the outſide of the petals is abundantly cloathed. Lam. Calyx-leaves three, equal, acute. Bot. Mag. We have no doubt with regard to the algarvenſis of Bot. Mag. and the laſianthus of La Marck being the ſame plant, though La Marck makes no mention of the aſcending ſtem, and have preferred the former trivial name, as it ſeems to have the right of priority, on the high authority of Tournefort, an authority which we preſume La Marck will not be inclined to diſpute. A native of Portugal. 34. C. *formoſus*, Willd. 19. Bot. Mag. 264. (C. laſianthus, β. Lam.? Helianthemum humilius luſitanicum, halimi folio nigrore, magno flore luteo, Tourn. Inſt. 250.) *Leaves* darkiſh grey. Peduncles a little branched. Lam. *Flowers* yellow, thrice as large as thoſe of C. halimifolius; petals marked with a dark purple ſpot a little above the claw; peduncles and calyx cloathed with red hairs. Bot. Mag. We have almoſt as little doubt with reſpect to the identity of Curtis's and La Marck's plants. A native of Portugal. 35. C. *cheiranthoides*, Lam. 24. C. halimifolius β. Willd. (C. femina portulacæ marinæ folio anguſtiore mucronato; Bauh. Pin. 465. C. folio halimi 2. Cluſ. i. p. 71). "Shrubby; leaves tomentous, oblong-lanceolate, narrower at the baſe; peduncles ſhort, about two-flowered." *Stem* three feet high.

Leaves oppoſite, very white when young, a little three-nerved underneath, about an inch long. *Flowers* yellow. A native of Portugal. 36. C. *atriplicifolius*, Lam. 25. (C. halimi folio, flore luteo amplo, maximus, hiſpanicus, Barrel. Ic. 292. Helianthemum hiſpanicum, halimi folio ampliſſimo incano et nervoſo; Tourn. 250). "Shrubby; leaves petioled, egg-ſhaped, undulated towards the baſe, hoary on both ſides; flowers in racemes; peduncles and calyxes hiſpid." *Stem* from four to ſix feet high or more, upright. *Branches* in a regular head, whitiſh, cloathed with a very ſhort cottony down. *Leaves* oppoſite, nerved underneath, about an inch broad. *Flowers* yellow, not ſpotted, numerous, more than an inch in diameter, terminal, and from the forks of the upper branches; peduncles from three to five inches long; calyx-leaves three, ovate-acute concave; ſometimes two exterior ones very ſmall, narrow, acute: petals falling off ſoon after opening. Capſules even-ſurfaced, one-celled, three-valved. A native of Spain. 37. C. *elongatus*, Mart. 65. Willd. 21. Vahl. Symb. 1. p. 38. "Arboreſcent; leaves lanceolate, hoary; peduncles elongated, two-leaved; calyxes racemed, hirſute." *Stem* a foot high or more, upright, much branched. *Branches* ſhort; younger ones tomentous, hoary, beſet with yellowiſh ſcales. *Leaves* oppoſite, veinleſs, hoary, on both ſides, flat; younger ones doubled together, ſpreading at the tip; petiole very ſhort, with a few long hairs. *Flowers* yellow, with a duſky ſpot in the centre, nodding before they open; peduncles terminal, half a foot long, erect, not hoary, hairy, eſpecially near the bottom, with a pair of ſeſſile leaves towards the middle; pedicels towards the top of the peduncle, remote, filiform, quite ſimple, commonly five, with a bent joint at top; lower ones in pairs, the reſt alternate: calyx oblong, acuminate, ſmooth within; two leaves caducous. A native of Spain. 38. C. *involucratus*, Lam. 27. (Helianthemum hiſpanicum, halimifolio minimo; Tourn. Inf. 251.) "Somewhat ſhrubby; leaves ſmall, inclining to egg-ſhaped, tomentous, ſeſſile; peduncles very ſhort, lateral; flowers with leafy involucre. *Stem* about a foot and half high, much branched. *Branches* ſlender, filiform, cottony, greyiſh. *Leaves* as ſmall as thoſe of C. ocymoides, n. 31, keeled, cinereous. *Flowers* ſmall, ſolitary; calyx villous. A native of Portugal. 39. C. *alyſſoides*, Lam. 28. "Somewhat ſhrubby; leaves oblong, egg-ſhaped, beſet with ſhort ſtiff hairs; younger ones ſomewhat hoary; older ones green: peduncles and calyxes hairy." *Stem* about a foot high, much branched. *Branches* ſpreading, ſlender, rough towards the ſummit, with whitiſh, rather woolly, hairs. *Leaves* oppoſite, narrowed towards the baſe, ſome obtuſe, others rather acute, a little roughened on the ſurface by ſtar-ſhaped hairs, as in many ſpecies of alyſſum. *Flowers* yellow, rather large; peduncles ſhort, two or three flowered, near the top of the branches, unopened flower-buds bright purple at their ſummit. A native of France and Spain. It varies in the ſize and ſhape of the leaves. 40. C. *roſeus*, Mart. 22. Lam. 29. Jacq. Hort. vol. iii. tab. 65. "Somewhat ſhrubby, almoſt without ſtipules, procumbent: leaves oppoſite, petioled, oblong, revolute at the edges, greeniſh on both ſides." *Stem* branched. *Branches* ſlender, weak, almoſt ſmooth, greeniſh, leafy near the top, two or three pair of the upper leaves narrower, furniſhed with ſtipules. *Flowers* roſe-coloured, in terminal racemes. 41. C. *alandicus*, Linn. Sp. Pl. 20. Mart. 24. Lam. 30. Willd. 38. Jacq. Auſt. 4. tab. 399. Hall. Helv. n. 1034. (C. helianthemos flore parvo luteo, Bauh. Hiſt. 2. p. 17. C. alpeſtris: Scop. Car. tab. 23. Chamæciſtus 2. Cluſ. Hiſt. 1. p. 73). "Somewhat ſhrubby, procumbent, leaves oppoſite, oblong, ſmooth on both ſides; petioles ciliated; petals emarginate." Linn. "Leaves ciliated." Lam. *Stem* ſmall, woody, branched from its baſe. *Branches* ſlender, villous, reddiſh, diverging. *Leaves* almoſt ſeſſile, ſmall. *Flowers* yellow, ſmall, peduncled, terminal, in ſhort almoſt corymbous racemes. A native of the ſouth of France, Switzerland, Auſtria, and the iſle of Eland. 42. C. *marifolius*, Linn. 19. Mart. 21. Willd. 32. Eng. Bot. 396. (C. myrtifolius, Lam. Var. β. γ. C. hirſutus, Hudſ. Flor. Ang. C. anglicus, Linn. Mant. 245. Lam. 33. Willd. 36. C. canus, Jacq. Auſt. 277. but not of Linnæus; Helianthemum alpinum, folio Piloſellæ minoris Fuchſii, Bauh. Hiſt. vol. ii. p. 19. H. ſerpylli folio incano, flore minore luteo, inodoro, Dill. Elth. vol. i. tab. 145. fig. 173. Chamæciſtus luteus, thymi durioris folio, Barrel. Ic. 44). "Somewhat ſhrubby; leaves oppoſite, petioled, oblong, tomentous underneath." Linn. *Roots* long, woody. *Stem* three or four inches high, woody, cylindrical, branched, decumbent at the baſe. *Leaves* ſpreading, flat, green above, hiſpid with depreſſed briſtles. *Flowers* yellow, rarely white, ſmall, ſcentleſs, in terminal racemes; racemes few-flowered, pubeſcent, bracteated; calyx hairy, with ſeveral brown ribs; petals inverſely egg-ſhaped, entire, ſlightly undulated; germ egg-ſhaped, ſmooth, with three or four hairy lines; ſtyle curved. A native of England, France, Spain, Italy, and Switzerland. 43. C. *canus*, Linn. 18. Mart. 19. Lam. 27. (C. myrtifolius var. α. Lam. 31. Jacq. Auſt. 3. tab. 277. Allion pedem. tab. 45. fig. 3. Chamæciſtus foliis myrti minoris incanis, Bauh. Pin. Tourn. 249. Chamæciſtus 3. Cluſ. Hiſt. 1. p. 74). "Somewhat ſhrubby, procumbent; leaves oppoſite, inverſely egg-ſhaped, villous, tomentous underneath; flowers ſomewhat umbelled." Linn. There is a variety with elliptic leaves, with a few ſcattered white hairs on each ſide, not tomentous underneath; calyxes always hirſute, in ſeſſile terminal umbels. (Helianthemum, ſerpylli folio villoſo, flore pallido. Barr. rar. tab. 366. H. alpinum ſerpylli folio nigricante et hirſuto. Seg. ver. 3. tab. 6. fig. 2). *Old ſtems* procumbent and naked; thoſe which bear leaves and flowers erect. *Flowers* deep yellow, from the axils of the upper leaves; calyxes tomentous. *Capſule* egg-ſhaped, ſomewhat acute, trigonous, nearly ſmooth, three-celled, three-valved, covered by the calyx. *Seeds* two or three in each cell, egg-ſhaped, acute, angular. Jacq. A native of the ſouth of Europe. 44. C. *italicus*, Linn. Sp. Pl. 17. Mart. 20. Lam. 32. Willd. 31. Helianthemum ſerpylli folio villoſo, flore pallido, Italicum. Barr. Ic. tab. 366). "Somewhat ſhrubby; leaves oppoſite, hiſpid; lower ones egg-ſhaped; upper ones lanceolate: branches ſpreading." *Stem* about ſeven inches high, erect. *Branches* oppoſite, long, ſpreading, ſomewhat-deflexed, rufous, ſomewhat ciliated; lower ones petioled, upper ones nearly ſeſſile. *Flowers* pale yellow, in a terminal raceme; calyxes hiſpid; corollas ſcarcely emarginate. A native of Italy. Linnæus ſuſpects that it may be only a variety of the preceding ſpecies. 45. C. *vinealis*, Willd. 37. Hall. Helv. n. 1035. "Somewhat ſhrubby, procumbent; leaves petioled, oblong, obtuſe, hoary-tomentous underneath; flowers in racemes." It widely differs from C. marifolius in the form of its leaves, procumbent branches, and whole habit; and from C. celandicus in its leaves, being white with down underneath. A native of vineyards in Germany and Switzerland. 46. C. *echioides*, Lam. 34. "Somewhat ſhrubby; leaves linear, lanceolate, hairy on both ſides, rather rough, ſeſſile; racemes ſmall, hairy, recurved at the top." *Stem* half a foot high, erect, rough, with hairs, branched from the bottom almoſt to the top. *Leaves* oppoſite, acute, greyiſh. *Flowers* almoſt ſeſſile, in the axils of the bractes. A native of Spain, deſcribed by La Marck from a dried ſpecimen in the herbarium of Juſſieu. 47. C. *origanifolius*, Lam. 35. Willd.

33. Cavan. Ic. 3. tab. 262. fig. 1. " Somewhat ſhrubby; leaves oppoſite, petioled, egg-ſhapped, hairy on both ſides." *Stems* five or ſix inches high, much branched. *Leaves* reſembling thoſe of origanum, but much ſmaller; deſcribed by La Marck from ſpecimens without flowers preſerved in the herbaria of Juſſieu and Iſnard. *Flowers* yellow, ſcarcely longer than the calyx, only half as large as thoſe of C. mariſolius; racemes from one ſide of the ſtem, in pairs, peduncled, hairy like the ſtem, Cavan. A native of Spain, near Cape St. Vincent. 48. C. *mollis*, Willd. 34. Cavan. Ic. 3. p. 32. " Somewhat ſhrubby; leaves roundiſh-egg-ſhaped, obtuſe petioled, flat, tomentous on both ſides, ſoft." *Stems* half a foot high, diffuſe, red, tomentous, branched. *Leaves* oppoſite, ſlightly nerved. *Flowers* three times as large as thoſe of the preceding ſpecies, in ſolitary terminal racemes. A native of Spain. 49. C. *dichotomus*, Willd. 35. Cavan. Ic. 3. tab. 263. fig. 1. " Somewhat ſhrubby, dichotomous; leaves egg-ſhapped, acute, ſmooth, revolute at the edges, oppoſite, petioled; flowers in racemes." *Leaves* ſmall, like thoſe of Thymus Piperella, on ſhort petioles. *Flowers* deep yellow, ſcarcely the ſize of thoſe of ſpergula nodoſa; racemes ſlender, few-flowered. A native of Spain. 50. C. *fumana*, Linn. Sp. Pl. 16. Mart. 18. Lam. 36. Willd. 26. (chamæciſtus ericæ folio luteus humilior; Bauh. Pin. 466. C. anguſtifolius, Ibid. Hall. Helv. n. 1032. C. minor, Barr. Ic. 286. and 2. 446. Helianthemum tenuifolium glabrum, luteo flore, per humum ſparſum, J. Bauh. 2. p. 18. Tourn. 249.) " Somewhat ſhrubby, procumbent; leaves alternate, linear, ſcabrous at the edges; peduncles one-flowered," Linn. *Stem* from five to eight inches high, woody, more or leſs upright, twiſted, branched. *Branches* ſlender, diffuſe, lower ones often procumbent. *Leaves* reſembling thoſe of Antirrhinum Linaria, but ſmaller, greeniſh; lower ones ſhorter and ſtiffer. *Flowers* yellow, on a ſolitary peduncle; calyx ſmooth, or cloathed with a very ſhort down, ſometimes with a purple tint, five-leaved; two outer leaves very ſmall, acute. *Capſules* three-celled, three-valved. A native of dry ſtony ground in Sweden, France, and Switzerland. 51. C. *calycinus*, Linn. Mant. 565. Mart. 16. Willd. 25. (C. fumana β. Lam. Deſfont. Fl. Atl. 1. tab. 105. C. ericoides, Cavan. Ic. 2. tab. 172. Chamæciſtus ericæ folio luteus elatior, Bauh. Pin. 466. Pluk. Alm. tab. 83. fig. 6.) " Somewhat ſhrubby, erect; leaves linear; peduncles one-flowered; calyxes three-leaved." *Stem* a foot high. *Branches* oppoſite, reddiſh. *Leaves* oppoſite, even-ſurfaced, obtuſely keeled underneath. *Flowers* yellow; peduncles terminal, ſolitary, ſcarcely longer than the leaves; calyx with three even-ſurfaced, equal leaves; ſtamens fifteen, very ſhort, yellow, all fertile; piſtil white; ſtigma warty. Nearly allied to the preceding. A native of the ſouth of Europe. 52. C. *ſcabroſus*, Mart. 59. Willd. 28. Hort. Kew. 2. p. 236. " Somewhat ſhrubby; leaves oppoſite, egg-ſhaped, hairy-ſcabrous, three-nerved; calyxes three-leaved." *Stems* decumbent, cylindrical, thickly cloathed with ſhort ſtellated hairs. *Branches* ſhort. *Leaves* an inch long, ſomewhat petioled. *Flowers* deep yellow, paler in the centre, terminal, ſomewhat panicled; calyx leaves equal, ovate-lanceolate, acuminate, pubeſcent on the outſide, with long ſtellated hairs; petals inverſely egg-ſhaped, ſomewhat retuſe, twice the length of the calyx. A native of Italy and Portugal. 53. C. *cinereus*, Willd. 29. Cavan. Ic. 2. tab. 141. " Somewhat ſhrubby; leaves oppoſite, egg-ſhaped, acute hoary; calyxes obtuſe; racemes panicled." Nearly allied to the preceding, but diſtinct. *Leaves* evidently petioled, veined. *Calyx* five-leaved, three of the leaves egg-ſhaped, obtuſe, two linear; petals quite entire, Cavan. 54. C. *ſyriacus*, Mart. 17. Mur. Syſt. 498. Jacq. Collect. 1. 98. (C. lavandula β. Lam. 54.) " Erect, leaves lanceolate, revolute; flowers racemed." *Leaves* acute, quite entire, nearly ſeſſile, alternate, ſomewhat villous, pale green. *Flowers* yellow; racemes terminal and axillary from the upper leaves, many-flowered, unilateral; calyx ſomewhat villous, pale green. Sent to Jacquin by Spielman in 1771. A native of the Levant. 55. C. *lævipes*, Linn. Sp. Pl. 15. Mart. 15. Lam. 37. Willd. 24. Jacq. Hort. 2. tab. 158. Ger. Prov. tab. 14. Pluk. Alm. tab. 84. fig. 6. (Helianthemum Maſſilienſe Coridis, fol. Tourn. 250.) " Somewhat ſhrubby, aſcending; leaves alternate, faſcicled, filiform, ſmooth; peduncles racemed," Linn. *Root* woody, creeping very much. *Stems* ſeveral, ſeven or eight inches long, woody when old, herbaceous when young, much branched. *Branches* ſlender, glaucous, quite ſmooth, except near the flowers, where they are often cloathed with ſhort ſeparate hairs. *Leaves* very numerous, alternate, ſetaceous-linear, from three to five inches long, glaucous; with each leaf come out two others, one-third ſhorter; between theſe, from the axil, other leaves come out ſucceſſively, ſo as to form a bunch ſitting cloſe to the branch. *Flowers* yellow, on long peduncles, terminal, ſcentleſs; calyx leaves five; three inner ones broad egg-ſhaped, acute, wrinkled longitudinally, variegated with white, green, and purple; petals egg-ſhaped, a little longer than the petals. *Capſule* obtuſely trigonous, obſcurely grooved, ſmooth, three-celled, three-valved. *Seeds* two in each cell, egg-ſhaped, convex on one ſide, angular on the other. A native of the ſouth of France. 56. C. *braſilienſis*, Lam. 38. (C. alternifolius, Willd. 39. Vahl. Symb. 1. p. 38.) " Somewhat ſhrubby; leaves alternate, ovate-oblong, villous, ſeſſile; peduncles one-flowered," Lam. Whole plant cloathed with rather long, white, almoſt ſilky hairs. *Stem* half a foot high or more, erect, a little zig-zag. *Leaves* villous on both ſides, flat, quite entire. *Peduncles* towards the top of the branch ſolitary, or ſometimes two or three together, one-flowered, in the axils of the leaves of the lower branches, ſpreading, twice the length of the leaf. A native of Brazil.

2. *Stem herbaceous.*

57. C. *globularifolius*, Lam. 39. Willd. 40. (Helianthemum Luſitanicum, globulariæ folio; Tourn. 250.) " Perennial; ſtem ſimple, nearly naked; root-leaves petioled ſpatulate, obtuſe." Root thick, woody. *Stem* from four to ſix inches high, furniſhed with two or three diſtant pairs of ſmall acute leaves. *Flowers* terminal, in a ſhort raceme. A native of Portugal. 58 C. *tuberaria*, Linn. Sp. Pl. 21. Mart. 25. Lam. 40. Willd. 41. Cavan. Ic. 1. tab. 67. (C. folio plantaginis, Bauh. Pin. 465. Helianthemum plantaginis folio, perenne, Tourn. 25. Buxb. Cent. 3. tab. 63. Tuberaria noſtras, et major mycoſis, J. Bauh. 2. p. 12.) " Perennial, root leaves egg-ſhaped, three-nerved, tomentous; ſtem leaves ſmooth, lanceolate; upper ones alternate," Linn. *Stem* half a foot high or more, commonly ſimple. *Root-leaves* ſpreading on the ground, white underneath; ſtem-leaves ſeſſile, diſtant. *Flowers* yellow, in a kind of corymb; two outer calyx-leaves ſhorter, lanceolate; three inner ones ovate-acuminate, concave. *Capſule* globular, three-valved. *Seeds* ovate-compreſſed, blackiſh, fixed to partitions oppoſite to the valves. A native of Spain, Italy, and the ſouth of France, cultivated by Miller in 1748. 59. C. *plantagineus*, Willd. 42. (C. ſerratus, Deſfont. Fl. Atl. 1. 416. excluding the ſynonym from Cavanilles. C. lanceolatus, Vahl. Symb. 2. p. 62?) " Herbaceous; leaves lanceolate, leſſened at both ends, three-nerved, hairy; racemes without bractes; petals finely toothed." Willd. " Inclining to ſhrub-

by near the bottom, herbaceous above; leaves lanceolate, three-nerved, hairy." Vahl. *Stem* a foot or a foot and a half high, ſprinkled with long ſtrait hairs, Willd.; branched at the baſe, Vahl. *Branches* quite ſimple, a ſhort ſpan long, aſcending, ſmooth at the bottom, tomentous at the top, hoary their whole length, Vahl. *Leaves* two inches long, ſeſſile, gradually ſmaller towards the top, oppoſite; two upper ones alternate, Vahl. *Root-leaves* oblong, acuminate, leſſened into the petiole, three or five-nerved, hairy on both ſides; the hairs on the under ſurface ſimple, ſcattered, cloſe-preſſed; on the upper more copious, ſtellated; ſtem-leaves oppoſite, lanceolate, ſeſſile, three nerved, an inch and a half or two inches long, more hairy than the root-leaves, Willd. *Stipules* only to the laſt pair of leaves, Vahl. and Willd.; half an inch long, linear, hairy, Willd. *Bractes* none, Vahl. and Willd. *Raceme* terminal, Vahl. *Racemes* two at the top of the ſtem, Willd. *Flowers* yellow, without a central ſpot, Willd.; calyx five-leaved, Vahl. Willd. A native of Crete and the north of Africa; found by Vahl near Bizerta in Barbary. We have contraſted Willdenow's and Vahl's deſcriptions, that our readers may judge for themſelves with reſpect to their identity. The only material difference ſeems to be, that Willdenow's plant is annual: Vahl's, perennial. 60. C. *ſerratus*, Willd. 43. Cavan. Ic. 2. tab. 175. fig. 1. "Leaves oppoſite, lanceolate, three-nerved, hairy, viſcous; root ones inverſely egg-ſhaped; racemes without bractes; petals ſerrated." *Stem* only one-third the length of the preceding. *Leaves* obtuſe. *Flowers* yellow, with a large black central ſpot. 61. C. *bupleurifolius*, Lam. 41. "Stem branched; ſtem-leaves lanceolate, three-nerved, even ſurfaced, ſmooth; upper ones alternate; flowers in corymbs." *Root* three or four inches long, ſlender, fibrous. *Stem* herbaceous, four inches high, ſmooth, leafy. *Branches* ſimple, a little villous towards the top. *Root-leaves* oblong, leſſened towards the baſe, ſlightly three-nerved, beſet with ſhort hairs; ſtem-leaves ſeſſile, very acute, even-ſurfaced, ſmooth, ſometimes, but rarely, furniſhed with ſome looſe hairs underneath, moſt of them oppoſite, gradually diminiſhing in ſize towards the top. *Flowers* in ſhort peduncles, in a ſmall cloſe corymb. Communicated to La Marck by Vahl, who found it in Spain. It ſeems to differ from his lanceolatus chiefly in its completely herbaceous ſtem, and its comparatively ſmooth leaves. 62. C. *guttatus*, Linn. Sp. Pl. 22. Mart. 26. Lam. 42. Willd. 44. Curt. Flor. Lond. faſc. 6. tab. 33. Eng. Bot. tab. 544. (C. flore pallido, punicante macula inſignito, Bauh. Pin. 465. Rai. Syn. 342. C. annuus flore guttato, J. Bauh. Hiſt. vol. ii. p. 14. Helianthemum flore maculoſo, Tourn. 250. Colum. Ecphr. tab. 77. fig. 1.) "Leaves oppoſite, lanceolate, three-nerved; racemes nearly naked." Dr. Smith. *Root* annual, ſmall, fibrous. *Stem* near a foot high, erect, ſimple or branched, ſquare, hairy; hairs white, ſpreading. *Leaves* rather obtuſe, quite entire, hairy on both ſides, ſomewhat viſcid. *Flowers* yellow; racemes terminal, ſimple, unilateral, hairy, often without bractes, but ſometimes with ſolitary lanceolate ones at the baſe of the pedicels; calyx glandular, hairy; petals unequally crenate, with an elegant purple ſpot near the baſe; ſtigma ſeſſile. *Capſule* egg-ſhaped, three-celled. *Seeds* attached to the partitions, which are fixed to the middle of the valves, Dr. Smith. La Marck mentions two varieties; one ſmaller with linear-lanceolate leaves; the other larger with ovate-acute or ovate-lanceolate ſtem-leaves. A native of Italy, the ſouth of France, and the iſles of Jerſey and Man. 63. C. *canadenſis*, Linn. Sp. Pl. 23. Mart. 27. Lam. 43. Willd. 45. "All the leaves alternate, lanceolate; ſtem aſcending." A native of Canada, obſerved by Kalm. 64. C. *alternifolius*, Mart. 63. Vahl. Symb. 1. 38. "Somewhat ſhrubby; leaves alternate; peduncles lateral and terminal, generally ſolitary, one-flowered." *Stem* erect. *Branches* ſlender, villous, brown. *Leaves* ſeſſile, oblong, erect, flat, quite entire, villous on both ſides. *Flowers* ſolitary towards the top, ſometimes two or three together in the axils of the leaves on the lower branches; peduncles ſpreading, double the length of the leaf, villous, a little thicker at the end, with two linear caducous leaves at the top; calyxes egg-ſhaped, acute, hirſute. A native of Brazil. It has the calyx and infloreſcence of ſalicifolius n. 103, but differs in being ſhrubby. 65. C. *medius*, Mart. 50. Allion pedem, n. 1657. "Leaves ovate-lanceolate, wrinkled, petioled, finely toothed." *Stems* ſhrubby, reddiſh, viſcid. *Leaves* green. *Flowers* pale yellow; peduncles ſolitary, axillary and terminal. A native of the county of Nice.

† † *With ſtipules.*

66. C. *ſquamatus*, Linn. Sp. Pl. 27. Mart. 32. Lam. 44. Willd. 51. Barr. Ic. 327. Bocc. Muſ. 2. tab. 64. fig. 3. "Stem ſomewhat ſhrubby; leaves covered with orbicular ſcales." Linn. *Stem* ſix or ſeven inches long, rather erect, tetragonous near the bottom. *Leaves* oval-lanceolate, thickiſh, petioled, oppoſite, ſome three together; ſcales ſilvery, with a hollow point in the middle. *Stipules* extremely ſmall, acute, ſhrivelling, ſeſſile. *Flowers* yellow, terminal, in ſmall racemes, on ſhort thick-ſet peduncles. A native of dry hills in Spain. 67. C. *lippii*, Linn. Mant. 245. Mart. 33. Lam. 45. Willd. 52. Vahl. Symb. n. 39. (C. ſtipulatus, Forſk. Deſ. 100.) "Somewhat ſhrubby, erect; leaves alternate and oppoſite, lanceolate, ſcabrous; ſpikes unilateral." Linn. *Stem* from four to ſix inches high, cylindrical, pubeſcent, whitiſh, bifid, or but little branched. *Branches* white, alternate, often zig-zag. *Leaves* generally alternate, petioled, oblong, obtuſe, pale green above, with ſhort hairs, whitiſh and ſlightly cottony underneath. *Stipules* ſmall, narrow-lanceolate, oppoſite, nearly the length of the petioles. *Flowers* yellow; racemes or ſpikes ſhort, ſolitary, oppoſite to the leaves, ſeſſile, ſcarcely opening, but appearing almoſt like buds till the fruit opens; petals ſmaller, ſcarcely longer than the leaves of the calyx. *Capſules* nearly globular, almoſt covered by the calyx. A native of Egypt. 68. C. *ſeſſiliflorus*, Willd. 53. Desfont. Fl. Atl. 1. p. 427. tab. 106. "Somewhat ſhrubby, erect; leaves alternate and oppoſite, linear, hoary, revolute at the margin; ſpikes unilateral." *Stem* a foot or two feet high, erect, much-branched. *Leaves* ſomewhat petioled, rather obtuſe. *Stipules* ſmall, linear. *Flowers* yellow, a little longer than the calyx, ſeſſile. *Bractes* minute, linear-lanceolate. *Calyx* pubeſcent. *Capſule* roundiſh, pubeſcent, longer than the calyx, Desfont. 69. C. *ellipticus*, Willd. 54. Desfont. Fl. Atl. 1. tab. 107. "Somewhat ſhrubby, erect; leaves oppoſite, elliptic, hoary, revolute at the edges; ſpikes unilateral." *Stem* a foot or two feet high, branched. *Branches* pubeſcent. *Leaves* on ſhort petioles, cloathed on both ſides with very ſhort and very denſe hairs. *Stipules* growing by fours, ſmall, linear. *Flowers* yellow, ſmall, ſeſſile; petals a little longer than the calyx. *Capſule* roundiſh, pubeſcent, longer than the calyx. A native of the country about Algiers. 70. C. *canarienſis*, Murray Syſt. 499. Mart. 36. Lam. 46. Willd. 59. Jacq. Ic. 1. tab. 97. Jacq. Miſc. 2. p. 339. "Procumbent; leaves ſomewhat egg-ſhaped, alternate and oppoſite; racemes erect." Jacq. "Procumbent; leaves oppoſite and alternate, pubeſcent, glaucous, oblong-inverſely egg-ſhaped, acute; racemes unilateral." Willd. *Root* fibrous. *Stem* ſix or ſeven inches long, ſlender, woody, branched, ſlightly pubeſcent, reddiſh brown near the

bottom. *Branches* alternate, whitiſh and a little cottony towards the top. *Leaves* petioled, pale green, almoſt ſmooth above, pubeſcent and reflexed at the edges underneath. *Stipules* narrow, almoſt ſetaceous, ſhorter than the petioles, hooked, villous, caducous. *Flowers* yellow, peduncled; racemes an inch and a half long; peduncles cottony; calyxes with projecting ſtriæ. A native of the Canary iſlands. 71. C. *ſerpyllifolius*, Linn. Sp. Pl. 30. Mart. 38. Willd. 60. (Chamæciſtus repens ſerpyllifolia lutea, Bauh. Pin. 466.) "Somewhat ſhrubby; leaves oblong; calyxes even-ſurfaced." A native of mountains in the ſouth of Europe. La Marck has omitted this ſpecies. 72. C. *violaceus*, Willd. 61. Cavan. Ic. 2. tab. 147. "Somewhat ſhrubby, aſcending; leaves oppoſite, ſomewhat tomentous, linear, obtuſe, attenuated at the baſe, revolute at the edges; calyxes even-ſurfaced." *Flowers* white, in long erect racemes; calyxes of a reddiſh violet colour. 73. C. *linearis*, Willd. 62. Cavan. Ic. 3. tab. 216. "Somewhat ſhrubby, aſcending, a little tomentous; leaves linear, obtuſe, petioled, revolute at the edges; calyxes even-ſurfaced. *Leaves* petioled, not attenuated at the baſe, thrice the length of thoſe of the preceding ſpecies. *Flowers* white; the two ſmaller calyx-leaves acute, not obtuſe; petals inverſely-egg-ſhaped. In theſe reſpects, its white flowers excepted, and in its whole habit, it differs from C. violaceus. A native of Spain. 74. C. *lævis*, Willd. 63. Cavan. Ic. 2. tab. 145. fig. 1. "Somewhat ſhrubby, erect, leaves linear, ſeſſile, ſmooth, revolute at the edges, keeled; calyxes even-ſurfaced." *Leaves* acute at the tip; lower ones crowded, ſhorter; upper ones a little ſpreading. *Stipules* linear. *Flowers* deep yellow, longer than the calyx: two ſhorter calyx-leaves awl-ſhaped. A native of Spain. 75. C. *ſtrictus*, Willd. 64. Cavan. Ic. ii. tab. 263. fig. 2. "Somewhat ſhrubby, erect; leaves hoary, linear-awl-ſhaped, revolute at the edges; racemes unilateral; calyxes ſmooth." Willd. *Stem* half a foot high; branches numerous, oppoſite, ſtiff, and ſtraight, cloathed with a ſhort hoary down. *Leaves* oppoſite, nearly ſeſſile, with a few hairs at the tip. *Flowers* white, larger than the calyx; calyx ſtriated. 76. C. *ſurrejanus*, Linn. Sp. Pl. 28. Mart. 34. Lam. 47. Willd. 55. (C. helianthemum δ. Hudſ. Flor. Ang. 233. Helianthemum vulgare, petalis florum peranguſtis, Dill. in Rai. Synop. 341. Hort. Elth. tab. 145. fig. 174.) "Somewhat ſhrubby; leaves ovate-oblong, hairy underneath, dotted; petals lanceolate. *Stems* proſtrate, ſimple, leafy, cylindrical, cloathed with depreſſed matted hairs. *Leaves* petioled, obtuſe, flat, quite entire, nearly naked above, hairy, and ſtudded with hollow points underneath, green on both ſides, not hoary. *Stipules* two, lanceolate, ciliated. *Flowers* yellow, erect, racemes terminal, ſolitary, ſimple, many-flowered, recurved, pubeſcent, bracteate; calyx hairy, with red nerves; petals very narrow, acute, generally longer, but ſometimes ſhorter than the calyx. *Capſule* one celled, or obſcurely three-celled. Dr. Smith. Found by Edward du Bois near Croydon, in Surrey, whence Linnæus formed its trivial name. It does not appear to have been obſerved wild in any other ſituation, either in or out of England. It is diſtinguiſhed from C. *helianthemum*, to which it is nearly allied, by the remarkable form of its petals. 77. C. *polyanthos*, Willd. 56. Desfont. Flor. Atl. i. tab. 108. "Somewhat ſhrubby; lower leaves hoary underneath; ſtem ones green on both ſides, ciliated; calyxes hiſpid; racemes panicled. *Stems* a foot high, numerous, cylindrical, villous, rough, with tubercles. *Leaves* oppoſite, petioled, obtuſe, veined underneath; lower ones egg-ſhaped, ſmaller; upper ones ovate-oblong, or lanceolate. *Stipules* four, petioled, linear-lanceolate, rather obtuſe, longer than the petiole. *Flowers* yellow, ſmall, longer than the calyx; racemes erect, drooping before the flowers open; peduncles filiform; pedicels capillary; bractes linear, ſhorter than the pedicels; calyx cloathed with numerous, white, ſoft, ſpreading hairs. *Capſule* ſmall, villous at the tip. A native of the north of Africa. 78. C. *glaucus*, Willd. 57. Cavan. Ic. iii. tab. 261. "Somewhat ſhrubby, aſcending; leaves tomentous, glaucous, revolute at the edges; lower ones egg-ſhaped, upper ones lanceolate; racemes unilateral." *Petals* yellow, longer than the calyx, roundiſh, crenulate at the edges. A native of Spain. 79. C. *croceus*, Willd. 75. Desfont. Flor. Atl. i. tab. 110. "Somewhat ſhrubby, pubeſcent, cloathed with very ſhort ſtellated hairs; leaves elliptic, obtuſe." A foot high. *Stems* numerous, erect, cylindrical, tomentous, ſomewhat hoary. *Leaves* oppoſite, petioled, ſomewhat hoary underneath, revolute at the edges, pubeſcent on both ſides; with cloſe-ſet ſhort ſtellated hairs; lower ones ſmaller, roundiſh, middle ones elliptic, obtuſe; upper ones lanceolate, ſomewhat acute. *Stipules* four, awl-ſhaped, a little longer than the petiole. *Flowers* ſaffron-coloured; racemes, before the flowers open, convolute; bractes lanceolate, pubeſcent, the length of the pedicels, calyxes pubeſcent, angular, yellowiſh; petals quite entire. Nearly allied to the preceding, but diſtinct. A native of Spain, and the north of Africa. 80. C. *nummularius*, Linn. Sp. Pl. 29. Mart. 35. Lam. 48. Willd. 58. (Helianthemum ad nummularia accidens, J. Bauh. Hiſt. ii. p. 20. Tourn. 249. Ciſtus humilis, ſ. chamæciſtus nummulariæ folio, Mag. Monſp. 293.) "Somewhat ſhrubby; lower leaves orbicular; upper ones egg-ſhaped." Linn. *Stems* long, trailing, much branched. *Leaves* oppoſite, petioled, ſlightly villous; lower ones whitiſh underneath; all of them green on the upper ſurface. *Stipules* three, narrow, erect. *Flowers* large, white, in terminal racemes. Found by Magnol on Mount Capouladon near Montpelier. J. Bauhin received it from Baſil. 81. C. *ciliatus*, Willd. 70. Desfont. Flor. Atl. i. tab. 109. "Somewhat ſhrubby, procumbent; branches tomentous; leaves narrow, lanceolate, villous; calyxes membranous, with ciliated angles." *Stems* a foot high, branched at the baſe. *Branches* ſingle, cylindrical, hoary. *Leaves* oppoſite, on ſhort petioles, hirſute on the upper ſurface, caneſcent and tomentous underneath, revolute at the edges. *Stipules* four, linear, longer than the petiole. *Flowers* roſe-coloured; racemes terminal, revolute before the flowers open; bractes linear-lanceolate; two outer leaves of the calyx ſmall, linear. *Capſule* roundiſh, covered by the calyx. A native of ſandy hills in the north of Africa. 82. C. *anguſtifolius*, Marray Syſt. Veg. p. 500. Mart. 43. Willd. 71. Jacq. Hort. iii. tab. 53. "Somewhat ſhrubby, diffuſe; leaves lanceolate; calyxes hirſute." *Root* branched. *Stem* cylindrical, woody, branched from the baſe; younger branches, leaves, ſtipules and racemes ſlightly villous and hoary. *Leaves* oppoſite, ſomewhat acute, quite entire, rough on both ſides, on ſhort petioles. *Flowers* yellow, orange-coloured in the centre; racemes terminal, many-flowered, erect; pedicels bent back as the fruit ripens; ſtipules and bractes deciduous; outer calyx-leaves linear; inner ones egg-ſhaped, acute, nerved; petals either quite entire, or crenulate about the edge. *Capſule* hirſute, egg-ſhaped, Jacq. 83. C. *helianthemum*, Linn. 33. Mart. 44. Lam. 49. Willd. 72. Curt. Flor. Lond. Faſc. 5. tab. 36. Flor. Dan. tab. 101. Eng. Bot. 1321. (Chamæciſtus vulgaris, flore luteo, Baun. Pin. 405. Helianthemum vulgare, Tourn. 248. Gært. tab. 76. fig. 11.) "Somewhat ſhrubby; ſtipules lanceolate; leaves oblong, revolute, ſomewhat hairy." Linn. "Somewhat ſhrubby, procumbent; leaves oblong, revolute, hoary underneath; calyxes ſomewhat hirſute." Lam. *Stems* generally ſimple, cylindrical, leafy, hairy. *Leaves* ſmall, various in ſize, elliptic, obtuſe, on ſhort petioles, entire green, and cloathed with ſimple hairs above; white, downy, and hairy underneath. *Stipules* acute, green on both ſides, ciliated. *Flowers* bright yellow, in terminal racemes, on hairy peduncles; calyx coloured with hairy ribs; petals roundiſh, obſcurely crenate; ſtamens the length of the ſtyle, erect; when touched with a pin or briſtle, retiring from the ſtyle, and lying down in a ſpreading form upon the petals; but this can be ſeen only in calm warm weather, and when the flowers have not been ruffled by inſects. Dr. Smith. A native of England, and other parts of Europe, chiefly on a calcareous ſoil, and flowering in July and Auguſt. It varies with paler and with white flowers. Willdenow makes C. *roſeus* of La Marck with roſe-coloured flowers only a variety. 84. C. *grandiflorus.* Mart. 51. Scop. Carn. n. 648, tab. 25. Allion. Ped. n. 4. (Helianthemum alpinum, vulgari ſimile, foliis latioribus; Bauh.) “Somewhat ſhrubby; leaves lanceolate, villous on both ſides, acuminate; ſtipules longer than the calyx.” *Stem* about ſix inches long, villous. *Leaves* an inch long. *Flowers* yellow, racemed; peduncles and calyxes villous; outer calyx-leaves linear; inner twice as long; petals almoſt half an inch in length. Allioni doubts whether it be diſtinct from the preceding ſpecies; but Scopoli aſſerts that it differs in the whole appearance of the flower, length of the racemes, and hardneſs of the leaves. 85. C. *mutabilis,* Mart. 45. Willd. 73. Jacq. Ic. 1. tab. 99. Miſc. 2. p. 340. (C. hiſpidus γ, Lam. who ſays it is the effect only of cultivation.) “Somewhat ſhrubby, procumbent; ſtipules lanceolate; leaves oblong, ſmooth, flat.” Native country unknown. *Flowers* either pale yellow or roſe-coloured. 86. C. *hirtus,* Linn. Sp. Pl. 34. Mart. 46. Willd. 76. “Somewhat ſhrubby, leaves egg-ſhaped; calyxes hiſpid,” Linn. *Stem* erect, much-branched. *Leaves* very narrow, oppoſite, revolute, bright green above, hoary underneath. *Flowers* white, large, in ſmall terminal racemes. A native of Spain and the ſouth of France, cultivated by Miller in 1759. Profeſſor Martyn quotes C. roſmarini foliis of Allioni as a ſynonym; but the calyx of Allioni's plant is only whitiſh, with nothing rough or hairy about it. It ſeems therefore to be a diſtinct ſpecies. 87. C. *barbatus,* Lam. 50. (C. piloſus β, Willd. Helianthemum ſ. Ciſtus humilis, flore ſampſuci, capitulis valde hirſutis; J. Bauh. 2. p. 20. Tourn. 249.) “Somewhat ſhrubby, erect; leaves egg-ſhaped, hairy, green on both ſides; racemes hirſute-bearded.” *Leaves* oppoſite, petioled, villous above and underneath. *Flowers* yellow, in terminal racemes, leſs looſe than thoſe of C. helianthemum. Lamarck ſuſpects that this plant may be one and the ſame with the preceding, excluding the ſynonyms quoted by Linnæus; but C. hirtus of Linnæus, or at leaſt of Miller, has its leaves hoary underneath; whereas thoſe of Lamarck's barbatus are green on both ſides. 88. C. *glutinoſus,* Linn. Mant. 246. Mart. 39. Lam. 51. Willd. 65. Cavan. Ic. 2. tab. 145. fig. 2. (Chamæciſtus incanus, tragorigani folio; Barrel. Ic. 415. Helianthemum folio thymi incano; J. Bauh. 2. p. 19. Tourn. 249.) “Somewhat ſhrubby; leaves linear, oppoſite and alternate; peduncles villous, glutinous.” Five or ſix inches high. *Stem* much branched from the bottom. *Branches* regular, pubeſcent, viſcous. *Leaves* of a cinereous green colour, ſmall, ſomewhat acute, revolute, not much more than three lines long. *Flowers* yellow, ſmall, in a looſe terminal raceme. *Capſules* ſmall, globular, three-celled. Lam. A native of the ſouth of Europe. 89. C. *thymifolius,* Linn. Sp. Pl. 31. Mart. 40. Willd. 66. (C. glutinoſus β. Lam. Chamæciſtus luteus, thymi folio, oliganthes; Barrel. Ic. 444. Ciſtus alpina humilis, foliis thymi minutiſſimis; Pluk. tab. 84. fig. 5.) “Somewhat ſhrubby, procumbent; leaves linear, oppoſite, very ſhort, cluſtered.” Linn. A native of Spain and the ſouth of France. 90. C. *ferrugineus,* Lam. 52. (C. minor thymi folio, flore ferrugineo; Burr. rar. tab. 285.) “Somewhat ſhrubby; leaves alternate, lanceolate, flat; lower ones ſomewhat linear; peduncles lateral, one-flowered.” *Root* woody, long, rather thick. *Stems* from five to eight inches long, ſomewhat woody, diffuſed, leafy, pubeſcent towards the top. *Leaves* ſmall, acute, greyiſh green. *Stipules* two, oppoſite, very ſmall, acute. *Flowers* ferruginous or reddiſh yellow, ſolitary; peduncles and calyxes pubeſcent. *Capſules* globular, three-celled. A native of Spain. 91. C. *arabicus,* Linn. Sp. Pl. 37. Mart. 49. Willd. 79. Desfon. Flor. Atl. 1. p. 419. Vahl. Symb. 2. tab. 35. (C. ferrugineus; β. Lam.? Helianthemum creticum, linariæ folio, flore croceo; Tourn. Cor. 18.) “Somewhat ſhrubby; leaves alternate, lanceolate, flat, even-ſurfaced.” Linn. “Somewhat ſhrubby, procumbent; leaves linear; thoſe of the peduncles alternate, thoſe of the ſmaller branches crowded.” Vahl. *Stem* branched from the bottom. *Branches* often a foot long, at firſt procumbent, afterwards aſcending, ſlender, cylindrical, ſmooth; branchlets numerous, alternate, diſtant, widely ſpreading; lower ones barren; upper ones floriferous, quite ſimple, elongated, cinereous, pubeſcent. *Leaves* of the barren branchlets crowded, marked with two lines, declining, linear, ſtiffiſh, without veins, rather obtuſe; upper ones tomentoſe-aſh-coloured. *Stipules* minute, egg-ſhaped. *Leaves* of the floriferous branchlets broader, longer, pubeſcent. *Stipules* lanceolate. *Flowers* three or four in a terminal raceme, without bractes; pedicels diſtant, hairy, and ſomewhat viſcid towards the top, a little thicker under the flower; calyx hairy, ſomewhat viſcous; inner leaves three-nerved, membranous between the nerves; outer ones lanceolate. Vahl. Vahl's plant came from Spain. According to La Marck, Tournefort's plant from the iſland of Candy differs from the preceding ſpecies only in being larger, leſs pubeſcent, with a little longer leaves; but he is dubious whether it be C. arabicus of Linnæus. 92. C. *racemoſus,* Linn. Mant. 76. Mart. 42. Lam. 53. Willd. 69. Vahl. Symb. 1. p. 39. Cavan. Ic. 2. tab. 140. (C. lavandulæ folio, thyrſoides; Barr. ic. 293.) “Somewhat ſhrubby; leaves lanceolate-linear, tomentous underneath.” Linn. “Somewhat ſhrubby; leaves lanceolate-linear, tomentous underneath; racemes terminal, unilateral; calyxes even-ſurfaced, angular. Lam. *Stem* nine or ten inches high. *Branches* numerous, erect, very ſlender, whitiſh, and ſlightly cottony towards the top. *Leaves* oppoſite, narrow, about an inch long, revolute, cottony and whitiſh underneath, green above, with a longitudinal furrow. *Stipules* awl-ſhaped. *Flowers* in long, terminal, upright racemes. Lam. A native of Spain. 93. C. *lavandulifolius,* Mart. 64. Lam. 54. Willd. 68. Vahl. Symb. 1. p. 39. Desfont. Fl. Atl. 1. p. 47. (C. folio ſpicæ; Bauh. Pin. 465. C. lavandulæ latifoliæ folio. Barr. ic. 288. Good. Helianthemum lavandulæ folio, Tourn. 249.) Somewhat ſhrubby, erect; leaves lanceolate, revolute, ſomewhat hoary; racemes terminal, incurved; flowers crowded.” Lam. *Stem* about a foot high, woody. *Branches* oppoſite, upright, whitiſh near the top. *Leaves* oppoſite. *Stipules* four, ſmall, villous, narrow, acute. *Flowers* yellow, ſmall; racemes terminal, a little branched, at firſt ſhort and curved; calyxes whitiſh, a little cottony; its leaves bordered with white ſilky hairs. When not in flower, the whole plant greatly reſembles common lavender. A native of Spain, the ſouth of France, Tunis, and Syria. According to La Marck, C. Syriacus of Jacquin and Martin, deſcribed above, n. 54. is only a variety of this ſpecies, with larger, leſs revolute, and not leſs white leaves. Willd. gives it as a ſynonym, and not even a variety. 94. C. *appenninus*, Linn. Sp. Pl. 35. Mart. 47. Willd. 77. (C. hiſpidus β. Lam. 55. Helianthemum ſaxatile, foliis & caulibus incanis oblongis, Apennini montis; Retz pug. tab. 8. Dill. Elt. 176. " Shrubby, ſpreading; leaves lanceolate, hairy." *Stem* a foot high, branched. *Leaves* green and rough, with hairs on the upper ſurface, hoary underneath. *Flowers* white. 95. C. *hiſpidus*, Lam. 55. (Chamæciſtus folio thymi, incanus. Bauh. Pin. 466. Helianthemum flore albo, folio anguſto, hirſuto. J. Bauh. 2. p. 17. Tourn. Inſt. 248. " Somewhat ſhrubby, erect; leaves oblong, hairy on the upper ſurface, tomentous underneath; calyxes hairy-hiſpid." Lam. *Stems* near a foot high, diffuſe, branched. *Branches* ſlender, whitiſh, and villous near the top. *Leaves* oppoſite, revolute. *Flowers* white, in terminal racemes. A native of Italy and the ſouth of France, diſtinguiſhed from the next ſpecies by its very hiſpid calyxes. 96. C. *piloſus*, Linn. 32. Allion. ped. n. 1672, tab. 45. fig. 1, 2. " Somewhat ſhrubby, rather erect; leaves linear, two-furrowed, underneath hoary; calyxes ſmooth and even." *Flowers* white; bractes ſolitary, at the ſide of the pedicels. A native of Spain, Piedmont, and the ſouth of France; cultivated by Miller in 1759. 97. C. *fœtidus*, Willd. 74. Jacq. ic. 1. tab. 98. Miſc. 2. p. 341. " Somewhat ſhrubby, procumbent; ſtipules lanceolate; leaves oblong, hirſute, ſcabrous." *Flowers* white. The whole plant has the fœtid ſmell of bryony. 98. C. *polifolius*, Linn. Sp. Pl. 36. Mart. 48. Lam. 56. Willd. 78. (C. humilis, Pluk. Alm. 107. tab. 23. fig. 6. Helianthemum foliis poli montani; Tourn. Inſt. 249. Dell. Elt. tab. 145. fig. 172.) " Somewhat ſhrubby, procumbent, with a ſtarlike pubeſcence; leaves oblong, revolute, tomentous-hoary underneath." Dr. Smith. The habit of C. helianthemum, but very diſtinct. *Stems* from five to eight inches long, tomentous, with cloſe-preſſed hairs. *Leaves* green above, with ſcattered ſtarlike hairs, white underneath, and denſely cloathed with ſtarlike down, marked with a very prominent nerve. *Flowers* white; calyx hairy, chiefly on the nerves; hairs bundled or ſtarlike. *Capſule* obſoletely three-celled. Dr. Smith. A native of England and France. 99. C. *ſplendens*, Lam. 57. (Helianthemum album Germanicum, Tabern. ic. 1002. Tourn. 248.) " Somewhat ſhrubby, erect; leaves lanceolate, linear, green and ſhining above, hoary underneath; calyxes ſmooth and even." About a foot high. *Stem* branched from the bottom. *Branches* very ſlender, cylindrical, ſmooth, chiefly erect. *Leaves* oppoſite, petioled, a little revolute, near an inch long. *Flowers* white, ſmall, peduncled, in terminal racemes; calyxes greeniſh, with brown nerves; claws of the petals and ſtamens yellow. A native of Germany and France.

(2.) *Stem herbaceous.*

100. C. *punctatus*, Willd. 46. " Erect, pubeſcent; raceme terminal; leaves oppoſite, oblong; lower ones inverſely egg-ſhaped." *Root* annual. *Stem* about three inches high. *Branches* erect, ſtiff, oppoſite, ſimple, ſhorter than the ſtem. *Leaves* oppoſite, petioled; lower ones obtuſe; upper ones rather acute. *Stipules* linear-lanceolate. *Flowers* in an elongated, terminal raceme; peduncles one-flowered, erect; bracte ovate-lanceolate, ſmall, not at the baſe, but about the middle of the peduncle; outer-calyx-leaves linear, ſpreading. Deſcribed by Willdenow from a dried ſpecimen; native country unknown. 101. C. *ledifolius*, Linn. Sp. Pl. 24. Mart. 28. Lam. 58. Willd. 47. (C. ledi folio, Bauh. Pin. 465. Lob. Ic. 2. 118. Helianthemum ledi folio, Tourn. 249.) " Erect, ſmooth; flowers ſolitary, nearly ſeſſile, oppoſite to the ternate leaf." Linn. " Pubeſcent; leaves lanceolate; peduncles erect, ſhorter than the calyx." Dr. Smith. *Root* annual, ſmall, a little branched. *Stem* from ſix to nine inches high, rather erect, generally ſimple, ſometimes branched from the bottom, cylindrical, hirſute, leafy, few-flowered. *Leaves* oppoſite, petioled, obtuſe, quite entire, narrowed at the baſe, pubeſcent on both ſides. *Stipules* two, lanceolate, acute, three times ſhorter than the leaf. *Flowers* yellow, oppoſite to the leaves, erect, on ſhort peduncles; calyx-leaves acuminate, nerved, hirſute; petals ſhorter than the calyx, ſoon falling off. *Capſule* about the length of the calyx, ſmooth, one-celled. Dr. Smith. According to La Marck, there are four ſtipules, growing in pairs, and almoſt as large as the leaves near the top of the plant. A native of England and France. 102. C. *niloticus*, Linn. Mant. 246. Mart. 30. Willd. 49. (C. ledifolius, β, Lam.) " Erect, ſomewhat tomentous; flowers in racemes, ſolitary, ſeſſile, oppoſite to the leaves." *Root* annual. *Stem* a foot high, ſomewhat woody, cylindrical. *Branches* next the root aſcending, ſhorter than the ſtem; towards the top of the ſtem alternate, erect, few. *Leaves* oppoſite, petioled, elliptic, ſpreading, ſomewhat tomentous, veined, longer than the joints of the ſtem. *Stipules* four, ſword-ſhaped, half the length of the leaf, permanent. *Flowers* yellow; in a terminal, erect, ſtiff raceme, alternate, accompanied by a leaf and two ſtipules, ſimilar to thoſe of the ſtem-leaves; calyx five-leaved, erect; the three inner leaves three-nerved, acuminate, two outer ones linear, ſhorter, ſpreading. A native of Egypt. Linn. La Marck aſſerts that it is merely a variety of the preceding, only a little larger, and without any pretenſions to be received as a diſtinct ſpecies. 103. C. *ſalicifolius*, Linn. Sp. Pl. 25. Mart. 29. Lam. 59. Willd. 48. (C. folio ſalicis, Bauh. Pin. 465. Lob. Ic. ii. p. 118. Helianthemum ſalicis folio, Tourn. Inſt. 249. H. annuum humile, foliis ovatis, flore fugaci, Seg. Ver. iii. tab. 6. fig. 3. good.) " Spreading, villous; flowers racemed, erect; pedicels horizontal." Linn. *Root* annual. *Stem* branched from the bottom. *Branches* ſpreading, about five inches long, cylindrical, pubeſcent. *Leaves* petioled, ſmall, oppoſite and alternate, oval-oblong, rather obtuſe, ſlightly wrinkled, cloathed with a ſhort ſomewhat woolly down. *Flowers* ſmall, pale yellow or whitiſh; peduncles alternate, lateral, and terminal, longer than the calyx, one-flowered. *Capſules* ſmaller than thoſe of the preceding ſpecies, ſcarcely longer than the calyx. A native of Spain, Portugal, and the ſouth of France. 104. C. *ægyptiacus*, Linn. Sp. Pl. 26. Mart. 31. Lam. 60. Willd. 50. Jacq. Obſ. 3. tab. 68. " Erect; leaves linear-lanceolate, petioled; calyxes inflated, larger than the corolla." Linn. *Stem* five or ſix inches high, very ſlender, generally ſimple, but ſometimes branched from the bottom, pubeſcent towards the top. *Leaves* about an inch long, oppoſite, on ſhort peduncles; ending in a weak point, ſmooth above, almoſt imperceptibly villous underneath. *Flowers* yellowiſh, very ſhort, peduncled, alternate, drooping, in a terminal raceme; two outer calyx-leaves very ſmall, half open; the three others converging into ſomething like an inflated, tranſparent bladder, remarkable for its ſtrong, ciliated, purpliſh nerves. *Capſules* encloſed in the calyx. A native of Egypt. In this now very extenſive intricate genus, Linnæus has thirty-ſeven ſpecies in the Species Plantarum, with the addition of ſix others in the two Mantiſſas; La Marck, ſixty; Profeſſor Martyn, in his edition of Miller's Dictionary, ſixty-ſix; and Willdenow, ſeventy-nine.

Cistus *indicus*, Herm. Lugb. Rai. Hiſt. See Azalea *indica*.

Cistus *virginiana, perclymeni flore ampliori minus odorato,* Pluk. See Azalea *nudiflora.*

Cistus *virginiana, flore & odore perclymeni,* Pluk. Alm. Catesby. See Azalea *viſcoſa.*

Cistus *humilis æthiopicus,* Pluk. Mant. See Diosma *uniflora.*

Cistus *folio majoranæ,* Bauh. Pin. See Telephium *imperati.*

Cistus *urticæ folio,* Sloan. Ray. See Turnera *ulmifolia.*

Cistus *chamærhododendros mariana laurifolia,* Pluk. Alm. See Kalmia *latifolia.*

Cistus *ſempervirens laurifolia,* Pluk. Alm. See Kalmia *anguſtifolia.*

Cistus *ledon foliis roſmarini ferrugineus,* Bauh. Pin. See Ledum *paluſtre.*

Cistus *pumilus montis Baldi,* J. Bauh. —— *chamærhodendros foliis confertis,* Pluk. Alm. See Rhododendrum *chamæciſtus.*

Obſ. Ancient authors differ much from each other in their application of the terms Ciſſus and Ciſtus. Ciſſus, Κισσος, in the Attic dialect Κιττος, is the proper Grecian name for the common ivy, hedera helix of Linnæus. Theophraſtus, as might be expected, gives it in its Attic form, and ſo clearly deſcribes it, as to leave no doubt of the plant intended. Of the plants which conſtitute the preſent Linnæan genus Ciſſus, none of which are natives of Greece, he appears to have had no knowledge. They reſemble the common ivy in nothing but in being climbers; and even in that ſingle point the reſemblance is not complete, as they attach themſelves to other bodies for ſupport in a very different manner.

The word Κισσος occurs twice in our preſent copies of the "Hiſtoria Plantarum, lib. 6. cap. 1." near the end, and in immediate connection with it, cap. 2. at the beginning. But the critics ſuppoſe, with great probability, that the text is corrupt, and that the genuine reading is Κιστος. For, to ſay nothing of the improbability, that the citizen of Athens ſhould depart from his native dialect, which he had elſewhere conſtantly preſerved, there is a moral certainty that he could not have meant the common ivy, no leſs from the place which he has aſſigned it in his ſyſtem, than from the characters which he has attributed to it. He had already deſcribed the common ivy, κισσος, or, as he ſpells it, κιττος, in that part of his work which treats of trees; an arrangement to which he was led by its thick arboreous ſtem or trunk when it is grown old. He is now proceeding to ſhrubs and herbaceous plants, *καὶ γαρ κισσου* (lege *κιστου*) *δυο γενη διαιρουσι, το μεν ἀρρεν, το δε θηλυ. τῷ το μεν μειζον καὶ σκληροτερον καὶ λιπαρωτερον φυλλον εχειν, καὶ το ανθος επιπορφυριζον, αμφω δε ὁμοια αγριοις (ροδοις)· πλην ελαττω καὶ αοσμα.* "For there are two kinds of ciſtus, one male, the other female; the former having larger, firmer and more ſucculent leaves, and a purpliſh flower; but both reſembling the wild roſe, though ſmaller and without ſcent." This deſcription cannot be applied to the common ivy, but correſponds exactly with thoſe ſpecies of ciſtus which were moſt familiar to this venerable naturaliſt, and are both of the ladaniferous kind. It is not a little ſurpriſing that he makes no mention of the ladanum itſelf. Dioſcorides has amply ſupplied the omiſſion, and has given a particular account of its medical properties, and of the manner in which it was then collected. Bodæus a Stapel, in his notes on Theophraſtus, labours hard to prove that a different poſition of the accent gives a different meaning to the ſame word; and that Κίστος with the accent on the penultimate is the proper ciſtus, on the laſt ſyllable the common ivy. But after much learned diſquiſition, he appears to us to have very honeſtly left the ſubject juſt as he found it, without taking away or diminiſhing any part of its difficulties. Dioſcorides aſcribes roſe-coloured flowers to what was then eſteemed the male, and white ones to the female; and in this he ſufficiently agrees with Theophraſtus, except that the latter has not noticed the colour of the flowers of the female. It appears from Dioſcorides, Lib. i. cap. 126, that in his time *κιστος* was called by ſome *κισθος, κισθαρον,* or *κισταρον*; the laſt two diminutives, one of *κισθος,* the other of *κιστος.* From theſe variations the confuſion which prevails in ſucceeding writers ſeems to have riſen. Galen calls the ivy *κιστος,* and the true ciſtus *κισθος.* Heſychius in his lexicon does the ſame. Κισθος *θαμνος οὗ αρρεν και θηλυ εστιν.* Κιστος *ειδος φυτου, η βλαστημα ηλισσομενον.* The epithet *ελισσομενον* can be referred only to the ivy, in direct oppoſition to Theophraſtus. Paulus Œgineta alſo expreſsly aſſerts that *κιστος* is the ivy. Pliny, the natural hiſtorian, confounds the *κισσος* and *κιστος* of the Greeks, conſidering both of them as ſpecies of ivy, and paſſing from one to the other, as if they were the ſame plant. See Lib. xvi. cap. 38. He begins with ſtating from Theophraſtus, that the ivy will not grow in India, and that Alexander, on account of its rarity, and, in imitation of Bacchus, crowned his army with it, on their triumphant return from that country He then adds, without any intimation of a tranſition to another ſubject, "Duo genera ejus prima, ut reliquarum mas et fœmina. Major traditur corpore, et folio duriori, etiam ac pinguiore, et flore ad purpuram accedente. Utriuſque autem flos ſimilis eſt roſæ ſylveſtri, niſi quod caret odore." This deſcription is taken from Theophraſtus, and can be applied only to ciſtus. He was doubtleſs deceived by the corrupt reading in the copies of that author; but it is evident that in this inſtance he wrote without any perſonal knowledge of the latter plant. He finally proceeds in the ſame unbroken kind of narrative, "Species horum genera tres. Eſt enim candida et nigra edera, tertiaque quæ vocatur helix;" and ſo goes on through the reſt of the chapter, deſcribing the ciſſus or ivy. The Arabian writers are ſaid to have laboured under the ſame confuſion of ideas. The earlier modern botaniſts partook of the embarraſſment; and we cannot wonder that the diſciples ſhould be puzzled, when their revered maſters were thus perplexed.

Cistus, in *Gardening,* comprehends different plants of the rock-roſe, or ſhrubby evergreen kind; of which the ſpecies chiefly cultivated are the poplar-leaved ciſtus, or rock-roſe (C. *populifolius*); the bay-leaved gum ciſtus (C. *laurefolius*); the Spaniſh gum-ciſtus (C. *ladaniferus*); the hoary rock-roſe, or roſe-ciſtus (C. *incanus*); the ſea purſlain-leaved ciſtus (C. *halimifolius*); the Montpelier gum-ciſtus (C. *monſpelienſis*); the Cretan ladaniferous-ciſtus (C. *creticus*); the white-leaved ciſtus (C. *albidus*); the curled-leaved ciſtus (C. *criſpus*); and the ſage-leaved ciſtus (C. *ſalvifolius*). But there are others that may equally deſerve cultivation. Theſe are all plants that riſe to conſiderable height in the ſtems, having a branching ſhrubby growth.

Of the third ſort there are varieties with large white flowers, and a purple ſpot in the middle of the petal, and with entire white flowers. The fifth has alſo varieties with numerous leaves and ſulphur-coloured flowers, and with yellow flowers, with purple ſpots in their baſes. And in the fixth there is a variety with olive-ſhaped leaves, and ſulphur-coloured flowers.

Method of Culture.—All theſe different ſorts are capable of being either raiſed by ſeeds or cuttings in the common earth, or on hot-beds; but the ſeed-method is moſtly practiſed, as it produces the beſt plants. The ſeeds ſhould be ſown in the early ſpring ſeaſon in a warm border near half an inch deep, and the plants will come up in ſix weeks: or, to render

der them more forward, in pots, and plunged in a moderate hot-bed. When the plants are of ſome growth, they ſhould have the full air admitted to them in the frames in mild weather, and frequent waterings, as well as occaſional ſhade from the ſun, while young; and when an inch or two high, ſome may be planted out ſeparately in ſmall pots, others in rich borders, occaſional ſhade and water being given during the ſummer-months. In autumn the potted plants ſhould be removed to a frame, to have ſhelter from froſt. Thoſe in the full ground ſhould alſo be carefully ſhielded in froſty weather with mats. In ſpring, when the weather is ſettled, thoſe remaining in the ſeed-bed ſhould be planted out, and thoſe in pots ſhifted into larger ones, to be continued another winter, and in the ſpring following be planted where they are to remain in the open ground.

When the latter method is practiſed, cuttings five or ſix inches long ſhould be planted the ſpring or ſummer ſeaſons in beds of rich earth, occaſional ſhade and water being given. When well rooted, they ſhould be removed into ſeparate pots; but by being planted in pots in the ſpring, and plunged in a hot-bed, they are rendered much forwarder. In other reſpects they require the ſame management as the ſeedling-plants.

They are all beautiful evergreen ſhrubs, effecting a fine variety at all ſeaſons, both from their leaves being of different figures, ſizes, and ſhades of green and white, and their being very profuſe in moſt elegant flowers, which, though of ſhort duration, there is a daily ſucceſſion of new ones for a month or ſix weeks on the ſame plant; and where the ſeveral different ſpecies are employed, they exhibit a conſtant bloom of near three months.

They are moſtly of a ſufficiently hardy nature to proſper in the open ground in any dry ſoil; and if they have a ſheltered ſituation, it will be an advantage, as in open expoſures they are rather ſubject to injury from very ſevere froſts; for which reaſon a plant or two of each ſort ſhould be conſtantly potted, to have ſhelter in winter in the green-houſe, or ſome other ſimilar place, where they are to be well protected in ſevere weather.

The ſecond and fifth are the moſt tender ſorts, and of courſe demand more attention.

In ſetting them out in ſhrubbery borders and clumps, they ſhould be placed towards the fronts, in aſſemblage with other choice ſhrubs of ſimilar growth. All the ſorts ſhould be ſuffered to aſſume their own natural growth, the ſtraggling branches being only cut in with a knife as there may be occaſion.

CITADEL, or Cittadel, Fr. *Citadelle*, a diminutive of the Italian *citta*, city, and denoting little city, in *Fortification*, a kind of fort, or ſmall fortification, conſiſting of four, five, or ſix ſides, with baſtions, commonly joined to towns, and ſometimes erected on commanding eminences within them. It is diſtinguiſhed from a caſtle by its having baſtions.

When the inhabitants of any town or place in a country, particularly if it be newly conquered, are diſpoſed to revolt, citadels are built to overawe them, and prevent all attempts on their part to ſhake off their dependence, as well as to ſecure the garriſon againſt any treachery, which they might meditate, or enter into againſt them.

It frequently happens alſo, as in Italy, that when a town is large and wealthy, has but few or no fortifications; and when the fortifying of it regularly would be attended with too great an expence, a citadel is built both to ſecure it againſt the attempts of an enemy, and to ſerve as a place of ſafety for the effects of the inhabitants in time of danger.

As to the ſituation of a citadel, if a town lies in a cleared and open country, it ought to be erected on the higheſt part of the ground, in order to overlook and command all the other parts, if poſſible. If the town lies near a river or lake, that is navigable, the citadel ſhould be placed at the entrance thereof, to prevent the approach of an enemy with ſhipping. And if the place is a ſea-port, the citadel ſhould be placed near the harbour, and in ſuch a manner as to command it throughout its whole extent, both for the protection of the ſhipping in the ſame, and for the ſecurity of the town againſt a bombardment.

Due attention ſhould be paid in erecting a citadel to the placing of it in ſuch a manner, that its works may look along and ſcour the principal ſtreets of the town, in order to fire on and diſperſe the mob in caſe of any tumult, inſurrection, or ſedition, and alſo to prevent the approach of an enemy that way, ſhould the town be taken. An open ſpace, called an *eſplanade*, ſeveral hundred yards broad, ſhould be left between the works of the citadel and thoſe of the town, for the purpoſe of drawing up, muſtering, and exerciſing the troops or garriſon on, and for preventing any ſecret or hidden approach, that might be carried on from the town againſt the citadel.

Citadels may be rectangular, ſquare, pentagonal, hexagonal, or of any other figure. But the pentagonal is the form moſt commonly made uſe of. The hexagonal form is generally conſidered as too large for one, and as requiring too great an expenditure for its utility, or the advantages to be derived from it; whilſt a work of the quadrangular, or ſquare form, is regarded as too inconſiderable, and incapable of making a ſufficient defence. The citadels of Liſle, Arras, Tournay, Amiens, are pentagons; thoſe of Montpellier, Bayonne, St. Martin de Ré, Havre de Grace, and Cambray, are ſquares; that of Perpignan is hexagonal; that of Metz is nearly rectangular; thoſe of Belle Iſle and Calais are quadrangular; that of Verdun is irregularly heptagonal; that of Valenciennes is quite irregular. And ſometimes they are found in the form of a ſtar-fort.

Sometimes a citadel is erected on a hill or eminence, within the fortifications of a place. One ſo ſituated is well calculated for keeping the inhabitants in awe, if its garriſon be ſufficiently provided with neceſſaries for defending themſelves till relief can be ſent to them. But it is of little uſe againſt an enemy that once gets poſſeſſion of the town itſelf.

The exterior ſides of a citadel, when it is regular, are generally each of them about 150 toiſes, or fathoms. But they may be more or leſs at pleaſure, as occaſion or the nature of the ground requires.

The citadel ſhould be fortified in a ſtronger manner than the town itſelf, to prevent the enemy's attacking it firſt, and by means of it afterwards reducing the other. And care ſhould be taken to make the parts, where the citadel joins the town, ſufficiently ſtrong to prevent both of them from being attacked together.

There are, for the moſt part, two gates to a citadel, the one for a communication with the town, and the other with the country. The former ſerves for the garriſon of the place to retire into the citadel, in caſe of an inſurrection or ſedition, or after the town has capitulated, and the latter for receiving aſſiſtance and ſuccour, when either the town is taken, or the citadel is blockaded by the inhabitants.

The citadel generally extends along, or takes up the two ſides of the fortification of the place that adjoin it, and ſhould be conſtructed in ſuch a manner, that the ditch of the place may be defended as directly as poſſible, either by the faces of its baſtions, or by thoſe of its ravelins, and that the enemy may have no advantage wherever they commence their attacks; ſo that if they attack the citadel in the firſt inſtance, the attempt may occaſion to them as much trouble and loſs of time as their attacking of the town firſt and the citadel afterwards.

It is but ſeldom that a citadel is joined to a town in ſuch a manner as to furniſh a direct defence for the ditch. This is a material defect; and, when it exiſts, ſhews that the citadel is not properly joined to the works of the place. Among others that might be mentioned, the citadels of Liſle, Arras, Tournay, &c. are greatly deficient in this reſpect.

In addition to what has already been ſaid reſpecting citadels, it may not be improper to obſerve, that in an extenſively fortified place a citadel may be formed, by uniting parts of its works themſelves, ſuch as a couple of adjoining baſtions, by a good retrenchment with flanking defences. Such a one will be ſufficient for keeping the inhabitants, who may be diſaffected to the government of the place, in awe, and for preventing and ſuppreſſing inſurrections. And the expence of making it is very trifling, compared to that of adding another fortification to that of the place. And ſuch additional works ſeldom add ſtrength to the works of a place in proportion to the expence of erecting them.

CITADINESCA, in *Natural Hiſtory*, a name given by ſome writers to the Florentine marble, which is ſuppoſed to repreſent towns, palaces, ruins, rivers, &c. Theſe delineations are merely accidental, and are uſually much aſſiſted by the imagination, though the natural lines of a ſtone may ſometimes luckily enough repreſent the ruins of ſome ancient building, or the courſe of a river. We have in England a kind of a ſeptaria, or ludus Helmontii, which has ſometimes delineations of this kind conſiderably beautiful, though very irregular. The Florentine marble, as we ſee it wrought up in the ornaments of cabinets, &c. owes a great deal to the ſkill of the workmen, who always pick out the proper pieces from the maſs, and diſpoſe them in the work ſo as to make them repreſent what they pleaſe.

CITAMUM, in *Ancient Geography*, a town of Aſia, placed by Ptolemy in Greater Armenia, near the Euphrates.

CITERIUS, a mountain of Macedonia, according to Ptolemy. Strabo calls it *Titarus*, and ſays that one of its extremities touched Mount Olympus.

CITATION, formed from *cito*, of *cieo*, *I ſtir up*, in the *Eccleſiaſtical Court*, a ſummons to appear before an eccleſiaſtical judge, on ſome affair relating to the church.

In the civil and ordinary courts it is called *ſummoning*. The eccleſiaſtical courts proceed according to the courſe of the civil and canon laws, by citation, libels, &c. A perſon is not generally to be cited to appear out of the dioceſe or peculiar juriſdiction in which he lives, unleſs it be by the archbiſhop in default of the ordinary; where the ordinary is party to the ſuit, in caſes of appeal, &c. And by law a defendant may be ſued where he lives, though it be for ſubtracting tythes in another dioceſe, &c. 1 Nelſ. 449. By the ſtat. 23 Hen. VIII. c. 9. every archbiſhop may cite any perſon dwelling in any biſhop's dioceſe within his province for hereſy, &c. if the biſhop or other ordinary conſents; or if the biſhop or ordinary, or judge, omits to do his duty in puniſhing the offence. Where perſons are cited out of their dioceſe, and live out of the juriſdiction of the biſhop, a prohibition or conſultation may be granted; but where perſons live in the dioceſe, if when they are cited they do not appear, they are to be excommunicated, &c. The above ſtatute was made to maintain the juriſdiction of inferior dioceſes, and if any perſon is cited out of the dioceſe, &c. where the civil or canon law doth not allow it, the party aggrieved ſhall have double damages. If one defame another within the peculiar of the archbiſhop he may be puniſhed there; although he dwell in any remote place out of the archbiſhop's peculiar. Godb. 190.

Citation is alſo uſed in ſpeaking of military and monaſtic as well as eccleſiaſtical courts. Such a heretic was cited to Rome, to a general council, &c.

Knights are cited to the general chapters of their order. King Edward I. of England was cited by order of Philip IV. of France, to a court of his peers; the citation was publiſhed by the ſeigneur d'Arrablay, ſeneſchal of Perigord and Querci; and was paſted up by his order, on the gates of the city of Libourne, which then belonged to king Edward. And for default in not appearing, all his domains and effects in France were confiſcated.

Citation is alſo an allegation or quotation of ſome law, authority, or paſſage.

CITELLUS, or Citillus, in *Zoology*, the name of a ſmall quadruped of the marmot tribe, the *arctomys citillus* of Schreber and Gmelin, and *mus citillus* of Pallas. Citillus is the old name under which Ray and Geſner deſcribe this little animal; Buffon calls it *le zizel* and *le ſouſlik*; Güldenſtadt, *mus ſuſlica*; and Pennant, the *caſan* or *earleſs marmot*.

The earleſs marmot, as its trivial appellation implies, is ſpecifically diſtinguiſhed from the reſt of the *arctomys* genus by being deſtitute of ears; the tail is villous, and body variegated. The prevailing colour is brown ſpotted, or otherwiſe diverſified with white; the under parts white, inclining to yellowiſh, the tail is of a brown colour above and ferruginous beneath. The length is about ten inches and a half including the tail, the body only, from the tip of the noſe to the baſe of the tail, meaſuring ſix inches. According to Pallas this animal varies, however, conſiderably in ſize as well as colour, for he aſſures us there are ſome varieties ſcarcely larger than the common water rat, while others are nearly equal in ſize to the alpine marmot. The earleſs marmot is an inhabitant of ſeveral parts of Europe, being found in Bohemia, Auſtria, and Hungary, the ſouthern part of Ruſſia, from the banks of the Volga to India and Perſia; through Siberia and Great Tartary to Kamtſchatka; it occurs alſo in China and America.

The writings of Pallas afford us an intereſting hiſtory of the manners of this little animal. He obſerves that it delights in dry hilly places, where the herbage is of ſhort growth, although it is ſometimes found in woods; they form ſubterraneous burrows in which they depoſit their winter food, which conſiſts chiefly of grain, roots, or nuts, for they do not appear to ſleep during the winter ſeaſon like ſome others of this genus. They breed in the ſpring, and produce from five to eight at a litter; they are ſometimes ſeen in conſiderable numbers baſking in the ſun-ſhine near the entrances of their burrows, and when diſturbed utter the ſame kind of ſhrill whiſtle as the common marmot. In a ſtate of nature they are quarrelſome and ferocious among themſelves, though they may be more readily tamed than moſt other animals. Vegetables are their principal food, but they alſo prey on ſmall birds and animals. They are of an extremely cleanly diſpoſition, and after feeding waſh their faces and lick their fur after the manner of cats. Like other domeſticated animals, they are fond of being careſſed and feed readily from the hand; their ſleep, according to Pallas, is extremely profound; it commences early in the evening and continues during the whole night, and even during great part of the day, when the weather happens to be cold or rainy.

Gmelin expreſſes ſome doubts whether this may not be the *mus ponticus* of Ariſtotle and Pliny. Some other late writers conceive that the *zizel* and the *ſuſlic* of Buffon are diſtinct, and that of conſequence the hiſtory of two different animals has been erroneouſly confounded by thoſe who conſider them as varieties only of a ſingle ſpecies.

CITERIA, ſmall figures which were made to ſpeak like our puppets, and which were carried before a Roman general on the day of his triumph. Theſe puppets uttered every kind of ludicrous words to excite the laughter of the people at the expence of the captives.

CITHÆRON, in *Ancient Geography*, a mountain of Greece, in Bœotia, near the city of Thebes. Pliny and Mela ſay that it was conſecrated to the Muſes; and Plutarch ſays, that it was called "Arterius," before it was named Cithæron.

CITHARA, in *Ancient Muſic*, a ſtringed inſtrument, of the harp or lute kind. The idea of producing ſound from a ſtring, aſcribed to Apollo, was, according to Cenſorinus, *De Die Nat.* cap. 22, ſuggeſted to him by the twang of his ſiſter Diana's bow. Ψαλλειν is ſtrictly to twang a ſtring, and Ψαλμος the ſound which the bow-ſtring produces at the emiſſion of the arrow. Euripides in Bacch. v. 782, uſes it in that ſenſe,

——— ——— τοξων χερι
Ψαλλουσι νευρας.

Who twang the nerve of each elaſtic bow.

Father Montfaucon ſays it is very difficult to determine in what the lyre, cithara, chelys, pſaltery, and harp, differed from each other; as he had examined the repreſentations of 600 lyres and citharas in ancient ſculpture, all which he found without a neck, and the ſtrings open as in the modern harp, played by the fingers. Antiq. Expl. tom. iii. lib. 5. cap. 3. But though ancient and modern authors uſually confound theſe inſtruments, yet a manifeſt diſtinction is made by Ariſt. Quintil. in the following paſſage, p. 101. After diſcuſſing the characters of wind-inſtruments, he ſays, "Among the ſtringed inſtruments, you will find the lyre of a character analogous to *maſculine*, from the great depth or gravity, and roughneſs of its tones; the *ſambuca* of a *feminine* character, *weak* and *delicate*, and from its great *acuteneſs*, and the ſmallneſs of its *ſtrings*, tending to *diſſolve* and *enervate*. Of the intermediate inſtruments, the *polypthongum partakes* moſt of the *feminine;* but the *cithara differs not much* from the *maſculine character* of the *lyre*." Here is a ſcale of ſtringed inſtruments; the *lyre* and *ſambuca* at the extremes; the *polypthongum* and *cithara* between; the one next to the *ſambuca*, the other next to the *lyre*. He afterwards juſt mentions that there were others between theſe. Now it is natural to infer, that as he conſtantly attributes the manly character to gravity of tone, the cithara was probably the more acute inſtrument of the two; leſs loud and *rough*, and ſtrung with ſmaller ſtrings. Concerning what difference there might be in the form and ſtructure of the inſtruments, he is wholly ſilent. The paſſage, however, is curious as far as it goes, and deciſive. The cithara may perhaps have been as different from the lyre, as a ſingle harp from one that is double; and it ſeems to be clearly pointed out by this multiplicity of names that the Greeks had *two* principal ſpecies of ſtringed inſtruments: one, like our harp, of full compaſs, that reſted on its baſe; the other more portable, and ſlung over the ſhoulder, like our ſmaller harp or guitar, or like the ancient lyres repreſented in ſculpture.

Tacitus, Annal. xvi. 4. among the rules of decorum obſerved by public performers, to which Nero, he ſays, ſtrictly ſubmitted, mentions, "That he was not to ſit down when tired." *Ne feſſus reſideret.* It is remarkable that he calls theſe rules, *citharæ leges*, "the laws of the cithara;" which ſeems to afford a pretty fair proof of its being of ſuch a ſize and form as to admit of being played on *ſtanding*.

The uſe of the *phorminx* in Homer leads rather to the rough, manly, harp-like character. But a paſſage in Orpheus (Argon 381.) ſeems to make *phorminx* the ſame as *chelys*, the lutiform inſtrument of Mercury. It is there ſaid of Chiron, that he "ſometimes ſtrikes the cithara of Apollo; ſometimes the *ſhell-reſounding phorminx* of Mercury,"

Αλλοτε δ' αυ Φοιβου κιθαρην μετα χερσιν αρασσων,
Ηλιγυρην Φορμιγγα χελυκλονον Ερμαωνος.

This paſſage is curious; for though the Argonautics were not written by Orpheus himſelf, they have all the appearance of great antiquity.

The belly of a theorbo, or arch-lute, is uſually made in the ſhell-form, as if the idea of its origin had never been loſt; and the etymology of the word guitar ſeems naturally deducible from cithara; it is ſuppoſed that the Roman C was hard, like the modern K, and the Italian word *chitarra* is manifeſtly derived from κιθαρα, *cithara*.

In the hymn to Mercury, aſcribed to Homer, Mercury and Apollo are ſaid to play with the cithara *under their arms*, ver. 507. ὁ δ' ὑπολενιον κιθαριζεν, *ſub ulna Citharâ ludebat*, "played with the Cithara *under his arm*." So in ver. 432. ἐπωλενιον, at his arm, ſhould, according to the critics, be ὑπωλενιον, as it is afterwards. This ſeems to point out a guitar more than a harp; but the ancients had lyres, citharas, and teſtudos of as different ſhapes from each other, as our harp, ſpinet, virginal, and piano-forte.

Theſe paſſages in old authors are a kind of antique drawings, far more ſatisfactory than thoſe of ancient ſculpture; for we have ſeen the ſyrinx, which had a regular ſeries of notes aſcending or deſcending, repreſented with ſeven pipes, four of one length, and three of another, which of courſe would furniſh no more than two different ſounds. The cymbals too, which were to be ſtruck againſt each other, are placed in the hands of ſome antique figures in ſuch a manner, that it is impoſſible to bring them in contact with the neceſſary degree of force, without amputating, or at leaſt violently bruiſing the thumbs of the performer. And it is certain that artiſts continue to figure inſtruments in the moſt ſimple and convenient form for their deſigns, long after they had been enlarged, improved, and rendered more complicated. An inſtance of this in our own country will confirm the aſſertion. In the reign of George the Second a marble ſtatue was erected to Handel, in Vauxhall gardens. The muſician is repreſented playing upon a lyre. Now if this ſtatue ſhould be preſerved from the ravages of time and accident 12 or 1400 years, the antiquarians will naturally conclude that the inſtrument upon which Handel acquired his reputation was the lyre; though we are at preſent certain that he never played on, or even ſaw a lyre, except in wood or ſtone.

In one of the ancient paintings at Portici, we ſaw a lyre with a pipe or flute for the croſs-bar, or bridge, at the top; whether this tube was uſed as a wind inſtrument to accompany the lyre, or only a pitch-pipe, we know not; nor, within the courſe of our inquiries, has any example of ſuch a junction occurred elſewhere.

CITHARÆDIST, a performer on the cithara or lute.

CITHAREXYLUM, in *Botany*, (from κιθαρα, a *harp*, and ξυλον, *wood*) fiddle-wood. Fr. Guittaren, or Bois de Guittarre, Cotelet. Enc. Linn. gen. 760. Schreb. 1019. Willd. 1158. Gært. 339. Juſſ. 108. Vent. vol. ii. 320. Lam. Ill. Pl. 545. Claſs and order, *didynamia angioſpermia*.

mia. Nat. Ord. *Perſonatæ*, Linn. *Vitices*, Juſſ. *Pyrenaceæ*, Vent.

Gen. Ch. *Cal.* Perianth one-leafed, campanulate, ſhort, toothed or truncated, permanent. *Cor.* one-petalled, funnel-ſhaped; tube longer than the calyx; border wheel-ſhaped, five-cleft; ſegments oblong, villous on the upper ſurface, almoſt equal. *Stam.* Filaments four in moſt ſpecies, with the rudiment of a fifth from the middle of the tube, ſhorter than the tube, two of them ſomewhat longer than the others; anthers oblong, didymous, erect. *Piſt.* Germ ſuperior, roundiſh; ſtyle filiform, the length of the ſtamens; ſtigma with an obtuſe head. *Peric.* Drupe roundiſh, ſlightly compreſſed, one-celled, containing two nuts, each nut two-celled, egg-ſhaped, hard, plano-convex, with an obſolete furrow on the back. *Seeds*, one in each cell of the nut, but in one of the cells ſometimes abortive.

Eſſ. Ch. Calyx toothed or truncate. Corolla funnel-wheel-ſhaped; ſegments villous above, nearly equal. Drupe with two nuts; nuts two-celled.

Sp. 1. C. *cinereum*, Linn. Sp. Pl. 1. Mart. 1. Lam. 1. Willd. 1. Brown. Jam. 264. Pluk. Alm. tab. 162. fig. 1. (C. teres, Jacq. Amer. tab. 118. Pict. tab. 178. Jaſminum arboreſcens racemoſum foliis lauri, Plum. MSS. Burm. Amer. tab. 157. fig. 2.) "Branches cylindrical; calyxes toothed," Linn. "Branches cylindrical; leaves oblong, acuminate, quite entire; racemes pendulous; calyxes toothed." A tree from fifteen to twenty feet high, not more than a foot in diameter, with a handſome branched head. *Branches* cinereous, ſmooth. *Leaves* commonly oppoſite, oblong-oval, acuminate at both ends, entire, bright green, and ſhining on the upper ſurface, a little veined underneath, with a few hairs on the axils of the nerves; petioles yellowiſh, with two or three concave mellifluous glands near their infertion into the leaf. *Flowers* white, numerous, ſmall, ſweet-ſcented, on ſhort peduncles, racemed; racemes from ſeven to nine inches long, quite ſimple, terminal, pendulous, ſolitary, or accompanied by two or three ſmaller ones at the baſe; corollas bearded at the mouth. *Fruit* roundiſh, ſucculent, ſhining, ſoft, firſt green, then red, finally black. Jacq. and La Marck. According to the latter, the branches in the plants cultivated at Paris are not cylindrical, as Linnæus deſcribes them, but truly tetragonal. A native of Jamaica, where it is called Old woman's bitter; and of Martinico and St. Domingo, where it is called by the French Bois Cotelet. 2. C. *quadrangulare*, Mur. Syſt. 564. Jac. Amer. 186. Hort. tab. 22. (C. cinereum β Lam.) It appears to be only a variety of the laſt ſpecies, as La Marck conſiders it, differing chiefly in having the berries red, or leſs black when ripe. The branches are round, but made apparently quadrangular, by having four ribs running down them. 3. C. *caudatum*, Linn. Sp. Pl. 2. Mart. 2. Lam. 2. Willd. 2.? Brown. Jam. 265. tab. 28. fig. 2. Swartz. Prod. 234. "Branches cylindrical; calyxes truncate," Linn. A ſhrub ten or twelve feet high. *Leaves* inverſely egg-ſhaped, leſs acuminate than thoſe of C. cinereus. *Racemes* terminal. *Fruit* ſmall. A native of Jamaica. Willdenow gives the caudatum of Swartz, as a ſynonym of quadrangulare; but as Swartz's plant has truncate calyxes, we apprehend there can be no doubt of its being the caudatum of Linnæus, and the plant deſcribed by Browne, which is expreſsly ſtated to have truncated calyxes. The C. erectum of Swartz, Prod. 91. Jacq. Ic. Rar. 3. tab. 501. quoted by Willdenow as a ſynonym of caudatum, appears to us a diſtinct ſpecies, with toothed calyxes. 4. C. *villoſum*, Mart. 4. Willd. 3. Jacq. Ic. Rar. tab. 118. Collect. 1. p. 72. Hort. Kew. 2. 349. "Branches tetragonal; leaves inverſely egg-ſhaped, pubeſcent underneath, ſomewhat toothed at the tip; racemes nodding." A ſmall tree, about ten feet high. *Trunk* and older branches round and cinereous; younger branches quadrangular and green; young ſhoots villous. *Leaves* three inches long, oppoſite, on ſhort petioles, acute, firm, ſomewhat rugged on the upper ſurface, extremely ſoft and villous on the under, with an oblong deep-green glandular hole on each ſide of the petiole at the top. *Flowers* white, numerous, on ſhort peduncles, villous all over, ſweet-ſcented; racemes half a foot long, terminal, pendulous; calyx truncate; according to Willdenow, obſoletely toothed, ſo as to be almoſt truncate; but in this as well as in his ſpecific character of C. caudatum, he ſeems biaſſed by a reſolution to have a five-toothed calyx part of the eſſential character of the genus. A native of St. Domingo. 5. C. *ſubſerratum*, Willd. 4. Swartz Ind. Occ. 2, p. 1043. Prod. 91. "Branches tetragonous; leaves oblong, rigid, tranſparent at the tip, ſomewhat ſerrated; racemes rather erect, calyxes toothed." *Leaves* veined. *Racemes* terminal, panicled. A native of Hiſpaniola. 6. C. *melanocardium*, Mart. 5. Willd. 6. Swartz. Prod. 91. Flor. Ind. Occ. 2. p. 1046. Brown. Jam. 265. (C. paniculatum, Gært. tab. 56.) "Branches tetragonous; flowers panicled, tetrandrous; leaves ſomewhat wrinkled, veined underneath, a little ſcabrous." A tree forty or fifty feet high, producing hard excellent timber; bark thick, whitiſh, winding, like the fibres of the wood, in a looſe ſpiral form. *Leaves* rather long, ſlightly ſerrated. *Flowers* in terminal panicled racemes, tetrandrous, and, as we preſume, without the rudiment of a fifth ſtamen. *Drupes* ſmall, yellow, egg-ſhaped, black, ſmooth. *Seeds* oblong, a little quadrangular, reddiſh. A native of Jamaica.

Propagation and Culture. The ſecond and fourth ſpecies are cultivated in England; and as they do not produce ſeeds in this climate, they are chiefly propagated by cuttings; but when ſeeds can be procured from the Weſt Indies, the plants which proceed from them are much better. They require the ſame kind of treatment as other tropical plants.

CITHARISTA, Ceireste, in *Ancient Geography*, a town of Gallia Narbonnenſis, at ſome diſtance from the ſea, in the ſame gulf with "Tauroentum," about ¼ of a mile from each other. Veſtiges of edifices erected by the Romans are ſtill viſible.

Citharista *Portus*, a harbour of Gallia Narbonnenſis, now called the port of "Ceireſte."

CITHARISTES Promontorium, *Cape Lician*, a promontory belonging to Gaul, between Tauroentum and Obbia.

CITHARISTIC, in *Ancient Muſic*, muſic and poetry fitted to the accompaniment of the cithara.

CITHARIZUM, in *Ancient Geography*, a fortreſs of Aſia, in Aſtianena, a country of Greater Armenia.

CITHAROEDUS, in *Antiquity*, the ſame with cithariſta. The citharoedi had the preference of all other muſicians, from whom they were diſtinguiſhed by an embroidered cloak, which was peculiar to them.

CITHENI Juga, in *Ancient Geography*, a name given by Pliny to mountains of Aſia, which he places in Parthia, near the country called *Choara*.

CITHIBEB, in *Geography*, a town of Africa, in the kingdom of Morocco, and province of Tedla.

CITHRUM, in *Ancient Geography*, a town of Greece, in Theſſaly.

CITILLUS. See Citellus.

CITIUM, Chiti, in *Ancient Geography*, a town on the ſouthern coaſt of the iſland of Cyprus, near the river Tetius, N.E. of Amathus. Joſephus ſays, that this city was built by Cittim, the ſon of Javan, and from him was called Citium, or, as Pliny has it, Cetium. It was the birth-place of Zeno the Stoic; and the place where Cimon the Athenian died, after having reduced great part of the iſland. Citium was epiſcopal.—Alſo, the name of an ancient town of Macedonia.

CITIUS, a name given by Livy to a mountain of Greece, which was ſituated towards Ætolia.

CITIZEN, or Cittizen, a native or inhabitant of a city, veſted with the freedom and rights thereof.

The word comes from *civis*, which authors derive from *ceo*, becauſe the citizens live together; or rather from *cieo*, *I call together*.

Auguſtus, upon numbering the Roman citizens, found they amounted to upwards of four millions.

To make a good Roman citizen, there were three things required: that he was an inhabitant of Rome; that he were inrolled in one of the thirty-five tribes; and that he were capable of dignities. Thoſe ſtrangers to whom were granted the rights and privileges of Roman citizens, were properly only honorary citizens. By the Porcian law it was ordained, that no citizen of Rome ſhould be put to death. It was alſo a privilege of the utmoſt conſequence to a Roman citizen, to have none but the people for his judges. Were it not for this, he would have been ſubject in the provinces to the arbitrary power of a proconſul, or of a prætor.

The ſeventh law, *de incolis*, makes a great deal of difference between a citizen and a mere inhabitant. Birth alone made a citizen, and intitled to all the privileges of burgeſſes; time could not acquire it, but the emperor could beſtow it; and it was often given to men and cities as a reward of ſome ſpecial merit or ſervices. It is not improbable that the citizenſhip of St. Paul, mentioned in the book of Acts (ch. xxi. 37-39), was of this kind, ſome of his anceſtors having obtained it for ſervices they had done to the Roman commonwealth in the wars. (See Grotius ad Acts xxii. 28.) This privilege was alſo bought, and that at a very great price, as Dio Caſſius informs us (l. lx.). "The Romans," he ſays, "having the preference above ſtrangers, there were many who begged the citizenſhip of the emperor, and others who bought it of Meſſalina, or the freed-men. By which means this privilege, which had been formerly bought at a great price, became ſo cheap, that many people would ſay, a man might be made a Roman citizen for a few pieces of broken glaſs," *υαλινα σκευη συντετριμμενα.*

The Romans were anciently ſo particularly careful to preſerve even their common citizens from any mixture of ſervile blood, that they prohibited all marriages between them and freed ſlaves, or their children. And it was decreed, as a ſpecial privilege and reward to one Hiſpala, of libertine condition, for her diſcovery of the impieties of the Bacchanalian myſteries, that a citizen might take her to wife without any diſgrace and diminution of his rights. Theſe diſtinctions, indeed, began to be diſregarded towards the end of the republic, with reſpect to the ordinary citizens, but were kept up to the laſt with regard to the ſenate. See Senator.

In order to have a right to the title of citizen by birth at Athens, it was ſufficient to be born of a father and mother who were both citizens; but the child of an Athenian, who married a foreign woman, was entitled only to the condition of his mother. This law was made by Pericles, and he executed it with ſo much rigour, that nearly 5000 perſons, excluded from the rank of citizens, were publicly ſold by auction. At firſt, when it was neceſſary to encourage the population of Attica, the title of citizen was beſtowed on every perſon who came to ſettle in that country. When that neceſſity ceaſed, Solon granted it only to thoſe who ſhould bring with them their families, or to perſons who, exiled for ever from their country, came thither in ſearch of a ſecure aſylum. At length it was permitted to thoſe who ſhould render ſervices to the ſtate. This honour was ardently ſought even by ſovereigns, as long as the Athenians rigorouſly obſerved the laws to prevent its being too eaſily obtained; afterwards it was held in leſs eſtimation. According to Ariſtotle, the privilege of citizen ought to be granted only to him, who, free from every other care, dedicates himſelf entirely to the ſervice of his country; and hence it would follow, that the name of citizen is imperfectly applicable to children and decrepit old men, and cannot appertain to artiſans, labourers, and freedmen. Among the advantages which eſtabliſh or deſtroy the equality of citizens, Ariſtotle mentions three which merit ſome conſideration; liberty, virtue, and riches. In all governments, he ſays, individual citizens are and ought to be in ſubjection; and liberty, he adds, does not conſiſt in doing whatever we pleaſe, as is maintained in certain democracies, but in only doing what is enjoined by the laws, which ſecure the independence of each individual; and in this point of view all the citizens may enjoy equal liberty. As our citizens, he ſays, participate in the ſovereign authority, they ſhould be all equally intereſted to maintain it, and deeply imbibe the ſame love for their country; and they will be more or leſs free, in proportion as they are more or leſs virtuous. With reſpect to riches, he obſerves, that ancient legiſlators judged it neceſſary, in the commencement of a reformation, to divide property equally among all the citizens; but he maintains that a difference in riches may have place among citizens; but as this difference can occaſion none in the diſtribution of employments and honours, it will not deſtroy that equality which ought to ſubſiſt among them. They ſhall be equal, becauſe they ſhall only be ſubject to the laws: and they ſhall be all equally occupied in the glorious employment of contributing to the tranquillity and happineſs of their country. Ariſt. de Republ. lib. 2, 3, 4, 5.

Citizens *in Parliament*. See Burgesses.

Citizens *of London*. See London.

CITOIS, Citesius, Francis, in *Biography*, a learned and ingenious phyſician of Poitiers in France. He ſtudied medicine at Montpellier, where he took his degree of doctor in 1596; after practiſing a few years in his native city he went to Paris, and was ſoon placed at the head of the profeſſion, being in high repute with cardinal Richlieu, and made his phyſician. He diſtinguiſhed himſelf, among other things, for his treatment of the Colica Pictonum, on which he wrote a treatiſe, containing a portion of practical knowledge, much ſuperior to the uſual productions of that age. "De Novo, apud Pictones, Dolore Colico Bilioſo," 1616, 8vo. It paſſed through ſeveral editions. He thought the diſeaſe either appeared for the firſt time in the year 1572, or was attended with ſymptoms not noticed before; particularly with paralyſis of the extremities. He wrote an account of a girl, twelve years of age, who, after a fit of ſickneſs, by which ſhe had been much reduced, loſt the inclination and the power of taking ſuſtenance of any kind; ſhe had lived in this ſtate three years, when Citois publiſhed his account. As the ſtory was incredible, it was not without opponents, which produced from Citois, "Abſtinentia Puellæ Confolantaneæ ab Iſraelis Harveti Confutatione Vindicata," 1602, 8vo. It was the next year tranſlated into Engliſh, and publiſhed in London. Citois, to ſhew his perfect belief of the fact, added to this edition ſtories of long abſtinence both in men and beaſts. It appeared however to have been a fraud, for the girl being removed from the care of her mother, took milk, and afterwards broths and then ſolid aliments. "De tempeſtivo Phlebotomiæ ac Purgationis uſu, adverſus Homophobos, in collectione Opuſculorum," Paris, 1639, 4to. He defends the uſe of bleeding in the ſmall-pox, meaſles, and in fevers of an inflammatory type; he ordered the operation to be repeated ſix or ſeven times. He died at Poitiers, to which place he had retired in 1652, being 80 years of age. Haller, Bib. Eloy. Dict. Hiſt.

CITOLE, an old muſical inſtrument, mentioned by Gower, ſuppoſed to be derived from *ciſtella*, a ſmall cheſt, probably a kind of dulcimer.

CITOW, in *Geography*, a town of Bohemia, in the circle of Sehlan; 10 miles S.E. of Raudnitz.

CITRARO, a town of Naples, in the province of Calabria Citra, near the coaſt of the Tuſcan ſea; 18 miles W. of Biſignano.

CITREÆ MENSÆ, called *thyina* by the Greeks, in *Antiquity*, tables made of the wood of the citrum-tree, very beautiful, and greatly eſteemed by the ancient Romans. See CITRUM.

CITRIC ACID, *Acid of Lemons*, *Zitronenſaure*, Germ. Lemon juice is one of the ſoureſt and moſt agreeable of all the vegetable acids. It is procured ſimply by ſqueezing the fruit and ſtraining the juice through linen or any looſe filter. This juice forms a conſiderable article of commerce in Sicily, Italy, Majorca, and other parts of the Mediterranean. It is obtained by peeling the fruit, ſlicing it, and putting it in a ſtrong preſs with a cloth or hair ſtrainer. The juice, which comes out very turbid, is then placed for a day in a cool cellar and then ſtrained into jars with very narrow necks, which are then well cemented up. A little oil is often previouſly poured on the juice to keep it more completely from the air. Theſe preſſes are ſometimes ſo large as to ſqueeze ſix thouſand lemons at once.

Lemon juice is a fluid of about the ſpecific gravity of 1,034, and therefore heavier than water, compoſed chiefly of water, which holds in ſolution vegetable mucilage, extractive matter poſſeſſed of ſome aſtringency, a little malic acid, and laſtly that peculiar acid which, from its being contained more copiouſly in this fruit than in any other, is called the citric acid. The proportion of theſe ingredients of courſe muſt vary as in all native vegetable juices, but on an average (according to profeſſor Prouſt), 576 grains of the freſh juice loſe by evaporation 528 grains, which is the watery part; of the remaining 48 grains about 30 are the pure citric acid, and the reſt is malic acid, mucilage, and extract. It is to the preſence of theſe two latter ingredients that we may attribute the change that takes place in the juice by keeping, by which it becomes mouldy, undergoes an imperfect fermentation, and, at laſt, totally loſes its acidity, and acquires a flat muſty taſte.

To prevent this deſtruction of the acid, for which alone lemon juice is valuable, many methods of preſerving the juice have been deviſed, all of which anſwer to a certain degree, but none of them completely; and the only way of keeping the acid for a great length of time is firſt to extract it from the juice in the way which will be preſently deſcribed, and to bring it to a ſolid ſtate of cryſtallization.

Lemon juice is clarified partly by remaining perfectly at reſt in a cold cellar for a day or two. Much of the mucilage then ſubſides, together with any accidental mixture of the pulp of the fruit, and the juice poured off clear, bottled, and carefully corked, will then keep for a conſiderable time. It keeps better if boiled briſkly for a minute or two before it is ſet by to clarify, but this ſomewhat impairs the flavour, and gives another which is leſs agreeable. In the Mediterranean countries the juice is covered with oil, which, by preventing the action of the air, aſſiſts in preſerving it; but after a while the juice beneath becomes bitter, mouldy, and turbid, and beſides acquires from the oil a rank flavour.

Concentration of the juice by freezing is another method which is ſometimes uſed with conſiderable ſucceſs. If the mucilage is firſt ſeparated as much as poſſible by ſtanding in a *cool* place for a day or two, and the clear juice is then expoſed to a cold of from 23° to 26° Fahr.; the watery part alone freezes, and the remaining unfrozen liquor of courſe contains the acid in a proportionably condenſed ſtate. By continuing to remove the ice as it forms as long as it remains taſteleſs, when the adhering liquor is waſhed off, lemon-juice may be concentrated to about one eighth of its original bulk, and is then clear, intenſely ſour, and will keep for ſome years unaltered in a cool climate. Still, however, much extract and ſome mucilage remain in it, and therefore in tropical climates even this concentrated juice ſpoils in no very great length of time. Beſides, the proceſs itſelf is only adapted for the winter ſeaſon, and in hot climates the juice would generally be ſpoiled before a ſufficient cold for this purpoſe would occur.

Another mode of preſerving this juice, often adopted, is, to make certain additions to it, which leſſen the tendency to fermentation. Forſter found, during Cook's voyage to the ſouth pole, that the juice, mixed with a fifth part of brandy or rum, and put in very well-cloſed caſks, kept good for thirty-two months. Bragnatelli propoſes to clarify the freſh juice by alcohol. Freſh lemon juice was mixed with ſome ſtrong alcohol and bottled; in a few days a ſlimy mucilage had ſubſided, and the liquor after filtration contained the purer juice and the alcohol. This laſt may be recovered by diſtillation. But it is obvious that this is only a very imperfect clarification, ſince this liquor, on evaporation to dryneſs, yields only a ſour gummy extract, and no cryſtallized acid. Some perſons are in the habit of adding ſulphuric, or ſome other mineral acid to the juice, partly to preſerve and partly to adulterate it. This does, indeed, preſerve the juice for a conſiderable time; but unleſs the purchaſer can depend on the quantity of addition made, he might be expoſed to ſerious loſs and inconvenience, particularly when the juice is uſed in calico-printing, as will be preſently mentioned, along with the method of diſcovering ſuch adulteration.

A further method of preſerving the juice, which is certainly the beſt for hot climates, and can often be performed in the large way at a moderate expence, is, by evaporating it conſiderably, and thus concentrating the acid in a ſmaller compaſs. The citric acid is leſs volatile than water, and indeed cannot be made to riſe at all in diſtillation, like vinegar, without ſuffering conſiderable decompoſition, and an actual and great loſs of the acid. Hence when the freſh juice, previouſly clarified by reſt, is expoſed to a gentle heat, never exceeding the boiling point of water, moſt of the mere water which it contains flies off, and the juice may ſafely be inſpiſſated to the conſiſtence of thick ſyrup, without much loſs of the acid, care being taken to avoid burning it. It is then intenſely ſour, and will keep in bottles for many years without alteration, and even retaining much of its original flavour. This inſpiſſated juice, or *rob of lemons*, as it is called, if intended for the table, may be immediately mixed with dry white ſugar, which is one of the beſt preſervers from corruption, and it will then keep in cloſed bottles for any length of time unimpaired, and forms an excellent and extemporaneous lemonade, by the addition ſimply of water, which is a very valuable ſtore for ſea-voyages.

In very hot countries this inſpiſſation may be begun and carried on to a conſiderable degree by the mere heat of the ſun.

But the pure *citric acid* cannot be obtained by any ſimple inſpiſſation, for its adheſion to the mucilage or extract of the juice is ſo ſtrong, that, however well it be previouſly clarified, the acid will never cryſtallize by mere evaporation, but only ſeparates in a ſour gummy maſs when all the water is diſſipated. To procure the pure cryſtallized acid, a double proceſs of chemical affinity is required; firſt, to add ſome earthy ſubſtance with which the acid alone unites, and forms an inſoluble ſalt, to the excluſion of the extract or mucilage; and next, to diſplace this acid from the earthy ſalt by means of another acid of ſtronger affinity to the earth than the citric, and then this latter acid may be obtained pure by due evaporation of the ſupernatant liquor, and cryſtallizing. This very ingenious proceſs was diſcovered by Scheele, and has been ſince followed, with ſlight variations, by every ſucceeding chemiſt. The earth which this admirable chemiſt employed was lime, in the form of chalk, the ſame that he had before uſed in the preparation of the concrete acid of tartar.

The proceſs given by Scheele is, in a few words, the following: Saturate boiling lemon juice with chalk in powder added gradually, till all effervеſcence ceaſes. A grey inſoluble maſs ſettles to the bottom, compoſed of the citric acid united with the lime, leaving the mucilage and other ingredients of the lemon juice in the ſupernatant liquor, which may be thrown away, and the citrat of lime is to be well waſhed with *cold* water till the latter comes away colourleſs. Then, add to the precipitate a quantity of ſulphuric acid, equal to the weight of chalk employed, but previouſly diluted with about ten parts of water. Boil the whole for a few minutes, and a change of compoſition takes place, the ſulphuric acid engaging the lime, and the citric acid paſſing into the ſupernatant liquor. Strain off the latter, and evaporate it ſlowly to the conſiſtence of a thick ſyrup, and by ſtanding for ſome days, moſt of the citric acid will ſeparate in large cryſtals. A ſmall exceſs of ſulphuric acid is requiſite to enable the citric acid to cryſtallize, which otherwiſe would only concrete into a gelatinous maſs.

Such is the proceſs of this excellent chemiſt, to which he adds ſeveral valuable obſervations, which will preſently be mentioned; but as the preparation of this acid is now become of conſiderable importance, it will be proper to compare the ſeveral proceſſes and improvements propoſed by other chemiſts, particularly by Dizé (ſee "Journal des Phyſique,"); by Weſtrumb (ſee Leonhardi in Macquer Worterbuch, art. Citronenſaure); by profeſſor Prouſt (ſee Journ. de Phyſ.); by Richter (Gren's Handbuch), and others.

In preparing the citric acid in the great way, M. Dizé gives the following particulars: After the citrat of lime has been decompoſed by the ſulphuric acid, *cold* water, aſſiſted by ſtirring, is ſufficient to waſh out all the citric acid adhering to the ſulphat of lime, which ſhould therefore be employed, and theſe waſhings added to the filtered liquor. Much ſulphat of lime, however, remains in the clear liquor, which, in fact, is a mixture of citric acid, ſulphuric acid, and ſulphat of lime, and is of a clear light yellow. It may be evaporated at a boiling heat, and as the bulk of fluid leſſens, the ſulphat of lime falls down, ſo that it is of uſe to ſuſpend the evaporation once or twice for ſome hours, to give time for the ſulphat of lime to ſeparate, which ſhould be removed. Towards the end of the evaporation the liquor becomes blackiſh, owing to the ſulphuric acid remaining in it, becoming ſo concentrated as to act partly on the acid itſelf, and partly, as this chemiſt ſuppoſes, on a portion of the original extractive matter which accompanies the citric acid, in its combination with lime, and ſeparation from it, and which appears to be the cauſe of the difficulty found in getting the whole of the acid to cryſtallize. This acid is ſo very ſoluble that the evaporation muſt be puſhed to a very thick ſyrupy conſiſtence before it will cryſtallize. The cryſtals are at firſt black and dirty; by a ſecond ſolution in cold water, of which a ſmall quantity will ſuffice, filtration, and evaporation, the cryſtals are obtained yellow and more regular; but a third operation of the kind ſeems neceſſary to bring them to be perfectly tranſparent and colourleſs. As there is much waſte in theſe operations, all the waſhings and fouled parts ſhould be reſerved for ſubſequent purification.

Scheele remarked, (and other chemiſts have found the ſame,) that an exceſs of ſulphuric acid, beyond what the lime requires for ſaturation, is neceſſary in this proceſs. M. Dizé ſuppoſes the peculiar uſe of this exceſs of acid to be that of deſtroying the ſmall portion of extractive matter that remains in the calcareous compound; the exiſtence of which he endeavours to prove, by the proportions of ingredients required, compared with their products. He found 100 lbs. of lemon juice to require for ſaturation 6.25 lbs. of chalk, and to produce as much as 20 lbs. of citrat of lime. On the other hand, he found the cryſtallized citric acid to require its own weight of chalk for ſaturation, and to produce a quantity of citrat of lime equal to three-fourths of the weight of the two ingredients, the loſs being chiefly carbonic acid. Hence he concludes that 100 lbs of freſh juice contain 6.25 lbs. of the pure acid (being equal in weight to the chalk required), and that the citrat of lime, thence reſulting, ought, if pure, to be no more than 9.378 lbs. being three-fourths of the ſum of the weight of the chalk, and the eſtimated quantity of pure acid. But as he finds it to be really 20 lbs., even after waſhing, he ſuppoſes this great difference to be made up by extractive matter precipitated along with the citrat of lime, and adhering to it.

However, the experiments of other chemiſts do not give this difference, though they agree tolerably well in other particulars. M. Dizé does not ſpecify the quantity of cryſtallized acid actually obtained from a given quantity of juice.

Weſtrumb ſaturated 4 lbs. of ſtrained lemon juice with 3 oz. of chalk, and obtained 5 oz. and 1 dram of citrat of lime, which, decompoſed by 23 drams of ſtrong ſulphuric acid, diluted with ten times its bulk of water, gave, by due evaporation, 2½ oz. of cryſtallized acid, and a little foul, which loſt one dram by a ſecond cryſtallization.

Profeſſor Prouſt has examined the ſame proceſs, with attention to the actual quantities employed and obtained. The whole of the above experiments may be given in the following tabular form:

Lemon Juice.		Chalk.		Citrat of Lime.		Citric Acid.		Citric Acid.	
100 lbs.	require	4.25 lbs.	which	7.51 lbs.	yield	4.38 lbs.	and contains	4.74 lbs.	Prouſt.
——	for	4.65	produce	8.0	by	3.90	by	——	Weſtrumb.
——	ſaturation	6.25		20.0	evaporation	——	eſtimation	6.25	Dizé.
Cryſtal. Citric A.									
6.25	-	6.25	- -	9.375					Ditto.

With regard to the proportions given by Prouſt, it is to be obſerved, that only 7.51 lbs. of citrat of lime were actually precipitated; but by evaporation of the liquor he obtained about .54 lb. additional. The cryſtallized acid was obtained from a known quantity of the waſhed citrat of lime, ſix ounces of the latter giving $3\frac{1}{2}$ oz. of the acid, and hence 7.51 lbs. would yield 4.38 lbs., to which the additional .54 lb. of citrat would add .315 lb.; and a ſmall portion of acid is alſo left in the laſt liquor after all the cryſtals have been removed, which the author eſtimates at about $\frac{1}{100}$th of the quantity obtained, or about .049 lb., which together make a total of 4.74 of ſolid acid in 100 lbs. of the freſh juice.

The quantity of ſulphuric acid required for the decompoſition of the citrat is variouſly eſtimated, but it ſhould not be leſs of the concentrated acid than a weight equal to the chalk employed, of which latter rather more ſhould be uſed than will ſaturate the juice. If a portion of the ſame chalk is ſeparately ſaturated with the *diluted* ſulphuric acid intended to be employed, and the reſpective quantities noted, it will be a ſtill better guide for the quantity of ſulphuric acid to be uſed in the ſecond decompoſition, obſerving always that a ſmall *exceſs* of this acid is required. The clear liquor which ſtands above the citrat of lime in the firſt proceſs contains, beſides the mucilage and extract, a portion of *malat of lime* in ſolution, which may be precipitated by alcohol if the liquor is reduced by evaporation. A ſmall portion of gallic acid alſo appears in lemon juice, as it turns of a brown red on the addition of a ſolution of iron, and exactly ſaturating the liquor with an alkali.

To ſeparate the citric acid completely from the citrat of lime by the ſulphuric acid, it is better to boil the whole for about ten minutes. The difficulty of ſeparating all the ſulphat of lime and extract from the diſengaged citric acid in the proceſs of cryſtallization has been already mentioned. This is aſſiſted by adding a little alcohol towards the end of the firſt evaporation, and ſubſidence for ſome hours, interrupting the heat.

Richter gives another proceſs for preparing the citric acid, which is ſimilar to that of Scheele for procuring the malic acid. It is the following: ſaturate lemon juice with potaſh, and then add a ſolution of acetited lead, as long as any precipitate, which is very copious, continues to fall down. This is chiefly citrat of lead. Waſh it, and digeſt with dilute ſulphuric acid, as in the former proceſs, which unites with the lead, and ſets at liberty the citric acid; then evaporate the liquor to a thick conſiſtence, add a few drops of nitric acid and cryſtallize.

The theory of this operation is the ſame as in the former proceſs, ſubſtituting oxyd of lead for lime, but with this difference, that the lemon juice muſt be previouſly ſaturated with potaſh, that the acetited lead may be decompoſed by the citrat of potaſh by *double* affinity; and to prevent any exceſs of acid, by which the citrat of lead is readily diſſolved, though, without ſuch exceſs, it is hardly in any degree ſoluble. However, when this acid is uſed for the table, it is certainly better to prepare it by chalk in Scheele's method, than by ſo dangerous a ſubſtance as lead is, particularly in its acid combinations.

Lemon juice, when ſold out of the fruit, is ſometimes adulterated with the ſulphuric acid. This may be detected in the following way: put a little of it in a glaſs, and add a ſolution of acetited lead as long as any precipitate falls down. This conſiſts of citrat of lead, mixed with ſulphat of lead, if any ſulphuric acid was contained in the juice; and of theſe the former is immediately ſoluble in moderately dilute nitric acid, but the latter not ſo. Add, therefore, a quantity of this acid, and if, on ſtirring the mixture, the precipitate entirely diſappears, and the liquor becomes clear, the lemon juice will be proved to contain no ſulphuric acid; but if any of it remains, it will be a pretty ſure indication of this acid.

Pure *citric acid* cryſtallizes (according to Lowitz) in alum-ſhaped cryſtals, conſiſting of two four-ſided pyramids joined baſe to baſe, or ſometimes in rhomboidal priſms. Its taſte is intenſely ſour, and, when diluted, very grateful to the palate; but it is ſimply an acid taſte, and retains nothing of the aromatic fragrance of the freſh fruit. It is very ſoluble, one ounce of diſtilled water diſſolving at a moderate heat, $1\frac{3}{4}$ oz. of the cryſtallized acid, and conſiderable cold is produced during the ſolution. Boiling water diſſolves twice its weight of the acid. Theſe cryſtals are not deliqueſcent when pure. Diſtilled, *per ſe*, the products are an acid empyreumatic phlegm, carburetted hydrogen gas, and carbonic acid. It ſeems to be compoſed of carbon and hydrogen with oxygen in unknown proportions.

If this acid is boiled with a little nitric acid, much nitrous gas is evolved, and the liquor yields by evaporation cryſtals of oxalic acid. A greater proportion of nitric acid converts the whole into acetous acid, without giving any indications of paſſing through the intermediate ſtate of oxalic acid. Thus, Weſtrumb obtained 30 grains of oxalic acid, by treating 60 grains of citric acid with 200 grains of nitric acid; with 300 grains of the latter, only 15 grains of oxalic acid, and with 600 grains, not an atom.

Vauquelin aſſerts that this acid may be obtained by paſſing oxymuriatic acid gas through gum-arabic in water for a conſiderable time.

The domeſtic uſes of citric acid and lemon juice are well known, but of late the concentrated juice and the cryſtallized acid have been employed very largely in calico-printing, as diſchargers of colour, in order to produce with more clearneſs and effect the white figured parts of coloured patterns dyed with iron colours. It is not abſolutely neceſſary to cryſtallize the acid for this purpoſe, but only to concentrate it. The mineral acids anſwer equally well as diſchargers, but when ſufficiently concentrated to do this effectually, they injure the texture of the cotton.

The citric acid being extremely expenſive, there may ſometimes be reaſon to apprehend an adulteration of it even in the cryſtallized ſtate. The tartaric and oxalic acids reſemble it the moſt in ſenſible properties, and ſuch an adulteration could hardly be detected without chemical means. The oxalic is ſo expenſive, that it would not, we apprehend, be worth while to employ it for this purpoſe; but the tartareous is much cheaper. Any conſiderable admixture of this latter acid might be diſcovered by the following ſimple method: make a ſaturated ſolution of ſulphat of pot-aſh in cold water, and add to it ſome of a ſaturated ſolution of the acid to be tried; if the tartareous acid is contained, the mixture will depoſit in a ſhort time a number of minute grains of tartar; but if it conſiſts only of citric acid, it will remain clear.

CITRATS. Theſe are ſalts formed by the union of the citric acid with alkaline, earthy, and metallic baſes. Only a few of them deſerve particular notice. They are all decompoſed by heat, which burns off the acid.

Citrat of Pot-aſh. This has long been known in medicine under the name of *Riverius's ſalt*. When uſed medicinally, it is prepared merely by ſaturating ſalt of tartar with lemon juice. About 12 to 16 parts of the latter will ſaturate one part of the common carbonat of pot-aſh, or *kali præparatum*. This is ſometimes taken in the act of efferveſcence; but when this is the intention, the cryſtallized carbonat of pot-aſh is by far preferable, on account of the large quantity of carbonic acid which it contains. To prepare it more accurately, according to Vauquelin, 36 parts of the cryſtallized citric acid diſſolved in water require for ſaturation 61 parts of cryſtallized carbonat of pot-aſh. This ſalt cryſtallizes, though with difficulty, and is very deliqueſcent; 100 parts contain about 55.5 of acid and 44.5 of alkali. It is decompoſed by barytes and lime.

Citrat of Soda. This is a very ſoluble and cryſtallizable ſalt. According to Vauquelin, 36 parts of citric acid require 42 of dry carbonat of ſoda, ſo that 100 parts of this ſalt conſiſt of 60.7 of citric acid and 39.3 of ſoda.

Citrat of Ammonia. This ſalt is employed in medicine as well as the citrat of pot-aſh, and then is made extemporaneouſly by ſaturating lemon juice with carbonat of ammonia. When the ſolid acid is uſed, 36 parts of it will ſaturate 44 of carbonat of ammonia. Hence 100 parts of the ſalt, when dry, will contain 62 of acid and 38 of ammonia. It is very ſoluble, and difficult of cryſtallization.

Citrat of Barytes. This ſalt conſiſts of equal weights of citric acid and barytes. When barytic water is poured into a ſolution of citric acid, a precipitate is formed which is immediately re-diſſolved. But when it approaches the point of ſaturation, the barytic citrat is depoſited in quantity, at firſt pulverulent, afterwards in fine cluſtered cryſtalline needles.

Citrat of Magneſia. Thirty-ſix parts of the acid require for ſaturation 40 parts of carbonate magneſia and 100 parts of the ſalt contain 33½ of magneſia and 66 of real acid. This cannot be cryſtallized, but when nearly evaporated to dryneſs, the ſalt riſes in muſhroom-like knobs, white and opake.

Citrat of Lime. This ſalt, from being the intermede whence the acid is obtained from lemon juice, is by far the beſt known. In its neutral ſtate, it is but ſparingly ſoluble in water, and the ſolution has but little taſte. But any exceſs of acid renders it extremely ſoluble. An hundred parts of citric acid mixed with water, and boiled, diſſolve 50 parts of citrat of lime. According to Vauquelin, 24 parts of the acid are ſaturated by 18 of calcareous ſpar. Hence 100 parts of the citrat of lime contain 37.34 of lime and 62.66 of acid. Prouſt found that 100 parts of the citrat waſhed and dried left by calcination 31.5 of lime, and hence the remaining 68.5 muſt be acid and water. Dizé found that the acid required an equal weight of chalk for ſaturation; hence, ſuppoſing the chalk to contain 53 per cent. of lime, 100 parts of the dry citrat, quite pure, will conſiſt of 65.4 of acid and 34.6 of earth. This ſalt kept under water in a warm place ſoon grows mouldy, the acid is decompoſed, and the water is covered with a cruſt of carbonat of lime. Citrat of lime is decompoſed by the oxalic acid.

Metallic Citrats. Theſe have been but little examined. This acid diſſolves zinc and iron readily, and moſt of the other metallic oxyds with more or leſs eaſe. The acid decompoſes acetite of lead, and the citrat of lead is inſoluble in water. Citrat of mercury is formed by adding this acid to the nitrat or acetite of this metal. The ſalt is a flaky precipitate of a brick duſt red.

The affinities of this acid appear to be in the following order: barytes, lime, pot-aſh, ſoda, ſtrontian, magneſia, ammoniac, and alumine. The comparative affinities of the metallic oxyds have not yet been determined.

CITRIL, in *Ornithology.* See the next article.

CITRINELLA, in *Ornithology*, the citril finch, *citrinella* of Geſner, *Verzellina* of Olina, and *Venturon de Provence* of Buffon. This bird bears ſome reſemblance to the linnet, it is of a greeniſh colour, with the back ſpotted with brown, and the legs fleſh-colour; its note is delightful, and it is for this reaſon kept in cages in many parts of Italy. See FRINGILLA *citrinella*. The common yellow-hammer is alſo named ſpecifically *citrinella*, but is of the *emberiza* genus. See EMBERIZA *citrinella*.

CITRINUS, in *Natural Hiſtory*, the name of a peculiar ſpecies of ſprig cryſtal, which is of a beautiful yellow. Many of the common cryſtals, when in the neighbourhood of lead mines, are liable to be accidentally tinged yellow, by an admixture of the particles of that metal; and all theſe, whether finer or coarſer, have been too frequently confounded together, under the name *citrine*. It is never found colourleſs, like the other cryſtals, but has a great variety of tinges, from that of deeper ochres to a pale lemon-colour. It is very plentiful in the Weſt Indies, and is found in ſome parts of Bohemia. Our jewellers have learnt from the French and Italians, who are very fond of it, to call it *citrine*, and often cut ſtones for rings out of it, particularly out of the pyramid, which is always finer than the column, and theſe, after they have paſſed through two or three hands, are generally miſtaken for topazes.

CITRON, in *Botany*. See CITRUS.

CITRON-*water*, a well known ſtrong water, or cordial, which may be thus made: take of fine thin lemon-peel eighteen ounces, of orange-peel nine ounces, perfect nutmegs one quarter of a pound, alcohol perfect, that is, the fineſt and beſt rectified ſpirit of wine, two gallons and a half; digeſt in balneo mariæ for one night; draw off with a ſlow fire; then add as much water as will juſt make the mixture milky (which will be about ſeven quarts or two gallons) and add alſo about two pounds of fine ſugar-candy.

This compoſition may be improved by freſh elder flowers hung in a cloth in the head of the ſtill, ſprinkled with ambergriſe in powder, or its eſſence. Otherwiſe, citron-water may be made, by taking dry yellow rinds of citrons three pounds; two pounds of orange-peel; three quarters of a pound of bruiſed nutmegs; ten and a half gallons of clear proof ſpirit, and one gallon of water, digeſting them with a gentle heat, drawing off ten gallons in balneo mariæ, and dulcifying with fine ſugar.

CITRON-*wood*, the wood of an American tree, called by the natives candle-wood, becauſe, being cut into ſplinters, it burns like a candle. The tree is frequent in the Leeward Iſlands, and grows to a conſiderable ſize; the leaves are like thoſe of the bay tree, but of a finer green; the flower is ſweet, and much like thoſe of the orange; the fruit ſucceeding theſe is black, and of the ſize of a pepper-corn. The trunk is ſo like the yellow ſaunders in colour, that there was an opinion that it was the ſame tree, and much of it was imported into Europe, and ſold as ſuch; but they were ſoon found to be different, the true ſaunders being of a ſweet ſcent, and but moderately heavy and reſinous, but the citron-wood is conſiderably heavy, very oily, and of a ſtrong ſmell. It is of no known uſe in medicine, but is uſed in France and Germany by the turners, being a firm fine-grained wood, and taking a fine poliſh, and with age becoming of a very beautiful brown.

CITRONVOGEL, in *Ornithology*, one of the ſynonymous names of the creſted oriole, *oriolus criſtatus*. Gmelin.

CITROSINA, in *Botany*, Boſc. Nouv. Dict. Flor. Peruv. Pl. 29. Claſs and order, *diœcia icoſandria*.

Gen. Ch. *Cal.* Perianth campanulate or pitcher ſhaped; border four or eight-toothed. In the *male*, filaments from ſeven to ſixty, petal-ſhaped, ovate, flattened. In the *female*, germs ſuperior, from three to ten; ſtyles tubular; ſtigmas ſimple. *Peric.* Berry egg-ſhaped, fleſhy, umbilicate, covered by the calyx and crowned with its border, one-celled, opening unequally, and with elaſticity, for the diſperſion of the ſeeds.

Seeds from three to ten, egg-ſhaped, oſſeous, half enveloped in a fleſhy aril. Seven ſpecies, all ſhrubs, with the ſmell of the citron, are mentioned in the Flora Peruvienſis. Boſc.

CITRULLUS, in *Botany*, J. Bauh. See Cucurbita *citrullus*.

CITRUM. The *citreæ menſæ* have been ſuppoſed by ſome to be made of the citron tree, and by others of the cedar; but it appears plainly that they were made of neither, but of a wood peculiar for its fineneſs, and very different from both. The ancient Greeks have deſcribed the ceder under the name κεδρος, and the citron tree under the name *malus medica*; and beſide theſe, they have deſcribed another tree under the name of *thya*.

CITRUS, in *Botany*, (derivation unknown), Linn. Gen. 901. Schreb. 1218. Willd. 1391. Gært. 705. Juſſ. 261. Vent. vol. iii. 155. Claſs and order, *polyadelphia icoſandria*. Nat. Ord. *Bicornes*, Linn. *Aurantia*, Juſſ. *Heſperideæ*, Vent.

Gen. Ch. *Cal.* Perianth one-leafed, five-cleft, ſmall, withering. *Cor.* Petals five, oblong, ſpreading. *Stam.* Filaments about twenty, forming a cylinder, united at the baſe in ſeveral ſets or brotherhoods, awl-ſhaped, compreſſed, erect. *Piſt.* Germ ſuperior, roundiſh; ſtyle cylindrical, the length of the ſtamens. *Peric.* Berry with a fleſhy rind, many-celled; cells ſeparated from each other by a thin tranſparent membrane, filled with a mucilaginous pulp, in numerous ſeparate bladder-like veſicles. *Seeds*, cartilaginous, from one to four in each cell, attached to the interior angle.

Eſſ. Ch. Calyx five-cleft. Petals five. Stamens about twenty, polyadelphous. Berry many-celled.

Sp. 1. C. *medica*, Linn. Sp. Pl. 1. Mart. 1. Poir. 1. Willd. 1. (Malus medica, Bauh. Pin. 435.) "Petioles linear; leaves egg-ſhaped, acuminate." Willd. Citron. Miller mentions two kinds of the proper citron, one ſweet, with a thick rough-rinded fruit, which he calls C. medica; the other four, with a rough knobbed-rinded fruit, which he calls tuberoſa. β. C. Limon. Common lemon. Black tab. 362. Brown. Jam. 309. n. 6. Sloan. Jam. 2. 178. Lam. Illuſt. tab. 639. fig. 2. Woodv. Medical Botany, vol. iii. Pl. 184.) "Leaves ovate-lanceolate, acuminate, ſomewhat ſerrated." Miller. γ. C. acris. Lime. "Leaves egg-ſhaped, entire; branches ſomewhat entire." Miller. Miller has another variety which has ovate-lanceolate, ſomewhat ſerrated leaves, and the fruit in cluſters. All theſe varieties have linear petioles, and are therefore referred to one ſpecies by all botaniſts: but as, in popular language, they are known by different names, it were to be wiſhed that, upon minute inveſtigation, they might be found to poſſeſs diſtinct ſpecific characters. The fruit of the proper citron is oblong, with a very thick rind; that of the lemon oblong, with a nipple-like protuberance at the end; and that of the lime egg-ſhaped, without the protuberance, with a very thin rind, and about the ſize of the egg of a bantam hen, not half ſo large as a lemon; but theſe characters are not quite conſtant. According to Miller, the bark of the citron is ſmoother, and the wood leſs knotty, than that of the lemon. In their wild ſtate, ſome of them are ſaid to attain to the height of ſixty feet; in our greenhouſes they are neceſſarily reſtrained to a more moderate ſize. The citron is a native of all the warmer regions of Aſia. It was firſt introduced into Europe from Media, whence it obtained the name of malus medica. It ſeems to have been brought into Italy after the age of Virgil and Pliny, but before that of Palladius, who cultivated it with ſucceſs. Its fruit is ſeldom eaten raw, but preſerved as a ſweet-meat, in which form it is now ſent to North America and Europe from the Weſt Indies, where it has long been propagated. The lemon is alſo a native of the Eaſt, but, as well as the orange, has long been naturalized in the ſouth of Europe. Its juice is much uſed in England as an ingredient in the liquor called punch; mixed with ſugar and water, it affords a cooling beverage in hot weather, and is alſo introduced at the table as a condiment to different kinds of meat. Its virtues as an antiſcorbutic are well known; and on that account it is now generally carried on board ſhips deſtined for long voyages; but even when well depurated of its mucilage, it is found to ſpoil by long keeping. To preſerve it in purity, it is neceſſary that it be brought to a highly concentrated ſtate. See Citric *Acid*. Its rind is employed various ways in cookery, as a grateful aromatic bitter, not ſo hot as that of the orange. The lime is a native of the Eaſt, but has long been cultivated in the Weſt Indies and the warmeſt parts of North America. In what are called the ſea iſlands of South Carolina and Georgia, it is produced in great perfection. Its juice is eſteemed a much more grateful acid than that of the lemon, which is there in little repute, and comparatively ſeldom ſeen. A plate of limes is a conſtant diſh at entertainments in the Weſt Indies and the ſouthern ſtates of North America, and the juice is ſqueezed into ſoups, turtle, &c. by the gueſts. The lime in Jamaica, according to Brown, is a buſhy ſhrub ſeldom leſs than twelve or fourteen feet high, and by its ſpreading prickly branches affords an impenetrable fence to the ſugar cane plantations. Numerous varieties of all the kinds have been produced by cultivation, but the enumeration and deſcription of theſe are more properly within the province of the gardener than of the botaniſt. From one of them the perfume called bergamot is obtained, which is ſaid to have derived its name from Bergamo in Italy, where the variety was firſt cultivated in Europe, and where it is ſtill preſerved. 2. C. *angulata*, Willd. 2. (Limonellus angulоſus; Rumph. Amb. 2. tab. 32.) "Petioles naked; leaves egg-ſhaped, acute; fruit angular." Certainly a diſtinct ſpecies. *Fruit* ſmall, glutinous, four or five-angled. *Peduncles* ſolitary, axillary. *Spines* two, ſtipular. Willd. 3. C. *madurenſis*, Lam. 8. Lour. Flor. Cochin. p. 570. n. 4. (Limonellus madurenſis, Rumph. Amb. vol. ii. tab. 31.) "Without thorns; branches diffuſe, angular; petioles linear; fruit globular; flower very ſmall." A ſhrub not more than three feet high. *Branches* crooked, often without ſpines. *Leaves* large, egg-ſhaped, rather acute, almoſt entire, quite ſmooth. *Flowers* near the extremities of the branches, almoſt ſolitary, ſweet-ſcented. *Fruit* globular, ſmall, even-ſurfaced, yellowiſh green, half an inch or more in diameter, eight or nine-celled, filled with a veſicular bitter pulp. A native of China and Cochinchina, where it is cultivated for its beauty. 4. C. *buxifolia*, Poir. Encyc. 6. "Leaves nearly ſeſſile, ovate-retuſe; flowers in racemes, very ſmall." *Branches* ſpreading, thorny; thorns ſtiff, erect, yellowiſh at the point. *Leaves* ſcattered, alternate, reſembling thoſe of box, but twice as large, obtuſe, often emarginate, narrowed at the baſe, coriaceous, entire, nerved; nerves near together, ſtrongly marked, parallel; petioles very ſhort, ſimple. *Flowers* white, in ſmall racemes near the extremity of the branches. In its ſhort ſtiff branches, thorns, and the form and firmneſs of its leaves, it has much of the habit of rhamnus pyracantha. A native of China, deſcribed by Poiret from dried ſpecimens without fruit, ſent to La Marck by Sonnerat. 5. C. *margarita*, Poir. 9 Lour. Flor. Cochin. p. 570. n. 5. "Branches aſcending, thorny; petioles linear; berries five-celled, oblong." A ſhrub, four feet high. *Leaves* lanceolate, quite entire. *Flowers* white, ſweet-ſcented, ſcattered on the branches, few together on a common peduncle. *Fruit* not more than eight lines long, ſmooth, yellowiſh red, with a very thin rind, and a ſweet veſicular pulp. A native of China, in the neighbourhood of Canton, remarkable for the ſmallneſs of its fruit. 6. C. *nobilis*, Poir. 7. Lour. Flor. Cochin. p. 569. n. 3. Rumph. Amb. tab. 34. "Without thorns; branches aſcending; petioles linear, ſtiff and ſtraight; fruit tubercled, ſomewhat compreſſed." A tree of a moderate ſize. *Leaves* ſcattered, lanceolate, quite entire, dark green, ſhining, very odorous. *Flowers* white, ſweet-ſcented, in terminal racemes. *Fruit* roundiſh, a little compreſſed, about nine-celled, red within and without, about twice the ſize of a China orange; rind thick, ſucculent, ſweet. It has the fruit of an orange, but the petioles of a citron or lemon, and ſeems a connecting ſpecies between C. medica, and C. aurantium. Loureiro's deſcription agrees exactly with Rumphius's figure. A native of Cochinchina. 7. C. *aurantium*, Linn. Sp. Pl. 2. Mart. 2. Poir. 2. Willd. 4. Lam. Ill. tab. 639. fig. 1. orange. "Petioles winged; leaves acuminate; ſtem arboreous," Willd. α. Seville or ſour orange (Thunb. Flor. Jap. p. 293. Lour. Flor. Cochin. p. 569. Rumph. Amb. tab. 33. (malus aurantia major, Bauh. Pin. 436. Blackw. tab. 349. Ferr. Heſp. tab. 377. β. China or ſweet orange, (malus aurantia cortice eduli, Bauh. Pin. 436. Ferr. Heſper. tab. 433.) "Leaves lanceolate, acute, ſmooth," Mil. A middle-ſized tree, with a greeniſh brown bark. *Branches* generally ſpinous. *Leaves* thick, ſhining, ſmooth, ovate-lanceolate, alternate, not at all, or very little toothed; ſprinkled with ſmall, reſinous, tranſparent tubercles, reſembling thoſe in ſome ſpecies of hypericum. *Flowers* white, very odorous, in ſhort racemes towards the end of the branches; filaments united at firſt by an entire membrane, which afterwards becomes torn, and forms ſeveral ſets of ſtamens. *Fruit* round, compreſſed into the ſhape of an oblate ſpheroid, yellow; rind fleſhy, rather thick, containing a number of veſicles, filled with a volatile or eſſential oil, which ſpirts out when the rind is preſſed by the finger nail. A native of the Eaſt Indies, but naturalized in the ſouth of Europe, as well as in the Weſt Indies, and the ſouthern part of North America. The China orange flouriſhes only on the ſea iſlands of South Carolina and Georgia, intermingled with the lemon and lime. The Seville orange is hardier, and is found in the upper part of the country. Evelyn informs us, that the firſt China orange, which appeared in Europe, was ſent for a preſent to the old Conde Mellor, then prime miniſter to the king of Portugal; but of the whole caſe ſent to Liſbon, there was only one tree which lived, and became the parent of all the flouriſhing trees ſince cultivated by the gardeners. Biſhop Gibſon, in his additions to Cambden's "Britannia," ſays, probably from Aubrey, that the orange trees at Beddington in Surrey, introduced from Italy by Sir Francis Carew, were the firſt that were brought to England; that they were planted in the open ground, under a moveable covert during the winter months; and that they had been growing there more than a hundred years, *i. e.* before 1595. Theſe trees all periſhed in the great froſt of 1739-40. It has alſo been ſuppoſed to be a native of the Heſperides, or Canary Iſlands, and its fruit to be the golden apples which the daughters of Heſperus cauſed to be ſo ſtrictly guarded by a dragon. Under this idea, Ventenat has changed the name of the natural order to which it belongs, from Aurantia to Heſperideæ. There are more varieties of this ſpecies than of C. medica. Poiret enumerates and deſcribes eighteen of the citron, eleven of the lemon, and forty-four of the orange, all cultivated in the Paris gardens; but obſerves, that with reſpect to ſome of them, it is not eaſy to determine whether they ought to be referred to C. medica, or C. aurantium. The ſmell of the orange flower is almoſt univerſally eſteemed. Du Tour, in "Nouveau Dictionaire d'Hiſtoire Naturelle," is quite eloquent in its praiſe. "The ſcent of the orange flower," expatiates that lively writer à la mode Françoiſe, "is regarded as a ſtandard of perfection in its kind. It has not, like that of many flowers, a deceitful ſweetneſs, which pleaſes only to injure. It is not faint, like the ſcent of jaſmine or reſeda; it does not affect the head like narciſſus or tuberoſe; it does not weaken the nerves. but rather ſtrengthens them; it is a ſalutary odour, which refreſhes the ſenſes and enlivens the brain. In fine, it has no rival, and is as ſalutary as it is delicious." Theſe flowers are much uſed in perfumes and ſcented waters, yielding their flavour by infuſion to rectified ſpirit, and in diſtillation both to ſpirit and water. An oil diſtilled from them is brought from Italy under the name of oleum, or eſſentia neroli. The juice of the fruit is a grateful liquor, which, by allaying heat, quenching thirſt, and promoting various excretions, proves of conſiderable uſe in febrile and inflammatory diſeaſes. It is only that of the Seville orange which has a place in the materia medica of our Britiſh pharmacopœias; but that of the China orange, having a larger quantity of ſaccharine matter, is more agreeable to the taſte, and may be uſed more freely. Theſe acids, by uniting with the bile, are ſaid to take off its bitterneſs; but if they are in greater quantity than can be properly corrected by the bile preſent, they ſeem, by ſome union with that fluid, to acquire a purgative quality, that gives a diarrhœa, and the colic pains; that are ready to accompany the operation of every purgative. The outer yellow rind of the fruit is a grateful aromatic bitter; by the union of theſe qualities, it warms the ſtomach, promotes appetite, and gives tone and ſtrength to the viſcera; but Dr. Cullen obſerves, that its virtues are not ſufficiently experienced, becauſe we employ it chiefly in its dried ſtate, and in too ſmall a proportion, as we take with it part of the white inert ſubſtance that compoſes the inner rind. Its flavour is likewiſe ſuppoſed to be leſs periſhable than that of the lemon; hence the London college employ orange-peel in the ſpirituous bitter tincture, which is deſigned for keeping; whilſt in the bitter watery effuſion, lemon-peel is preferred. A ſyrup and diſtilled water are for the ſame reaſon prepared from the rind of oranges in preference to that of lemons. See Woodville's "Medical Botany." 8. C. *fuſca*, Poir. 10. Lour. Flor. Cochin. p. 571, n. 6. Rumph. Amb. 2. tab. 33. "Much branched, thorny; leaves lanceolate, egg-ſhaped; petioles with heart-ſhaped wings; berries globular, rough." A large tree. *Branches* numerous, crooked, almoſt erect, furniſhed with long ſtout ſpines. *Leaves* quite entire, dark-green, ſtrong-ſcented. *Flowers* white, not very odorous, in nearly terminal racemes. *Fruit* greeniſh brown, eight or nine celled, of a diſagreeable, bitter flavour. A native of Cochin China, where it is one of the moſt common kinds. Poiret regards it as a mere variety of C. aurantium, differing in its nearly ovate-leaves, and the colour of its fruit. It ſeems moſt allied to the Seville orange. 9. C. *humilis*, Poir. 4. (C. aurantium, δ. Mart.) Dwarf or nutmeg orange. "Leaves egg-ſhaped; flowers ſeſſile." A low ſhrub. *Leaves* ſmall, growing in bundles. *Flowers* near together, ſweet-ſcented. Poiret agrees with Miller in regarding this as a diſtinct ſpecies. Profeſſor Martyn makes it a variety of C. aurantium. 10. C. *japonica*, Poir. 5. Mart. 4. Willd. 3. Thunb. jap. 292. Icon. Pl. 15. (Kin Kan. Kæmp. amen. 801.) "Petioles winged; leaves acute, flowers axillary, moſt frequently ſolitary; ſtem ſhrubby." *Stem* ſcarcely a foot high, compreſſed-angular, erect. *Branches* and *Branchlets* alternate, compreſſed-angular, ſpinous, ſmooth, erect, green; ſpines ſolitary, axillary, erect, ſpreading. *Leaves* ſcattered, egg-ſhaped, rather acute, quite entire, a little concave, ſmooth, deep green above, paler underneath. *Flowers* ſnowy-white, rarely two together, peduncled, nodding; peduncles a line long, ſmooth, drooping; calyx ſmooth, very ſmall, five-toothed; petals oblong, a little concave, ſpreading; filaments nineteen, awl-ſhaped, compreſſed, erect, in five ſets, forming a cylinder ſhorter than the corolla, nearly equal, white; anthers oblong, minute, yellow; germ roundiſh, ſmooth, ſtyle cylindrical, a little ſhorter than the ſtamens, greeniſh white; ſtigma globular, yellow, ſtriated. *Fruit* with a thick rind, about the ſize of a cherry, nine-celled, very ſweet and grateful to the taſte. Thunb. Poiret does not venture to pronounce it ſpecifically diſtinct from the preceding. 11. C. *decumana,* Murray, Syſt. Veg. 580. Mart 3. Poir. 3. Willd. 5. (C. aurantium γ; Linn. Sp. Pl. Limo decumanus; Rumph. Amb. 2. tab. 24. fig. 2. Malus aurantia fructu caput humanum excedente; Sloane Jam. 212. Hiſt. 1. tab. 12. fig. 2, 3. Thunb. Flor. Jap. 293. Lour. Cochin. 571.) Shaddock. "Petioles winged; leaves obtuſe, emarginate." Mur. "Leaves ovate-lanceolate, thick, ſhining; fruit very large," Mill. A middle-ſized tree, with ſpreading, ſpinous branches. *Leaves* egg-ſhaped, a little acute, ſeldom obtuſe, very ſeldom emarginate, toothed, petioles with remarkably large heart-ſhaped wings. *Flowers* white, very odorous, in long ſlightly tomentous racemes; petals reflexed; ſtamens about twenty, nearly the length of the petals, collected into a many-cleft tube. *Fruit* eight inches in diameter, yellowiſh green, even-ſurfaced, twelve-celled or more, containing ſome a red, others a white pulp; the juice in ſome ſweet, in others acid; rind very thick, of a diſagreeable bitter flavour, not eſculent. *Seeds* egg-ſhaped, ſomewhat acute, two or three in each cell. A native of China, Cochin-China, Japan, and the Friendly Iſlands. It derives its vulgar name from a captain Shaddock, who firſt brought it from the Eaſt to the Weſt Indies. In England it was cultivated by Miller in 1739. Murray's ſpecific character appears to have been very careleſsly formed; and it is rather extraordinary that it ſhould have been copied without alteration or addition by Martyn, Poiret, and Willdenow. 12. C. *trifoliata,* Linn. Sp. Pl. 3. Mart. 5. Poir. 11. Willd. 6. (Tſi. ſ. Karatas bauna; Kæmpf. Amen. tab. 802. Thunb. Fl. Jap. 294.) "Leaves ternate." A ſhrub. *Stem* near ſix feet high; branches alternate, compreſſed-angular, crooked, green, ſhining, ſpinous; ſpines near an inch long, alternate, dilated, and compreſſed at the baſe, ſpreading, ſtiff and ſharp, yellow at the end. *Leaves* diſtant from each other; leaflets oval, crenulate; petiole with a crenulate wing. *Flowers* white, axillary, ſeſſile, ſolitary; petals concave, roundiſh, clawed; filaments not united at the baſe, much longer than the petals. *Fruit* globular, the ſize of a ſmall orange, ſeven-celled; pulp glutinous, with an unpleaſant ſmell, and bad flavour. *Seeds* oval. A native of Japan, where it is employed for fences, which its crooked thickſet branches and ſtiff ſharp thorns render impenetrable.

Obſ. Loureiro imagined that he found Kempfer's Tſi. v. Karatas, in Cochin China, and as his plant did not accord with the generic character of citrus, he formed for it a new genus, which he has called *triphaſia aurantiola*; but a bare inſpection of Kempfer's figure is ſufficient to ſhew that his and Loureiro's plant cannot be the ſame. The Cochin-China plant is probably *limonia trifoliata* of Linnæus.

CITRUS, in *Gardening*, comprehends plants of the citron, lemon, and orange tree kinds, of which the ſorts uſually cultivated are, the citron tree, (C. *medica*), the orange tree (C. *aurantium*), and the ſhaddock orange (C. *decumana*).

The firſt, in its wild ſtate, is a tree that grows to the height of about eight feet, erect and prickly, with long reclining branches. The leaves are ovate-oblong, alternate, ſubſerrate, ſmooth, pale green; the flowers white, odoriferous, on many-flowered, terminating peduncles; the fruit a berry, half a foot in length, ovate, with a protuberance at the tip, nine-celled or thereabouts; the pulp white, commonly acid; the rind yellow, thick, hardiſh, odoriferous, irregular. The fruit is eſculent both in the raw and preſerved ſtate. It is a native of the warmer parts of Aſia.

Of this ſort, Martyn obſerves, that there are ſeveral varieties which are procured from Genoa, the great nurſery of this as well as lemons and oranges; the cultivators of them there being, he ſays, as fond of introducing a new variety into their collections as nurſerymen are here of obtaining a new pear, apple, or peach. There are the citron tree with ſweet fruit; with ſour fruit; and the common lemon, and the lime. But the firſt of the two latter varieties, or the lemon tree, differs, according to the ſame writer, from the orange, both in the naked foot-ſtalks of the leaves, and in the ſhape and colour of the fruit; while there is ſcarce any diſtinction between it and the citron.

It is obſerved that the moſt remarkable ſub-varieties cultivated in this climate are, the ſweet lemon, plain and variegated; the pear-ſhaped; the imperial; the lemon called Adam's apple; the furrowed fruited; the childing; and the lemon with double flowers.

The ſecond, or ſour lemon or lime, grows in its native climate to the height of about eight feet, with a crooked trunk and many diffuſed branches, which have prickles on them. It is a native of Aſia, and common in the Weſt Indies.

There is another ſub-variety, the ſweet lime, which, the ſame writer ſays, is generally a more upright tree, and bears a fruit, which in ſize and form ſeems to hold a mean between the lime and the lemon. But theſe two laſt ſub-varieties are but little cultivated in this country.

The ſecond ſpecies is a middle-ſized evergreen tree, having a greeniſh brown bark, and dividing upwards into a branchy regular head, the leaves broad lanceolated, and the fruit ſubglobular, flat, of a golden colour. It is a native of India. Of this ſort there are numerous varieties, but thoſe moſt known in garden culture are, the Seville; the China; the willow-leaved or Turkey; the yellow and white ſtriped-leaved; the curled-leaved; the horned; the double-flowering; the hermaphrodite; and the dwarf or nutmeg orange. The firſt of which affords a large, rough-rinded, ſour fruit, of excellent quality for culinary uſes. It is a handſome grower, and the hardeſt of the orange tribe, as it ſhoots freely in this climate, producing large and beautiful leaves; and flowers ſtronger and more abundantly, and generally bears a greater quantity of fruit than any other ſort, and arrives to greater perfection.

The ſecond has moderate-ſized leaves, and a ſmooth, thin-rinded, ſweet fruit; of which there are ſeveral ſub-varieties in warm countries, where they grow in the open ground. And the willow-leaved orange tree has narrow ſpear-ſhaped leaves, and a ſtriped willow-leaved orange.

In reſpect to the horned orange, it is a common-ſized tree, producing oblongiſh fruit, which divide at the end, the rind running out into diviſions like horns. The hermaphrodite orange is a common-ſized tree, producing fruit partly like an orange, and partly citron-ſhaped. And the dwarf or nutmeg orange has a low ſtem, and ſmall buſhy head, growing two or three feet high, with ſmall oval leaves in cluſters, and numerous flowers in bunches, covering the branches, ſucceeded by very ſmall fruit. When in flower it is proper to be placed for ornament in rooms or other places, which it perfumes with its flowers; but it requires care, and is ſeldom in a perfect ſtate of growth in this climate.

It is ſaid that the ſtriped and double-flowered varieties are the moſt curious and intereſting.

The third ſpecies is a tree above the middle ſize, in its native place, having ſpreading prickly branches, the leaves ovate, and the flowers white, very ſweet-ſcented, in copious, upright, terminating bunches; the fruit ſpheroidal, of a greeniſh yellow colour. It is a native of India, but introduced into the Weſt Indies by captain Shaddock.

And of this ſort, according to Martyn, there are many varieties, "one of which, ſuperior to the reſt in the flavour and ſmell of the fruit; has a ſmaller trunk, and ſub-globular fruit, five inches in diameter, yellow on the outſide, white and very ſweet within."

Method of Culture. In regard to the method principally practiſed in this climate for raiſing all theſe ſorts of trees, it is that of budding them upon ſtocks raiſed from the ſeeds; but they are likewiſe ſometimes increaſed by the operation of inarching. And new varieties are conſtantly raiſed from the ſeed of the different ſpecies.

Method of raiſing new Varieties and Stocks. With this view ſome ſeed ſhould be provided from the moſt perfectly ripened fruits of the different ſorts that are wanted, early in the ſpring, at which time it ſhould be ſown in pots filled with good light earth, being covered to the depth of about half an inch, plunging them in a tan hot-bed, giving them ſlight ſprinklings of water and a free admiſſion of air. When the plants have attained a tolerably ſtrong growth, which is moſtly in about eight or ten weeks, they ſhould be gradually hardened to bear the full air, in which they may be continued till the weather renders it neceſſary to remove them into the green houſe for protection during the winter.

With ſome, however, in order to get them forward more rapidly, it is the practice to prick them out ſingly, when about two inches in height, into other pots, and plunge them into a ſecond tan hot-bed, watering and giving them freſh air occaſionally, and gradually hardening them as in the preceding manner. In this way they are ſaid to become much larger plants the following year.

But in caſes where the firſt mode is practiſed, the plants ſhould, in the following ſpring, about the middle of March or the beginning of the following month, be ſhaken carefully out of the ſeed-pots, ſo as to preſerve the roots as entire as poſſible, and planted ſeparately in ſmall pots, made about half full with a compoſt of mellow loamy earth, and afterwards filled up with the ſame ſort, ſo as to ſupport the plants well; ſhade and water being occaſionally given, till they become perfectly eſtabliſhed. It is the cuſtom with ſome gardeners, in order to have the plants more forward, as well as more ſtraight and upright, to plunge the pots, as ſoon as the plants have been placed in them, in a tan hot-bed, covered by frames and glaſſes, freſh air and water being duly ſupplied.

In theſe modes of management, the plants are capable of furniſhing good ſtocks for budding upon the ſecond or third year. And where two hot-beds are made uſe of, many of them will be in a proper ſtate for the purpoſe the ſecond year, if proper care be taken of them. See Budding.

It is obſerved, that for the purpoſe of ſtocks, the citron, lemon, and Seville orange, are the beſt, as being the ſtrongeſt ſhooters, eſpecially the laſt.

Where any of the plants appear particularly handſome and of a healthy growth, they may be let remain, for the purpoſe of affording new varieties; but they are long in this way of raiſing them before they produce fruit; and when that happens, there is great uncertainty of their poſſeſſing any valuable qualities. After the plants have been thus propagated, they only require the ſame ſort of management as other exotics of the green-houſe kind, to be employed in preſerving them in a healthy ſtate.

Method of Budding them on the Stocks. Theſe plants, when they have acquired twelve or fifteen inches growth, and are about the thickneſs of a large gooſe quill, or rather more, are in a proper ſtate for the purpoſe. The buds ſhould be procured from ſound, plump, young ſhoots, of ſuch trees as have a free growth, and are in a ſtate of bearing, and the operation ſhould be performed about Auguſt, upon ſtocks of the ſame kinds and varieties, the buds being inſerted from ſix to ten or more inches from the bottom, in proper parts of the ſtocks, and only one bud in each of them. See Budding.

As ſoon as this has been done, the plants ſhould be removed into the green-houſe, a frame, or old tan hot-bed, in order to guard them from the wet, and promote the inoſculation of the veſſels, and the healing of the parts; due ſhade and air being occaſionally given; and when the union is perfectly accompliſhed, the ligatures be removed, to permit the ſwelling of the plants, without injury being done by their pinching them.

There is nothing more neceſſary afterwards, than the application of proper ſupplies of moiſture and air, with ſuitable protection from rain and all ſorts of dampneſs. When the heads of the ſtocks have been removed in the early part of the following ſpring, the buds begin to ſhoot with vigour, eſpecially where the aid of a tan hot-bed can be had recourſe to. The plants ſhould now be enured by degrees to the full air, for the latter part of the ſummer, and in the autumn and winter have the protection of a green-houſe given them.

Method of raiſing by Inarching. When this mode is employed, which is now but ſeldom the caſe, as the budding practice is much more convenient, and the trees more ornamental, the young ſhoots of the trees raiſed in the above modes, which are nearly of the ſame ſize as the ſtocks, ſhould be joined with them in the early ſpring months, ſo as to conſtitute a ſort of arch; and in the latter end of ſummer they are moſtly in a ſtate to be taken off from the parent-tree. See Inarching.

By this mode, the trees may be raiſed to a bearing ſtate in a very ſhort time, as the young bearing branches may be made uſe of for the purpoſe, by which a new bearing tree is at once produced. And different ſorts may be connected, and produced on the ſame tree. But the trees furniſhed in this way are never ſo beautiful as thoſe produced by that of budding, in the manner deſcribed above.

Method of Culture in the trained Trees. It is the cuſtom, in order to have trees of this ſort at once, to purchaſe ſuch as are brought from Italy, &c. in cheſts in the ſpring. They are of different ſizes, and, when properly managed, produce as good trees in two years, as thoſe raiſed in the above modes can in a great many. It is neceſſary to obſerve, that in chooſing theſe trees, thoſe which ſhoot the moſt vigorouſly are moſtly of the citron or ſhaddock kind, as the orange rarely grows with ſuch luxuriance. The laſt, therefore, as being more valuable, ſhould be attended to. And as ſome are only furniſhed with one bud, while others have two, the latter ſhould be preferred, as they will produce the moſt regular headed plants in moſt caſes.

And theſe trees, after having had their roots cleaned, trimmed, and well ſoaked in water for ſome time, as well as the ſtems and branches cleaned, ſhould be planted ſeparately in tubs or pots of ſuitable ſizes, filled with earth of the ſame ſort as mentioned above, watering them at the time, and plunging them in the tan-bed of the ſtove to the tops of the plants, &c. They ſhould continue in this ſituation ſome time, and be well watered, both at the bottom and over their heads, ſhade being given when neceſſary, and a due proportion of air when they begin to ſhoot in the heads. Theſe ſhould likewiſe be cut occaſionally, in order to induce them to throw out lateral branches, and form full handſome heads, air now being more freely admitted, to render the plants hardy, and capable of being preſerved in the green-houſe during the following winter, being managed as other plants of the exotic green-houſe kind.

General Method of Management in all the Sorts. As it is neceſſary that theſe trees ſhould be moved into different ſituations, it is moſtly proper to have them in pots or large tubs; and where there are ſuitable glaſs frames for protecting them in winter, a few may be planted out againſt walls which have flues that can be heated as there may be occaſion. None of the ſorts can be preſerved in the open air except during a few of the ſummer months. The management in which caſes is that of placing them in ſome warm public ſituation, at firſt waſhing their heads well with water, to remove duſt or other ſubſtances, ſupplying them frequently with a little water when the ſeaſon is hot, and preſerving the moiſture in the earth of the pots, by covering it with new cut-ſhort graſs. When they are removed to the green-houſe, on the approach of the autumn or winter, they ſhould be depoſited in a regular order, the largeſt to the back parts, proper ſupplies of freſh air and water being given when the weather is ſuitable, and due protection provided againſt froſt. It is occaſionally neceſſary alſo to water them over head, to remove all ſorts of inſects and other ſubſtances that may be upon their leaves, when all the decayed parts ſhould be wholly removed and dreſſed away. And as often as the earth in the pots or tubs begins to bind or become ſtiff, it ſhould be looſened to the depth of a few inches; and in the ſpring, it is uſeful to remove a little of the ſurface, re-placing it by ſuch as is freſh, as by theſe means the plants thrive better and continue more healthy. It becomes neceſſary in moſt caſes to ſhift the plants into larger pots or tubs of freſh earth every ſecond or third ſpring, about April, removing them with the balls of earth entire, the outſide matted mouldy roots being pared off cloſe, and part of the old earth at the top, ſides, and bottom taken away; then the tubs or pots being cleaned out, or new larger ones provided, ſome crooked pieces of tiles ſhould be laid over the holes at bottom, and ſome earth put in, placing the trees in the pots or tubs, and filling them up with more compoſt, preſſing it down on the ſides, giving a moderate watering at the tops, and retaining the plants in the green-houſe till the weather becomes ſufficiently fine for their being ſet out. And ſuch trees as have thin, ſtraggling, or irregular heads, ſhould now be pruned, ſo as to have the branches moderately ſhort, and to form better heads.

But it is adviſed, that when they appear in an unhealthy ſtate, with weak ſhoots, irregular heads, and ſmall ill-coloured leaves, they ſhould be pruned pretty cloſe, and ſhifted into entire freſh earth, the roots being ſoaked and waſhed well with water. When they have been again planted, they ſhould have a little water given immediately, and be plunged in a bark hot-bed, to remain until July, when they will have made ſtrong ſhoots, and have formed new, full, and regular heads in a handſome manner.

When ſuch of the trees as are in pots have attained a large ſize, they ſhould be ſhifted into tubs hooped with iron hoops, having ſtrong hooked iron handles at the tops, to receive poles to lift the trees by in removing them.

As there is often an abundance of flowers on theſe trees, when they appear in June and the following months, it may be proper to thin them a little by taking off the ſmalleſt; and as the trees continue blowing and ſetting fruit for ſome time, when a full crop is ſet, it is of benefit to the trees and fruit to gather off the ſuperabundant bloſſoms as they are formed on the trees.

And in planting trees of this kind in the full ground, there muſt be frame-erections for the ſupport of glaſs or other coverings, to defend the plants in inclement weather: in theſe ſituations, the trees, from their having full ſcope for their roots, generally ſhoot ſtrong, and produce large fruit, being trained within as wall or ſtandard trees. But the walls for this purpoſe ſhould have a ſouthern aſpect, and be in a dry ſituation; and for the greater protection of the trees in ſevere froſts, there ſhould be a fire-place with a flue carried along a low wall in the front and ends, the trees being planted in the full borders againſt the back walls, and their branches trained to them five or ſix inches diſtance, air and occaſional water being given, as for thoſe in the green-houſe, and the glaſſes put on in nights in bad weather, the flues being only made uſe of in ſharp froſts, and then with very moderate fires, ſo as juſt to prevent their injurious effects.

Having managed them in this way during the autumn, winter, and ſpring ſeaſons, they ſhould about the beginning of June have the glaſſes removed, and the borders raiſed a little where the ſoil is wet, and be ſlightly dug over two or three times a year, neceſſary ſupplies of manure being given. And for ſtandard trees, a more capacious and lofty glaſs covering ſhould be erected againſt the wall ſomewhat in the manner of hot-houſes, only higher, a border being made the whole width and length, planting one or two rows of trees lengthways in it, ſuffering them to run up as ſtandards, only giving a little pruning, juſt to preſerve regularity in their heads.

With ſome it is the cuſtom to have for this uſe lofty moveable glaſs frames, ſo that two or three rows of trees can be planted in ſome conſpicuous part of the pleaſure-ground, the frames being taken wholly away in ſummer, ſo as to appear a little orange grove. And when the trees are well protected by the glaſſes and other occaſional coverings, &c. in winter, they grow in this way to a much greater height than thoſe planted in tubs, or other methods.

It is neceſſary to obſerve, that the citron trees ſhould have warmer ſituations than thoſe of the orange kind during the winter, and be retained in the houſe later in the ſummer, at which period they ſhould alſo have rather more water given them.

And the common lemon trees, as being more hardy than the orange, ſhould of courſe have more air in the winter ſeaſon, when the weather is ſuitable for its being admitted.

CITTA, in *Botany*, Boſc. Nouv. Dict. Loureir. Flor. Cochin. (Lobus littoralis, Rumph.) Claſs and order, *diadelphia decandria.*

Gen. Ch. *Cal.* bilabiate, humped, coloured, hiſpid; upper lip entire; lower lip three-cleft; ſegments awl-ſhaped, the middle one the longeſt. *Cor.* papilionaceous; ſtandard almoſt naked, humped at the baſe; wings oblong, connivent; keel recurved. *Stam.* Filaments ten, nine united at the baſe, five alternate ones larger; anthers oblong. *Piſt.* Germ ſuperior, oblong, villous; ſtyle filiform; ſtigma almoſt round. *Peric.* Legume oval, oblong, thick, compreſſed, hiſpid, hollowed externally into ſquare cavities. *Seeds* three, large, compreſſed, arilled.

Sp. C.—A climbing ſhrub. *Leaves* ternate, petioled; leaflets egg-ſhaped, acute, quite entire, ſmooth. *Flowers* almoſt black, ſpotted with white, in axillary corymbs. A native of Cochin China.

Citta, in *Medicine*, κίττα, is ſynonymous with *pica*, a term generally uſed to denominate a depraved appetite, which craves for indigeſtible ſubſtances, ſuch as chalk, earth, &c. See Pica.

Citta Castellana, in *Geography*, a town of Italy, in the ſtate of the church, and patrimony of St. Peter; once the ſee of a biſhop united with Orta; 23 miles N. of Rome.

Citta di Castello, a town of Italy, in the province of Umbria, ſeated on the Tiber, the ſee of a biſhop; containing 10 churches, and a great number of convents; 23 miles S.W. of Urbino, and 97 N. of Rome.

CITTADELLA, a ſea-port town of the iſland of Minorca, with a good harbour, on the N.W. coaſt, ſurrounded with walls and baſtions; it contains two churches, four convents, and 600 houſes. N. lat. 40° 2′. E. long. 4° 3′.—Alſo, a town of Italy, in the Paduan; 19 miles N.N.W. of Padua.—Alſo, a town of the Paduan, near the Brenta, between Vicenza and Trevigno.

Citta Ducale, a town of Naples, in the province of Abruzzo Ultra, founded in 1308, by Robert, duke of Calabria, and almoſt ruined by an earthquake in 1703; the the ſee of a biſhop; 18 miles W. of Aquila.

Citta della Pieve, a town of Italy, in the province of Perugia; the ſee of a biſhop; 18 miles W. of Perugia, and 68 N. of Rome.

Citta del Sole, a town of Italy, in the duchy of Tuſcany, built in the year 1565, by Coſmo I. duke of Tuſcany; 16 miles S.S.W. of Ravenna.

Citta Nuova, a town of Iſtria; 7 miles S. of Umago.

CITTADINI, Pier-Francesco, called *Il Milaneſe*, in *Biography*, a painter very much eſteemed for his ſmall pictures. He was born at Milan in the year 1626; but at a very early period ſettled in Bologna, where he is ſaid to have been inſtructed by Guido: he ſoon became admired for the univerſality of his genius, and the beauty and freedom of his painting; and it is thought he would have proved one of the greateſt artiſts of his ſchool, had he not ſo entirely devoted himſelf to painting in ſmall. His little pictures, whether repreſenting rural feaſts, dances, ſpectacles, or landſcapes, are equally admired; and his repreſentations of fruit, flowers, and ſtill life, are conſidered ſuperior to thoſe of any of his Bologneſe cotemporaries. Many of his works are in the collections at Bologna, where he died, in the year 1681. Lanzi, Storia Pittorica. Orlandi. Creſpi.

Cittadini, Carlo, Gio. Batista, and Angiol Michele, three ſons of Pier-Franceſco Cittadini, were all of them painters of ſome note, in the ſtyle of their father. Carlo and Gio. Batiſta, like him, excelled equally in figures and in ſtill life; but Angiol Michele principally confined himſelf to pictures of fruits and flowers. Carlo had two ſons, Gaetano, a good landſcape painter, and Gio. Girolamo, who, like his uncle Angiol Michele, ſatisfied himſelf with the more humble province of dead game, flowers, and other ſtill objects. Gio. Batiſta died in 1692. Gio. Girolamo was living towards the latter part of the 18th century. Lanzi. Orlandi. Creſpi.

CITTERN, or Getern, corrupted from the Spaniſh, *citara*, a guitar, and *citron*, a guitar-maker.

CITTOWIANY, in *Geography*, a town of Samogitia; 10 miles N. of Roſienne.

CITULA, in *Ichthyology*, the name given by Paulus Jovianus, and others to the common dory, or doree, *zeus faber* of modern naturaliſts. Pliny calls it *zeus*; and hence Artedi adopted the ſame as a generic name for this and ſeveral other fiſhes of the ſame natural family.

CITUS, is the name given by Salvian (*aquat.*) to the *cottus gobio* of later naturaliſts; and *river bull-head* of Engliſh writers.

CITY, or Citty, *Urbs*, a large town incloſed with a wall; or a town incorporated, which is or hath been the ſee of a biſhop.

It is hard to give any juſt definition of a city; becauſe cuſtom has reſerved the appellation of towns, to many places which ſeem to have every thing requiſite to conſtitute cities. Formerly city, according to ſome, was only underſtood of ſuch towns as were biſhops' ſees: which diſtinction ſeems ſtill to hold in England, though no-where elſe. See Bishop and Diocese.

According to Cowel, city, or civitas, is a town corporate, which hath a biſhop and cathedral church, which is called *civitas, oppidum,* and *urbs*; *civitas*, becauſe it is governed by juſtice and order of magiſtracy; *oppidum*, as it contains a great number of inhabitants; and *urbs*, becauſe it is in due form begirt about with walls. But Crompton, in his Juriſdictions, where he reckons up the cities, omits Ely, although it has a biſhop and a cathedral church, and inſerts Weſtminſter, though it hath not now a biſhop: and ſir Edward Coke makes Cambridge a city, and yet there is no mention of its ever having been an epiſcopal ſee. It appears, indeed, by the ſtat. 35 Hen. VIII. c. 10, that Weſtminſter had a biſhop; ſince which time, in ſtat. 17 Eliz. c. 5, it is denominated a city or borough: and notwithſtanding the obſervation of Coke with reſpect to Cambridge, in the ſtat. 11 Hen. VII. c. 4, Cambridge is called merely a town. We learn, however, from Burnet's Reformation (Appendix), that Weſtminſter retained the name of city, not becauſe it had been a biſhop's ſee, but becauſe it was expreſsly created ſuch in the letters-patent by king Henry VIII., erecting it into a biſhopric. There was a ſimilar clauſe in favour of the other five new created cities, *viz.* Cheſter, Peterborough, Oxford, Glouceſter, and Briſtol. Mr. Hargrave, in his Notes to 1 Inſt. 110, proves, that although Weſtminſter is a city, and has ſent citizens to parliament from the time of Edward VI., it never was incorporated: and this is a ſtriking inſtance in contradiction to the learned opinion there referred to; *viz.* that the king could not grant, within time of memory, to any place the right of ſending members to parliament, without firſt creating that place a corporation. Lord Coke ſeems anxious to rank Cambridge among the cities; and Mr. Woodeſon, late Vinerian profeſſor (ſee his Lectures, i. 302.), has produced a deciſive authority that cities and biſhop's ſees had not originally any neceſſary connection with each other. It is that of Ingulphus, who relates, that at the great council aſſembled in 1072, to ſettle the claim of precedence between the two archbiſhops, it was decreed that biſhops' ſees ſhould be transferred from towns to cities. The above authority derives ſtrong confirmation from the fact, that the ſame diſtinction was not paid to biſhops' ſees in Ireland.

The term city had its riſe, among us, ſince the Conqueſt; for in the time of the Saxons there were no cities, but all great towns were called burghs. Thus, London was called London burgh; as the capital of Scotland is now called Edinburgh.

And for a long time after the Conqueſt, city and burgh were uſed promiſcuouſly. Thus, in the charter of Leiceſter, that place is called both *civitas* and *burgus*; which ſhews that lord Coke and other writers are miſtaken, who tell us that every city was, or is, a biſhop's ſee. Hence it ſhould ſeem, that though the term city ſignifies with us ſuch a town corporate as hath uſually a biſhop and a cathedral church, yet it is not always ſo.

However, Chaſſanæus, " De Conſuetud. Burgund." ſays, France has within its territories 104 cities; and gives his reaſon, becauſe it has ſo many archbiſhops and biſhops.

Cities and villages held formerly, in the time of the feudal government, of ſome great lord, on whom they depended for protection; and to whoſe arbitrary juriſdiction they were ſubject: and the inhabitants were deprived of the natural, and moſt unalienable rights of humanity.

They could not diſpoſe of the effects, acquired by their own induſtry, either by will, or by any deed executed during their life. They had no right to appoint guardians for their children, whilſt they were minors. They were not permitted to marry without purchaſing the conſent of the lord on whom they depended. If once they commenced a law-ſuit, they were not allowed to terminate it by an accommodation, becauſe the lord in whoſe court they pleaded would thus have been deprived of the perquiſites due to him in paſſing ſentence. Services of various kinds, equally diſgraceful and oppreſſive, were exacted from them without mercy or moderation. The ſpirit of induſtry was checked in ſome cities by abſurd regulations, and in others by unreaſonable exactions; nor would the narrow and oppreſſive maxims of a military ariſtocracy have permitted it ever to riſe to any degree of height or vigour. But as ſoon as the cities of Italy began to turn their attention to commerce, and to conceive ſome idea of the advantages which they might derive from it, they became impatient to ſhake off the yoke of their inſolent lords, and to eſtabliſh among themſelves ſuch a free and equal government as would render property ſecure, and induſtry flouriſhing. Concurring circumſtances encouraged the inhabitants of ſome of the Italian cities, towards the beginning of the 11th century, to aſſume new privileges, to unite more cloſely together, and to form themſelves into bodies politic, governed by laws eſtabliſhed by common conſent. The rights which many cities acquired by bold or fortunate uſurpation, others purchaſed from the emperors, who deemed themſelves gainers when they received large ſums for immunities which they were no longer able to withhold; and ſome cities obtained them gratuitouſly from the generoſity or facility of the princes on whom they depended. The great increaſe of wealth, which the cruſades brought into Italy, occaſioned a new kind of fermentation and activity in the minds of the people, and excited ſuch a general paſſion for liberty and independence, that before the concluſion of the laſt cruſade, all the conſiderable cities in that country had either purchaſed or extorted large immunities from the emperors. As ſoon as their liberties were eſtabliſhed, and they began to feel their own importance, they endeavoured to render themſelves maſters of the territory round their walls; which, under the Romans, belonged to each town, but which under the prevalence of the feudal policy had been ſeized and ſhared among the conquerors. The barons, to whom the circumjacent lands were granted, erected their caſtles almoſt at the gates of the cities, and exerciſed their juriſdiction there. Many of the cities in Italy attacked their troubleſome neighbours, and diſpoſſeſſing them, annexed their territories to the communities, and thus acquired a very conſiderable addition of power. Several inſtances of this kind occur in the 11th, and the beginning of the 12th century. As increaſing power enlarged the proſpects of ambition, the cities proceeded to attack ſeveral barons at a greater diſtance, and compelled them to become members of their communities; to take the oath of fidelity to their magiſtrates, to ſubject their lands to all burdens and taxes impoſed by common conſent, to defend the communities againſt all their enemies, and to reſide within the reſpective cities during a ſpecified time in each year. This ſtate, into which ſome nobles were compelled to enter, others embraced from choice, with a view to their ſecurity and credit. Accordingly they voluntarily became citizens of the towns to which their lands were moſt contiguous, and, abandoning their ancient caſtles, took up their reſidence in the cities, at leaſt for ſome part of the year. This privilege was deemed ſo important, that not only laymen, but eccleſiaſtics of the higheſt rank, condeſcended to be adopted as members of the great communities, in hopes of enjoying the ſafety and dignity which that conferred. Hence cities not only became more populous, but were filled with inhabitants of better rank; and a cuſtom which ſtill ſubſiſts in Italy, was then introduced, that all families of diſtinction reſide more conſtantly in the great towns than is uſual in other parts of Europe.

Whilſt cities were thus acquiring new dignity by the acceſſion of ſuch citizens, they became more ſolicitous to preſerve their liberty and independence. The emperors, as ſovereigns, had anciently a palace in almoſt every great city of Italy; in which they occaſionally reſided, and at this time the troops that accompanied them were quartered in the houſes of the citizens. This, however, they deemed both ignominious and dangerous, and they combined to reſiſt and aboliſh the practice. With this view they required the emperors to erect them in the ſuburbs. By degrees theſe encroachments of the Italian cities alarmed the emperors, and ſchemes were meditated for reſtraining them. In this enterpriſe Frederick Barbaroſſa engaged with great ardour. Upon this the free cities of Italy joined together in a general league, and ſtood in their defence; and after a long conteſt, carried on with alternate ſucceſs, a ſolemn treaty of peace was concluded at Conſtance, A. D. 1183, by which all the privileges and immunities granted by former emperors to the principal cities of Italy were confirmed and ratified. This treaty ſecured very important privileges to the confederate cities; and though a conſiderable degree of authority and juriſdiction was reſerved by it to the empire, yet the cities perſevered ſo vigorouſly in their efforts for extending their immunities, and they enjoyed ſuch favourable conjunctures for this purpoſe, that, before the concluſion of the 13th century, moſt of the great cities in Italy had ſhaken off all marks of ſubjection to the empire, and were become independent ſovereign republics.

This innovation on the part of cities was not long known in Italy, before it made its way into France, and alſo into other countries of Europe, from A. D. 1108 to A. D. 1137. In leſs than two centuries, ſervitude was aboliſhed in moſt of the towns of France, and they became free corporations, inſtead of dependent villages, without juriſdiction or privileges. Much about the ſame period, the great cities in Germany began to acquire like immunities, and laid the foundation of their ſubſequent liberty and independence. The ancient Germans, it ſhould be recollected, had no cities. They conſidered it as a badge of ſervitude to be obliged to inhabit a city ſurrounded with walls. (Tacit. de Mor. Germ. c. 16. Id. Hiſtor. l. iv. c. 64.) The Romans built ſeveral cities of note on the banks of the Rhine; but in all the extenſive countries from that river to the coaſts of the Baltic, there was hardly one city previous to the 9th century of the Chriſtian æra. Under Charlemagne, and the emperors of his family, ſeveral cities were founded in Germany, and men became accuſtomed to aſſociate and live together in one place. Charlemagne founded two archbiſhoprics and nine biſhoprics in the moſt conſiderable towns of Germany. His ſucceſſors increaſed their number; and as biſhops fixed their reſidence in theſe cities, and performed religious functions there, many people were thus induced to ſettle in them. However, Henry, ſurnamed the Fowler, who began his reign A. D. 920, muſt be conſidered as the great founder of cities in Germany; which he eſtabliſhed in order to counteract the incurſions of the Hungarians and other barbarous people. He thus encouraged his ſubjects to ſettle in theſe cities, ſurrounded with walls and towers, and by enjoining or perſuading ſome of the nobility to fix their reſidence in the towns, he rendered the condition of citizens more honourable than it had formerly been. From this period the number of cities continued to increaſe, and thus became more populous and more wealthy. Various circumſtances contributed to their increaſe. The eſtabliſhment of biſhoprics, and alſo the building of cathedrals, induced many people to ſettle there. Beſides, it became the cuſtom to hold councils and courts of judicature of every kind, eccleſiaſtical as well as civil, in cities. In the 11th century many ſlaves were enfranchiſed, and many of them ſettled in cities. Several mines were diſcovered and wrought in different provinces, which, drawing together a great concourſe of people, gave riſe to ſeveral cities. In the 13th century the cities began to form leagues for their mutual defence, and for repreſſing the diſorders occaſioned by the private wars among the barons, as well as by their exactions. This rendered the condition of thoſe who inhabited cities more ſecure than that of any other order of men, and allured many to become members of their communities.

Although the cities of Germany did not acquire liberty at ſo early a period as thoſe in France, they extended their privileges much farther. All the imperial and free cities, of which the number is conſiderable, acquired the full right of being *immediate*, *i. e.* of being ſubject to the empire alone, and poſſeſſing, within their own precincts, all the rights of complete and independent ſovereignty. The practice of eſtabliſhing cities, which was adopted in Italy, France, and Germany, ſpread quickly over other parts of Europe, and prevailed in Spain, England, Scotland, and all the other feudal kingdoms. It appears from Mariana, that in 1350, 18 cities had obtained a ſeat in the Cortes of Caſtile. In Aragon cities ſeem to have acquired at an early period extenſive immunities, together with a ſhare in the legiſlature. In 1118, the citizens of Saragoſſa had not only obtained political liberty, but were declared to be of equal rank with the nobles of the ſecond claſs; and many other immunities were conferred upon them. In England, as we have already obſerved, the eſtabliſhment of communities or corporations was poſterior to the Conqueſt; and the practice was borrowed from France. Lord Lyttelton, however, ſuggeſts, in his "Hiſtory of Henry II. (vol. ii. p. 317.) that ſome of the towns in England were formed into corporations under the Saxon kings, and that the charters granted by the kings of the Norman race, were not charters of enfranchiſement from a ſtate of ſlavery, but a confirmation of privileges which they already enjoyed. However this be, the Engliſh cities were very inconſiderable in the 12th century.

The inſtitution of cities was intereſting and beneficial. Its influence on government, as well as manners, was no leſs extenſive than ſalutary. It was the means of releaſing a great body of the people from ſlavery, and of promoting the intereſts of general liberty and of general ſecurity. It contributed alſo to the revival of a ſpirit of induſtry; to the proſperity of commerce; to the increaſe of population; to the diffuſion of wealth, and to a greater degree of refinement in the manners, and in the habits of life. Together with this improvement in manners, a more regular kind of government and police was introduced, ſtatutes and regulations became neceſſary with the increaſing populouſneſs of cities, and all became ſenſible that their common ſafety depended on obſerving them with exactneſs, and on puniſhing ſuch as violated them with promptitude and vigour. Laws and ſubordination, as well as poliſhed manners, took their riſe in cities, and inſenſibly diffuſed themſelves through the reſt of the ſociety. When the inhabitants of cities had obtained perſonal freedom and municipal juriſdiction, they ſoon acquired civil liberty and political power. In proceſs of time the repreſentatives of cities gained a place in the legiſlature; and this event had great influence on the form and genius of government. It tempered the rigour of ariſtocratical oppreſſion, with a proper mixture of popular liberty; it ſecured to the great body of the people, hitherto unrepreſented, active and powerful guardians of their rights and privileges; and it eſtabliſhed an intermediate power between the king and nobles, to which each had recourſe alternately, and which at ſome times oppoſed the uſurpations of the former, and on other occaſions checked the encroachments of the latter. After the inhabitants of towns had been declared free by the charters of communities, the other part of the people which reſided in the country, and was employed in agriculture, began to recover liberty by enfranchiſment. Accordingly, the enfranchiſment of ſlaves became more frequent in France, Italy, Germany, and England. In our own country more eſpecially, as the ſpirit of liberty gained ground, the very name and idea of perſonal ſervitude, without any formal interpoſition of the legiſlature to prohibit it, were totally baniſhed. Upon the whole we may obſerve, with Dr. Robertſon, that the eſtabliſhment of communities contributed more perhaps than any other cauſe, to introduce regular government, police, and arts, and to diffuſe them over Europe. Hiſt. Ch. V. vol. i. *paſſim.* See CHARTERS *of Community*.

CITY, CIVITAS, in ſpeaking of antiquity, ſignifies a ſtate, or people, with all its dependencies, conſtituting a particular republic. Such are ſtill ſeveral cities of the empire, and the Swiſs cantons.

Though the ancient Gauls were, in effect, only one nation; they were yet divided into ſeveral people, which formed as may different ſtates: or, to ſpeak with Cæſar, as many different *civitates*, *cities*. Beſides that each city had its peculiar aſſemblies, it ſent deputies too, from time to time, to the general aſſemblies held on affairs relating to their common intereſt.

CITY is particularly uſed to expreſs the heart of the place. At Paris they have the *city* and the *univerſity*; at London we have the *city* and the *ſuburbs*.

It has been obſerved that large cities are more liable than other places to peſtilential and putrid diſorders, which is owing to the ſtagnation and corruption of the air. This is always the caſe in thoſe which are low and unprovided with common ſewers; where the ſtreets are narrow and foul, the houſes dirty, water ſcarce, and jails and hoſpitals crowded; alſo, when in ſickly times the burials are within the walls, or when dead animals and offals are left to rot in the kennels, or on dunghills; when drains are not provided to carry off any large body of ſtagnating water in the neighbourhood; when fleſh-meats make the greateſt part of the diet, without a proper mixture of greens, bread, wine, or fermented liquors; from the uſe of old mouldy grain. In proportion to the number of theſe and the like cauſes concurring, a city will be more or leſs ſubject to peſtilential diſeaſes, or to receive the leaven of the true plague, brought into it by any merchandize. An excellent writer emphatically calls them the graves of the human ſpecies. See *Bills of* Mortality.

However, as great cities furniſh many materials for vitiating the air, they likewiſe afford two conſiderable antidotes; the firſt ariſes from the circulation of the air, by means of the conſtant motion of people and carriages, and of the draughts made by fires; the other depends on the great quantity of an acid produced by fuel, the ſtrongeſt reſiſter of putrefaction.

City, *Advocate of the.* See Advocate.

City, *Capital.* See Capital.

Cities, *College of.* See College.

Cities, *Foreſt.* See Forest.

City, *Freedom of a.* See Freedom.

City, *Honours of the.* See Honours.

Cities, *Imperial.* See Imperial.

Cities, *Municipal.* See Municipal.

City, *Provoſt of the.* See Provost.

CIVES, in *Botany* and *Gardening.* See Allium.

CIVET, a kind of perfume, bearing the name of the animal whence it is taken.

The word comes from the Arabic *zibet* or *zebed, ſcum, froth.*

The animal, commonly known by the name of the *civet,* or *civet-cat,* is the "Viverra civetta" of Linnæus, the "Meles faſciis et maculis albis, nigris et rufeſcentibus variegata" of Briſſon, the "felis zibethi" of Geſner, the "civette" of Buffon, and the "aſh-coloured weeſel, ſpotted with black, with cheſnut-coloured mane, and duſky tail ſpotted towards the baſe" of Dr. Shaw. Its general length, from noſe to tail, is ſomewhat more than two feet, and the tail meaſures 14 inches. The ground-colour of the body is yellowiſh aſh grey, marked with large blackiſh or duſky ſpots, diſpoſed in longitudinal rows on each ſide, with ſometimes a tinge of ferruginous; the hair is coarſe, and along the top of the back ſtands up, forming a ſort of mane; the head is of a lengthened or ſharpiſh form; with ſhort rounded ears; the eyes are of a bright ſky-blue; the tip of the noſe black; the ſides of the face, chin, breaſt, legs, and feet are black; the remainder of the face, and part of the ſides of the neck, are of a yellowiſh-white; from each ear are three black ſtripes, terminating at the throat and ſhoulders; the tail is generally black, but ſometimes marked with pale or whitiſh ſpots on each ſide of the baſe. Some naturaliſts, and particularly Belon, will have it to be the ſame with the hyæna of the ancients, and calls it "hyæna odorifera." But Buffon obſerves, that it has nothing in common with the hyæna, except the fiſſure or ſac, under the tail, and the mane along the neck and ſpine. It differs from the hyæna in the figure and ſize of the body, being one-half ſmaller. Its ears are ſhort, and covered with hair, while thoſe of the hyæna are long and naked. Beſides, it has ſhorter limbs, and five toes on each foot; but the legs of the hyæna are long, and it has only four toes on each foot. Neither does the civet dig the earth in queſt of dead bodies. Theſe animals, therefore, are eaſily diſtinguiſhed. The civet is an animal of a wild diſpoſition, and lives in the uſual manner of others of this genus, preying on birds, the ſmaller quadrupeds, &c. It is a native of ſeveral parts of Africa and India; but not of America, as ſome have erroneouſly aſſerted; though it has been tranſported thither from the Philippine iſlands, and the coaſt of Guinea. This animal, as well as the "zibet," though originally natives of the warm climates of Africa and Aſia, are capable of ſubſiſting in temperate and even in cold countries, provided they are defended from the injuries of the weather, and fed with ſucculent nouriſhment. Numbers of them are kept in Holland for the ſake of procuring and ſelling the perfume which they yield, called *civet,* and ſometimes erroneouſly confounded with muſk. There is a conſiderable traffic of civet from Baſſora, Calicut, and other places, where the animal that produces it is bred; though great part of the civet among us is furniſhed by the Dutch, who rear a conſiderable number of the animals. That which is obtained from Amſterdam is preferred to that which comes from the Levant or India, becauſe the latter is generally leſs pure. That brought from Guinea would be the beſt, if the negroes, as well as the Indians and Levanters, did not adulterate it with the juices of plants, or with labdanum, ſtorax, and other balſamic and odoriferous drugs. This perfume is gathered from time to time; and ſtill abounds in proportion as the animal is fed. Before any of theſe animals were ſeen in Europe, or it had been obſerved how the perfume had been gathered, the common opinion, founded on the relations of travellers, was, that it was the ſweat of that animal, when irritated and provoked into rage. To this effect, it was ſaid, that the animal was incloſed in an iron cage, and, after having been a long time beaten with rods, they gathered with a ſpoon, through the bars of the cage, and between the thighs of the animal, the ſweat or foam, which the rage and agitation had produced; and that, without this precaution, the animal would yield no perfume at all; which is undoubtedly falſe. This ſubſtance is a ſecretion formed in a large double glandular receptacle, ſituated at ſome little diſtance beneath the tail, and which the animal empties ſpontaneouſly. When the civet-cats are kept in a ſtate of confinement (as is uſually the caſe with the perfumers at Amſterdam and other places), they are placed, from time to time, in ſtrong wooden cages or receptacles, ſo conſtructed as to prevent the creature from turning round and biting the perſon employed in collecting the ſecreted ſubſtance; this operation is ſaid to be generally performed twice a week, and is done by ſcraping out the civet with a ſmall ſpatula or ſpoon. The ſubſtance is of a yellowiſh colour, and of the conſiſtence of an unguent; of an extremely ſtrong, and even unpleaſant odour when freſh, ſo as ſometimes to cauſe giddineſs and head-ach; but becomes more agreeable by keeping, though this is denied by the French academicians of the laſt century; the quantity obtained each time amounts to about a dram. The quantity ſupplied depends much on the quality of the nouriſhment, and the appetite of the animal, which always produces more in proportion to the goodneſs of its food. Boiled fleſh, eggs, rice, ſmall animals, birds, young poultry, and eſpecially fiſhes, are the beſt kinds of food, and they ought to be ſo varied as to preſerve the health and excite the appetite. He requires very little water; and though he drinks ſeldom, he diſcharges urine frequently; and in this operation, the male is not to be diſtinguiſhed from the female. When the ſecreted ſubſtance becomes incommodious to the animal on account of its quantity, or when the reſervoirs are too full, it is provided with proper muſcles for ſqueezing it out. The perfume of the animals is ſo ſtrong that it infects all parts of the body: the hair and the ſkin are ſo thoroughly penetrated with this odour, that they retain it long after death; and, during life, it is ſo violent as to be quite inſupportable, eſpecially if a perſon be ſhut up in the ſame apartment with the animal. When heated with rage, the odour becomes more highly exalted; and if the animal be tormented till he ſweats, the keeper collects the ſweat, which has likewiſe a ſtrong ſcent, and ſerves for adulterating, or, at leaſt, augmenting the quantity of the perfume.

Beſides the India and Dutch civet, there is alſo a civet from Braſil, Guinea, &c. like that of India.

There is another animal, *viz.* the "Viverra zibetha," (which ſee) or zibet of Buffon, that agrees in diſpoſition and manners with that above deſcribed; and which yields a ſecretion of perfume that is collected in the ſame manner.

Civet, though an article in the more ancient Materia Medica, and though ſtill employed by the oriental phyſicians, is uſed with us chiefly in perfumes. It has a very fragrant ſmell, and a ſub-acrid taſte; it unites readily with oils, both expreſſed and diſtilled; in watery or ſpirituous menſtrua, it does not diſſolve, but impregnates the fluids ſtrongly with its odour. It may, however, be made to unite with, or be ſoluble in water, by means of rubbing with mucilages. Civet has been ſometimes uſed medicinally in a thickneſs of hearing ariſing from cold; in which caſe, a grain or two being put in a little cotton or wool, and the ears ſtopped with it, is ſometimes of ſervice. Shaw's Zool. vol. i. part 2. Buffon by Smelly, vol. v.

CIVIC Crown, among the Romans, was a garland made of oak-leaves and acorns, or of ground oak, and was given as a reward to ſuch as had ſaved a citizen's life in battle, or reſcued him after being taken priſoner. This crown was highly eſteemed; and was given as an honour to Auguſtus Cæſar, who on that occaſion cauſed coins to be ſtruck, inſcribed OB CIVES SERVATOS. It was alſo given to Cicero, after his diſcovery of Catiline's conſpiracy. See Crown.

CIVIDAD das Palmas, in *Geography*, a ſea-port town of the Grand Canary iſland, called alſo *Canary*, which ſee.

Cividad *Real.* See Chiapa.—Alſo, the capital of the province of Guaira, in the eaſtern diviſion of Paraguay.—Alſo, a town of Spain, and capital of La Mancha, famous for a manufacture of leather gloves. It has three churches, ſeven convents, and three hoſpitals; 7 miles from Toledo.

Cividad *de los Reyes*, a town of South America, in the country of Terra Firma, and province of St. Martha. The heat is moderated in ſummer by the eaſt wind; but frequent rains and chilling blaſts from the mountains produce coughs and fevers. The adjacent land is fertile, and abounds in paſtures. The inhabitants are numerous, warlike, and hitherto unſubdued.

Cividad *del Rey Felippe*, a town built in 1585 on the continent of South America, near the ſtraits of Maghellan, but ſoon abandoned.

Cividad *del Rio del St. Pedro*, a town of South America, in Braſil, ſituated at the mouth of the river St. Pedro. S. lat. 32°. W. long. 34° 15′.

Cividad *Rodrigo*, a town of Spain in Leon, ſeated on the river Aguada, the ſee of a biſhop, ſuffragan of Compoſtella; built by Ferdinand II. as a rampart againſt Portugal, from which it is about 8 miles diſtant; 45 miles S.S.W. from Salamanca. N. lat. 40° 52′. W. long. 6° 15′ 24″.

CIVIERE, a ſmall hand-barrow carried by two men, and much uſed in the artillery, particularly at mortar batteries.

CIVIL, Civilis, in its general ſenſe, denotes ſomething that regards the policy, public good, or peace of the citizens, or ſubjects of a ſtate. In this ſenſe we ſay, civil government, civil law, civil rights, civil war, &c.

Civil, in a *Legal Senſe*, is alſo applied to the ordinary procedure in an action relating to ſome pecuniary matter, or intereſt. In which ſenſe it is oppoſed to criminal.

Civil *Action*. See Action.

Civil *Architecture*. The hiſtory of architecture, in a general ſenſe, would require an account of all the modes of building practiſed at different times among the various nations of the earth; but as it is not conſiſtent with the plan of the preſent work to include in one treatiſe the entire conſideration of any ſcience, we ſhall follow the ſubdiviſion which the ſubject naturally preſents, and treat of architecture as an uſeful and as a fine art. The former has been already conſidered under the article Building; and the preſent article will be devoted to the inveſtigation of the latter, in which we ſhall confine our attention to the architecture of Greece, and its imitators, the only ſtyle of building which, proceeding on a reaſoned ſyſtem of imitation, and regular proportions, has a title to be ranked among the fine arts.

Greece, which, after the decline of Egypt, became ſo eminent, pretended to no high antiquity, or remote origin. Her hiſtory reaches not many centuries back from that era which beheld her flouriſhing in arts and letters beyond all that the world had known before. The perſon to whom ſhe attributes the invention of the common conveniencies of life, exiſted long after Egypt had become a powerful and enlightened kingdom. Prometheus, whoſe ſuppoſed age is not more than 1600 years prior to the Chriſtian epocha, is introduced by Æſchylus, in his tragedy, as enumerating the various benefits which he had conferred upon mankind: amongſt the reſt he taught them (he ſays) to conſtruct houſes with bricks and timber; for till then they knew nothing of building, but dwelt in holes and caverns.

This perſonage (like many others to whom the invention of uſeful arts is attributed) is probably nothing more than factitious: or perhaps the Greeks might deſign, by this appellation, to preſerve the character, when they had forgotten the name, of their benefactors. Prometheus, which ſignifies prudence, is a term juſtly applicable to the ſagacity of all thoſe who made the diſcoveries that are aſcribed to that perſon. And the age which is aſſigned to him, the time when he is ſuppoſed to have lived, whatever be repreſented under his ſtory, will determine the period which the Greeks acknowledge for the origin of their civilization.

The priority of Homer to all other Grecian authors, his extenſive acquaintance with the arts, and his faithful and animated deſcription of the manners of his age, impart a ſingular value to whatever information he conveys upon thoſe topics. It may be amuſing to collect, from his poems, what was the ſtate of architecture at his time in that country, where it was deſtined, within a few generations afterwards, to attain to a pitch of excellence unequalled either in ancient or modern annals.

The houſes (the only ſpecies of edifices of which Homer has given any detail) had a court in front, which was fenced around, ſometimes with ſtone. An altar to the ſupreme deity (Jupiter) ſtood in the middle of the court, and one or more ſides of it were ornamented with a portico, where it was a cuſtom to lodge the gueſts. Dogs were kept here for a guard to the houſe; and ſometimes pictures of them were placed here: here alſo were the ſtables. This particular, *viz.* the ſituation of the ſtables, was obſerved by the Greeks in later ages, when, as Vitruvius relates, they built their houſes without any court in front. In the houſe itſelf the ground-rooms were lofty, and ſupported either by one or more columns. The upper ſtory was appropriated to the women; who were not, however, in that age, ſecluded from the common apartment, or the company of ſtrangers. We learn that the roofs of the houſes were flat, by an accident which befel one of the companions of Ulyſſes; who having got intoxicated at the houſe of Circé, fell from the roof and was killed. From time immemorial the ſame kind of roofs has been common in the ſouthern and eaſtern countries, and the ſame kind of accidents has attended them: ſo that the

Jews had a law reſpecting roofs, Deut. c. 22. v. 8, by which they were obliged to ſurround the top of their houſes with a baluſtrade, to prevent men from falling off.

In the Iliad few particulars of architecture are to be found. We read there little more than that Priam's palace contained 50 chambers; and that Paris lived in a ſeparate houſe adjoining, which he had built for himſelf with the aſſiſtance of ſome architects. It had a hall, a chamber, and a court. But it is in the Odyſſey, that intereſting narrative, and pleaſing delineation of manners, that the architecture of Homer's age is to be traced; and eſpecially in the palace (if it may be ſo called) of Ulyſſes. This edifice was diſtinguiſhed from all the reſt, in his town of Ithaca, by having the wall of the court built of ſtone with θριγκοι (ſome crowning ornament), and a gate with folding doors. There appears to have been but one room or hall for the reception of the company; the entrance to which was from the court. It muſt have been of great dimenſions; for it was not only large enough to entertain above 50 perſons at ſeparate tables, but alſo ſerved for ſeveral other purpoſes. The columns (if they were more than one), that ſtood within it, ſeem to have been as much for uſe as ornament. They were lofty; and the room probably roſe to the height of two ſtories. The floor was paved with ſtone; but rather ſunk than raiſed above the level of the natural ſoil; or, at leaſt, it was lower than the ſtone threſhold at its entrance. Two ſtaircaſes led from the hall; one to the roof, as it ſhould ſeem, and the other to certain ſtore-rooms, whither Ulyſſes conveyed away the armour from the hall, leſt the ſuitors ſhould avail themſelves of it when he came to attack them. The windows muſt have been at a great height from the floor; for the ſuitors when they were aſſaulted and ſaw themſelves without any means of defence, neither attempted to eſcape out of them, nor to call for aſſiſtance through them; notwithſtanding that they propoſed to raiſe the town in their behalf; but they knew no other way to do this than by getting to the roof, and the ſtaircaſe which led to that was guarded againſt them. On the night before they were ſlain they entertained themſelves with muſic and dancing; when the hall was lighted up by fires made upon three moveable hearths or braziers; and during that time Ulyſſes, in the character and dreſs of a beggar, attended in the room, to ſupply the cleft wood which was burnt upon them for a light. The total neglect of cleanlineſs is a feature which marks, as ſtrongly as any, the condition, perhaps the riot and licentiouſneſs, of Ulyſſes' houſe. For to omit other particulars, ſuch as the dunghill lying by the path way from the court-gate to the hall-door, the hall itſelf was the place where they killed, or at leaſt cut up and dreſt their beaſts; and they held the feaſts in the midſt of the ſkins and offal. When, upon the diſcovery of Ulyſſes, the ſuitors were incloſed and deſtroyed in the hall, the herald, who was among them, ſaved his life by hiding himſelf under a ſkin, that was newly taken off and left there; and when one of the ſuitors deſigned to inſult Ulyſſes while he was ſitting at meat near Telemachus, he found a bullock's foot lying cloſe by him, which he took up and threw at his head.

Within about four centuries from this era of coarſe manners in Greece did the ſame people arrive at the higheſt excellence in the polite arts that had ever been attained. And though that ſpace of time may appear ſufficiently long for the acquiſition of any ſcience, according to modern ideas, it is to be remembered that thoſe ages wanted our means of communicating knowledge; for writing and books were then almoſt unknown. By what ſteps they made ſuch a progreſs is not related; but that the varieties in architecture, the Ionic and Corinthian orders and all the ornaments, were invented within the period, is juſtly inferred from Homer's ſilence concerning them. Had architecture, at that time, been diſtinguiſhed by its ſeveral orders, or decorated with an entablature of carved work, we ſhould have heard from the Grecian, as we have from our own bard, *of Doric frize and cornice;* for he evidently takes a delight in deſcribing all the arts which then exiſted, and he was fond of diſplaying his learning.

The progreſs of improvement in Grecian architecture appears to have occupied a period of about three centuries, from the age of Solon and Pythagoras beginning with the year, before Chriſt, 600, when the temples of Jupiter, at Olympia and in the capitol of Rome, thoſe at Samos, Priene, Epheſus, and Magneſia, were begun, to the time when, under the adminiſtration of Pericles, the ornamental ſtyle of Grecian architecture attained its utmoſt beauty and perfection, in the temple of Minerva in the acropolis of Athens, built after the model of that of Jupiter at Olympia, and finally concluding this firſt period with the completion of the temple of Diana at Epheſus, in the time of Alexander, which, as Pliny informs us, had been 220 years in building, one of the columns being the work of Scopas. The ancient temple of Minerva, at Tegea in Arcadia, having been deſtroyed, a ſecond edifice was erected under the direction of Scopas, far exceeding in ſplendour and magnificence every building of the kind in the Peloponneſus. In this ſtructure the three Grecian orders of architecture were employed. Within the encloſure were galleries ſupported by Doric and Corinthian columns ſurrounding the hypæthros or open area of the cella. On the outſide of the temple were porticos of the Ionic order. The facades were enriched with ſculpture. (Pauſanias, l. viii.) To theſe examples may be added the temples in Sicily, as far as Gelo or Hiero may have contributed to their conſtruction, though many of them, as well as thoſe of Pæſtum, may poſſibly have had an earlier date.

Of all the phenomena in the political hiſtory of mankind, there is none more curious and wonderful than the great comparative degree of ſtrength and power, both internal and external, acquired by thoſe little ſtates whoſe only territory was a petty iſland, a narrow iſthmus, or a rocky promontory, from which they ſent out their piratical fleets to every part of the Mediterranean, and planted colonies on all its coaſts, in defiance of the proud monarchs who ruled the extenſive and populous plains of Aſia and Egypt, or the rude and hardy barbarians who inhabited the no leſs fertile regions of Sicily and Italy. Not only the leading ſtates, ſuch as Athens, Corinth, and Syracuſe, but Pæſtum, Segeſta, and Selinus, little obſcure republics, whoſe names alone can be gleaned from hiſtory by the diligence of the antiquary, have erected public works which would be a conſiderable enterprize for the greateſt nations of modern times. The portico of the great temple of Selinus in Sicily, which is one of ſix ſtill remaining, though proſtrate and in ruins on the ſite of that city, conſiſted of a double periſtile of eight columns in front and ſeventeen in depth, each of which was ten feet diameter and fifty feet high.

In conſidering the buildings of antiquity, and particularly of Greece, the firſt circumſtance that ſtrikes us is their extreme ſimplicity and even uniformity of plan; the temples of Greece were invariably quadrilateral buildings, differing only in ſize, number of columns, and diſpoſitions of the porticos, which either ornamented the front alone or ſurrounded every ſide. Prior to the Macedonian conqueſt all the temples of Greece and its colonies, in Sicily and Italy, appear to have been of one order, the Doric, and one general form, though ſlightly varied in particular parts, as occaſional convenience or local faſhion might chance to require. Their general form was an oblong ſquare of ſix columns by thirteen, or eight by ſeventeen, incloſing a walled cell, ſmall in proportion, which in ſome inſtances appears to have been left open to the ſky, and in others covered by the roof which protected the whole building.

The ſyſtem of Grecian architecture is founded on the ſimple principles of wooden conſtruction; a quadrangular area is ſurrounded with trunks of trees placed perpendicularly with regular intervals; theſe ſupport lintels, upon which reſt the beams of the ceiling, and an inclined roof covers the whole. Such was the model in which, when touched by the hand of taſte, the poſt and lintel were tranſmuted into the column and entablature, and the wooden hut into the temple.

It appears probable that the earlieſt Greek temples were really of wood, ſince ſo many of them were conſumed during the invaſion of Xerxes; and that large and magnificent edifices were ſometimes compoſed principally of this material, is rendered evident by the example of the temple of Jeruſalem, which was ſurrounded with columns of cedar. But builders ſoon adopted the more noble and durable material of ſtone, and though the general ſyſtem of architecture was already eſtabliſhed, its forms received ſome modification by being thus, as it were, tranſlated into a new language.

A wooden lintel, from its fibrous texture, poſſeſſing conſiderable tenacity and ſtrength, in proportion to its weight, it was practicable to form very wide intercolumniation; thus we are told by Vitruvius, that the ancient Tuſcan temples were conſtructed with wooden architraves. Stone, on the other hand, of a granular compoſition, and of great ſpecific gravity, would break by its own weight in a bearing where a timber beam would be perfectly ſecure. When, therefore, porticos were erected of ſtone, it was neceſſary, in order to enſure ſolidity, to contract the diſtance between the columns to very narrow limits. A wooden edifice, never ſecure from the injuries of accident or violence, preſented no motive for any great ſolidity in its conſtruction. But in ſtone it is poſſible, as the energetic induſtry of the ancient Egyptians has ſhewn, to defy the injuries of time, and almoſt the violences of rapine. The architect who builds in ſtone may build for eternity, and this idea will give a motive for that grand and maſſy ſolidity ſo eſſential to the ſublime of architecture. Theſe circumſtances led to the perfection of the Grecian ſtyle; the original model ſecured ſimplicity of form and conſtruction, while a ſuperior material preſerved it from the meagreneſs attendant on wooden building.

Thus aroſe the Doric, or, as it might be emphatically called, the Grecian order, the firſt born of architecture; a compoſition which bears the authentic and characteriſtic marks of its legitimate origin in wooden conſtruction transferred to ſtone.

In contemplating a capital example of this order, as, for inſtance, the Parthenon of Athens, how is our admiration excited at this nobleſt as well as earlieſt invention of the building art. What robuſt ſolidity in the column—what maſſy grandeur in the entablature—what harmony in its ſimplicity; not deſtitute of ornament, but poſſeſſing that ornament alone with which taſte refines and dignifies the conceptions of vigorous genius. No foliage adds a vain and meretricious decoration, but the frieze bears the achievements of heroes, while every part, conſiſtent in itſelf, and bearing a juſt relation to every other part, contributes to that harmonious effect which maintains the power of firſt impreſſions and effects with increaſing admiration in the intelligent obſerver. Other orders have elegance, have magnificence, but ſublimity is the property of the Doric alone.

Fluting the ſhafts of a column is a practice never omitted in any great and finiſhed Grecian work, and which appears to be mentioned by Homer, who, in deſcribing the column of Ulyſſes' hall, uſes the expreſſion δουροδοχη, or *ſpear-holder*, which we conceive can only mean flutes or channels cut in the ſhaft. It therefore ſeems probable that this ornament had ſome relation to the original type; perhaps the furrowed trunk might ſuggeſt the idea; it is, however, a beautiful decoration, which is applied with equal happineſs to break the otherwiſe heavy maſs of a Doric ſhaft, or in the other orders, to obviate an inconſiſtent plainneſs. The invention of the Ionic and Corinthian orders enlarged the bounds of architectural compoſition, and completed its powers of expreſſion.

The Ionic order was, doubtleſs, invented in that country whoſe name it bears, and where its beſt models are ſtill to be found. Vitruvius ſuppoſes this order to have been founded upon the imitation of the female form, as he alſo ſuppoſes the proportions of the Doric order to have been ſettled upon thoſe of men. The Greeks in Ionia having formed the Doric order according to the proportions of a man, followed the ſame traces to obtain a new order that ſhould imitate the gracefulneſs of women, and to that end they made a ſlenderer column whoſe thickneſs was only one-eighth part of its height. To this order they gave a baſe by which they deſigned to repreſent a ſhoe, and the capital had a curling ornament, called a volute, ſaid to reſemble the treſſes of the hair dropping to the right and left. The channels and flutings of the ſhaft were the plaits of the matron's garment. Thus aroſe the invention of two orders, one of a maſculine appearance and unadorned, the other imitating the fine proportions of the female ſhape.

The hiſtory of the origin of the Corinthian order, which might poſſibly be contrived either to give an intereſt to the invention or to diſguiſe the ſource from whence it came, though ſo often repeated and ſo well known, may, nevertheleſs, be here told once more as a pleaſing anecdote of ancient manners. A young maiden of Corinth having died, her mother or nurſe collected in a baſket the toys which ſhe had been fond of while alive, and carried them to her grave, where ſhe left the baſket covered with a tile to preſerve its contents from the weather. The baſket happened to be ſet upon the root of an acanthus. The plant being thus depreſſed in the middle, its leaves and ſtalk ſpread outwards, and grew up around the ſides of the baſket till they were bent down by the tile, which lay projecting over its top.

At that time Callimachus, the ſculptor, chanced to paſs by the grave, and being pleaſed with the agreeable appearance of the foliage, and novelty of the form, he converted it to the purpoſes of architecture; and having made ſome columns of a more delicate proportion than had been uſed before, he adopted the baſket and leaves of the acanthus for the capital; and thus eſtabliſhed the ſymmetry and ornaments of the Corinthian order.

The Egyptian capitals, which are ſtill to be ſeen decorated with palm and other leaves, throw great doubt upon this ſtory. Yet Callimachus might claim great merit from the Corinthian capital, and even ſome ſhare of the invention. He might be the firſt who conceived the idea of ſubſtituting the leaf of the acanthus; and certainly the capital was improved in Greece, eſpecially in the happy adjuſtment of its ſtalks and foliage, and this too was probably due to Callimachus,

machus. It is unfortunate for the fame of that architect, that no relic of this order exiſts in the city which gave name to it.

About the ſame time that Grecian architecture was riſing to eminence, the Tuſcans, by whoſe name one of the five orders is ſtill diſtinguiſhed, began to ſignalize themſelves in Italy by their ſuperior ſkill in building. The tomb of Porſenna, king of Etruria, which he founded in the city of Cluſium, is recorded by Pliny (Nat. Hiſt. b. 36) as a wonderful, but idle, ſpecimen of their art. Their works at Rome were leſs oſtentatious, but much more important and uſeful. In that city they were employed in conſtructing its walls of hewn ſtone, and in raiſing the Capitol. To them alſo muſt be attributed the cloaca maxima, that extraordinary piece of architecture, which has always been ranked with the chief monuments of Roman greatneſs, and which remains to this day an object of admiration. Rome was fortified and adorned with theſe ſtructures at an early period, while ſhe was advancing to power and dominion under the government of her kings. The Tarquins, in whoſe reigns theſe great works were undertaken, were of Tuſcan origin.

But while a ſtyle of grandeur was diſplayed in the public edifices of that city, its private buildings were mean and poor. The life and manners of an ancient Roman citizen were not of a nature to diſpoſe him to the ſtudy of architecture; and when the Gauls, in the 366th year of Rome, ſacked and burnt it, they deſtroyed but a parcel of ſorry huts. Neither was the city after their departure rebuilt in any good or improved manner. Expedition alone ſeems to have been required, but order and propriety altogether neglected. For Livy aſſerts (b. 5.) that, without ſtaying to have the ſtreets ſet out, every perſon ſeized upon the ground which he found vacant, ſo that in many parts they built their houſes over the common ſewers *(cloacæ)*; and that the public gave permiſſion to dig ſtones and cut timber at free coſt, and ſupplied roofing, that is ſhingles, for all thoſe who would give ſecurity to complete their houſes within a year.

Their connection with Greece afterwards introduced the Romans to the knowledge of a more elegant ſtile of architecture; and long before the period when Vitruvius compoſed his treatiſe, they could boaſt of many good architects, and ſome authors upon the ſubject. Of theſe, one of the earlieſt and the moſt eminent was Coſſutius. This artiſt was engaged by king Antiochus about 200 years before the Chriſtian æra, in the temple of Jupiter Olympus, which Piſiſtratus had begun; and then was ſeen the novel ſpectacle of a Roman citizen conducting the architecture of the principal edifice in Athens.

We are not to conclude from hence that the art had ſo far declined in Greece as to need the aſſiſtance of foreigners; nor to eſtimate its progreſs at Rome by the ſolitary inſtance of Coſſutius. The Greeks, who might eſteem the age of Pericles as the period of their higheſt excellence in architecture, about that time poſſeſſed three orders, either invented or improved by themſelves, which were reſpectively applicable to every ſpecies of building where ſtrength, or elegance, or lightneſs was requiſite. The ſpoils of the eaſt enabled them, under Alexander and his ſucceſſors, to increaſe the number, and enrich the ſtile, of their edifices; but the influx of that wealth was not ſo abundant as to corrupt their taſte, or ſupply the extravagancies of luxury; and architecture, among that people, underwent little or no change for the worſe. The Romans as yet cultivated few arts but that of war. Greece, and afterwards Aſia, had the misfortune to fall under their dominion. The conqueſt of the firſt gave them ſome taſte for the fine arts; the poſſeſſion of the latter furniſhed them with the means of indulgence. The return of Sylla from the Mithridatic war was the æra which was marked by the firſt exceſs of architecture in Rome. It was then that Scaurus, the ſon-in-law of Sylla, raiſed a temporary theatre, with ſuch extravagance of decoration, that Pliny (Nat. Hiſt. b. 36.), who charges him as the firſt who corrupted the Roman morals by luxury, affirms, "that the example was more pernicious to the city, than even the proſcription of Sylla."

About fifty years before this period, an edifice of marble was erected in Rome, the earlieſt of its kind; that edifice was a temple. The uſe of marble in private buildings was yet hardly known there; within a little time, however, it was introduced; firſt, in door-caſes, then in columns: afterwards Mamurſa, an inferior officer in Julius Cæſar's army, incruſted his whole houſe with marble, and his example led the way to the uſe of marble in that manner with ſtill greater profuſion. But Mamurſa will appear moderate and ſober if the expences and mode of his building be compared with thoſe which took place under the emperors. The extent, the materials, the decorations of the Roman dwellings were then ſuch as almoſt exceed the limits of credibility. An author of the age of Tiberius ſays, "The man thinks himſelf confined in his habitation now whoſe houſe is not as large as the farm of Cincinnatus was," *(viz.* 4 *acres.)* This is not the language of one writer only; Pliny ſays the like. "Thoſe to whom the greatneſs of this empire is owing, had not ſo much ſpace for their farm, as ſome now have for their cellars." The golden houſe of Nero was upon a ſcale much larger ſtill; it extended from the Palatine hill to the Eſquiline. A deſcription of it may be ſeen in the life of that emperor by Suetonius. When this pile of unparalleled extravagance was completed, Nero condeſcended to expreſs his approbation of it, ſo far as to ſay, "that at laſt he had got a houſe fit for a man to live in."

Auguſtus diſtinguiſhed himſelf by his love for building. It was his boaſt, that he had left a city of marble which he had found of brick. Inſtigated by his example, and with a deſire to pay him court, his relations, his wealthy ſubjects, the governors of his provinces, princes, tributary or allied to him, all engaged in ſome enterprize of architecture; and the general tranquillity of his reign was favourable to their operations; ſo that not only in Rome and Italy, but alſo in the reſt of his wide empire, grand and ſumptuous edifices were erected. The colonies too which he ſent out diffuſed a knowledge of their architecture in the countries where they ſettled; and Spain, Africa, and Germany exhibited to their rude inhabitants many fabrics in the Greek and Roman ſtyle.

But none that courted the favour of Auguſtus by extenſive and coſtly buildings could, in that reſpect, be compared with Herod the Great, king of Judea. The architectural deſigns of this monarch were conceived and executed upon a ſcale which ſurpaſſed all others of his age. The re-building of the temple of Jeruſalem, though a magnificent and wonderful undertaking, which occupied for eight years the labour of ten thouſand artificers, was yet but a ſmall part of what he performed: other parts of his dominions were adorned by him, not merely with ſingle edifices, but with entire cities. And if it be any excuſe in an arbitrary governor, who burdens his people with heavy exactions, that they are expended liberally, it may be alleged in favour of Herod, that he raiſed many ſtructures of great ſplendor and utility. The city and port of Ceſarea, perhaps the chief of his enterprizes, was eminently ſo. A full account of this, and a long catalogue of his other buildings, will be found in Joſephus, in the 16th book of his Antiquities of the Jews.

Whatever might be the eſteem in which architects were held at Rome, there is reaſon to think that the profeſſion was lucrative; a ſufficient inducement to make practitioners. And if we ſhould heſitate to give full credit to the aſſertion of Vitruvius, “ that many profeſſed to be architects who wanted ſufficient knowledge to be maſons,” we may yet believe that many were ſo ignorant as to commit groſs errors, and many ſo diſingenuous, as to follow the caprices of their employer, rather than their own better judgment. The emperor Domitian, who was not of a temper to bear controul, engaged much in architecture; and the ruins of his ſuperb palace are ſtill remaining. The ſtyle of building is good, though not without evident faults. Theſe, however, are not attributed ſo much to the architect, as to the caprice of the maſter, of whoſe bad taſte this ſignal inſtance is upon record. Domitian had plundered the temple of Jupiter in Athens of ſome of its marble columns, and brought them to Rome, to be erected in the Capitol. Before they were ſet up, he cut them anew, and, by ſo doing, he deſtroyed their juſt proportion, and made them too ſlender. Such is the account and judgment of Plutarch. That author ſays farther, “ Whoever ſhould admire the coſtlineſs of the Capitol, and afterwards ſurvey a portico in Domitian's palace, or a hall, or bath, or the apartments of his concubines, might apply what Epicharmus obſerved of a profuſe man: ‘ You have not a taſte, but an itch, for building; and, like Midas, you deſire to make every thing about you gold and precious ſtones.” (Life of Poplicola.)

Soon after the time of this emperor flouriſhed Apollodorus, an architect, whoſe merits and unfortunate end entitle him to an honourable diſtinction among thoſe of his profeſſion.

He was a native of Damaſcus, who, by his eminent talents, recommended himſelf to the patronage of the emperor Trajan. Under his direction was conſtructed the celebrated bridge over the Danube; a work ſurpaſſing, in its kind, every thing that the architecture of Greece or Rome had produced. He executed many other conſiderable buildings, which were eſteemed the beſt of their age; and in all the noble edifices that were raiſed by Trajan he was employed, or conſulted. The ſtately column in Rome, which is yet ſtanding entire, and diſtinguiſhed by the name of Trajan's pillar, is a monument of the abilities of Apollodorus. But while he enjoyed the favour of the reigning emperor, he neglected to ingratiate himſelf with the preſumptive heir. Adrian was not only fond of architecture, but alſo made ſome pretenſions to a ſkill in that ſcience, which, it is reported, Apollodorus was ſo impudent as to ridicule. When the empire devolved to Adrian, he built, after a deſign of his own, a temple dedicated to Rome and Virtue; whoſe ſtatues, in a ſitting poſture, were placed within the cell. After the fabric was completed, he ſent a repreſentation of it to Apollodorus, as a tacit vindication of his architectural ſkill, and a proof of what he was able to perform. If the emperor was a bad architect, the architect was certainly no good courtier: for upon ſeeing the ſtatues, ſitting, as they were, in the temple, (which, it ſeems, wanted much of its due proportion in height) he ſaid, if the goddeſſes ſhould ever attempt to ſtand upon their feet they would aſſuredly break their heads againſt the ceiling. For this ſarcaſm, upon his diſproportioned room, the emperor took that unjuſtifiable revenge, into which the exceſs of power may ſometimes betray the mildeſt characters: Apollodorus was ſhortly after put to death.

But, notwithſtanding this cruelty exerciſed againſt the beſt architect of his time, Adrian encouraged architecture equally with any of his predeceſſors, and certainly more than all thoſe who ſucceeded him; nor does antiquity record any perſon whoſe buildings are ſo numerous and widely ſpread. Much of his reign was ſpent in viſiting the various provinces of his empire: and throughout all the vaſt extent he raiſed monuments of architecture beyond the ſcale of ordinary edifices. Such, in the ſouth of Egypt, was the city of Antinoopolis, and in the north of England, the wall of defence, 80 miles long; the ruins of which are ſtill called after his name. He rebuilt, or repaired, various ancient cities. Athens was particularly diſtinguiſhed by his liberality; where he, at length, completed the temple of Olympian Jupiter: more than 600 years had elapſed ſince the commencement of that renowned fabric. His villa at Tivoli (the extenſive ruins of which are beheld with ſurprize), was the private retreat of this emperor, where he had combined, it is ſaid, the different ſtiles of architecture of every country which he had viſited: another inſtance of falſe taſte, ſomewhat reſembling what we have ſeen in England, by the introduction of Italian villas and Chineſe bridges.

Here, if it be aſked concerning theſe ſtructures, ſo many, ſo great, and ſome of them ſo excellent, after whoſe deſigns they were built, or by whom they were conducted in Egypt, or Greece, or Italy, no ſatisfactory anſwer can be given. For while the munificence of the founder was recorded upon every frontiſpiece, and the name of Adrian was engraved upon the walls in ſo many places, that he was therefore denominated the wall-flower, the memory of one architect alone has been preſerved. Of all thoſe who were employed in the courſe of his reign, the name of Detrianus only is known, a proof of the little conſideration that was then paid to the merit of architects.

The period of the Antonines, that golden age of Rome, produced ſome good works in architecture, of which the column yet ſtanding, commonly called Antonine's, is one example. But that period was followed by ſuch unſettled times, and deſolating wars, that the arts never recovered from the confuſion which then filled the empire.

Several ſucceeding emperors, as Severus Alexander, and particularly Diocleſian, engaged in building, and encouraged that art, which, however, ſpeedily declined; and with the erection of the vaſt palace of the laſt mentioned prince at Spalatro, may be placed the final corruption of good architecture in the Weſtern empire.

The removal of the ſeat of empire to Conſtantinople, taking place after the fine arts had received their mortal wound, that city was never illuſtrated by any public works of a pure and noble taſte. The numerous ſtructures of Juſtinian, which fill two volumes of deſcription in Procopius, were more ſignalized by their richneſs than their proportions. The church of St. Sophia, though a grand effort of conſtruction, is of barbarous architecture; the columns are of no eſtabliſhed order or juſt proportion, and the outſide is heavy and deformed by buttreſſes. The ſize and magnificence of the pile however commanded general admiration, and moved its founder, Juſtinian, upon a view of it when firſt completed, to exclaim, “ that he had ſurpaſſed Solomon in his temple.”

The Romans borrowed their architecture from Greece, but practiſed it with ſome peculiarities of manner and taſte. In reviewing the moſt favoured period, and the beſt examples of Roman architecture, we find, in addition to the ſquare plans of the Greeks, circular temples crowned with domes. The Corinthian was the favourite order at Rome, and as far as exiſting examples enable us to judge, the only order well underſtood and happily executed.

Thus practiſing the art as imitators, and further removed from the original type, with leſs ſeverity of taſte than the

Greeks, the Romans formed a ſtile of magnificence which always poſſeſſed grandeur, and in their beſt works was combined with taſte and ſimplicity.

In conſidering the architecture of the period under contemplation (*viz.* of Greece and the beſt ages of Rome), one circumſtance remarkably attracts attention: that while ſuch is the variety of general and particular proportions of the forms of mouldings and members, that it is impoſſible to name any two examples of an order which agree in all reſpects, ſo that it is evident that the fancy of each artiſt directed theſe particulars: this exuberant fancy was ſo well reſtrained within reaſonable limits, that the whole collection of columns may be reſolved into three characteriſtic orders. Having three expreſſions, the ſtrong, the elegant, and the rich, they knew that this was all that architecture could ſay diſtinctly, and any intermediate ſhade would but weaken and confuſe her language. The character of the three orders being firmly eſtabliſhed, and clearly marked by ſtrong and general features, the details were ordered by the taſte of each practitioner, and in thoſe happy taſte was the birthright of almoſt every artiſt.

Of what nature were the ſyſtems of architecture of the Greeks, is a queſtion which naturally preſſes on curioſity, when we read of the written works of a long liſt of architects, whoſe names alone ſurvive, in the works of Vitruvius. The authority of the laſt mentioned author we are not inclined to rank very high, as his precepts are in general contradicted by thoſe extant; it may, however, be concluded from his manner of teaching the art, that the ancients proceeded on very different principles in the execution of the orders from the moderns. Thus Vitruvius directs us to vary the proportion of the members, according to the magnitude, ſituation, purpoſe, and other circumſtances of the building; while modern authors offer no rules of that kind, but preſcribe a certain fixed modulation of the parts of each order, to be uſed in all edifices, however circumſtanced; each author recommending ſuch as his peculiar ſtudies have cauſed to make a favourable impreſſion on his mind. The columns of areoſtyle temples, ſays Vitruvius, are eight diameters in height; thoſe of a diaſtyle intercolumniation, eight and a half; thoſe of ſyſtyle, nine and a half; of pyenoſtyle, ten; and of euſtyle, eight and a half; and this he directs without any modification for the different orders, though, in a ſubſequent part of the work, each order has its particular proportions aſſigned. The columns of public porticos are directed to be made half a diameter higher than thoſe in temples. That the ancients were alſo guided by minute optical conſiderations, is rendered probable by another paſſage reſpecting the diminution of columns, which is directed to be varied according to their altitude; thus, in a column of fifteen feet high, the diameter at the bottom is to be divided into ſix parts, and five given to the diameter at the top; if the column is from forty to fifty feet in height, the bottom diameter is to be divided into eight parts, and ſeven given to the top. Several intermediate proportions are mentioned, and if it is ſtill higher, the ſame principle is to be obſerved. The reaſon aſſigned for this is, that as a greater height cauſes the column to appear more diminiſhed, this appearance is to be corrected by an additional thickneſs, " beauty being the province of the eye, which, if not ſatisfied by the due proportion and augmentation of the members, correcting apparent deficiencies with proper additions, the aſpect will appear coarſe and diſpleaſing." The columns at the angles of the porticos are alſo directed to be made $\frac{4}{30}$ part of a diameter thicker than the others, becauſe they being more ſurrounded by the air will appear ſlenderer. This laſt practice is confirmed by the example of the temple of Minerva at Athens. In another part, Vitruvius gives an extraordinary direction, for which it is not eaſy to conceive a reaſon; that the columns of the ſide porticos of a temple ſhould be ſo placed, that the inner line of the ſhaft may be perpendicular, thus leaving all the diminution on the outſide. Columns thus formed are obſerved in the temple of Veſta at Tivoli, and perhaps in no other antique example.

In examining the progreſs of Roman building, it will be found that the introduction of arches operated an eſſential change in the forms and principles of architecture. This was the nobleſt improvement in the art of conſtruction, an invention which enabled man to bridle the mighty river, to raiſe in the ſkies the ſelf-balanced pile, and cover with the penſile vault the vaſt area of a temple of all the gods. But it may be doubted, whether the arch, though enlarging the powers of conſtruction, has not in fact been injurious to architecture, conſidered as a fine art. Grecian architecture, as it has been before obſerved, is founded on the forms and proceedings of wooden conſtruction, by which it acquired that ineſtimable ſimplicity which ſatisfies the judgment, and attracts, with increaſing admiration, the eye of taſte. The arch, on the other hand, may be ſaid to be the natural ſtyle of ſtone building, and thus this invention introduced a new and inconſiſtent principle of imitation, cauſing a confuſion of ideas both in ſyſtem and practice.

Some of the Roman buildings which exhibit marks of the deterioration of taſte alluded to are the following. Veſpaſian's temple of Peace, where a vault of ground arches, a figure in itſelf ugly and ignoble, is ſupported at the ſpringing of each groin by a ſingle Corinthian column, a ſupport as meagre and inadequate, in conſideration of the vault, as the application of it is contrary to ſyſtem. In the theatre of Marcellus, and the Coliſeum, we find ſeveral ſtories of arcades, while the intermediate piers are ornamented with engaged columns; thus the order, inſtead of forming an eſſential part of the conſtruction, is degraded to an idle and oſtentatious ornament. The Coliſeum, though impoſing, from its maſs and general ſimplicity of form, is very deficient in detail; and the theatre of Marcellus, though erected in the Auguſtan age, exhibits an example of the Doric order entirely deprived of its characteriſtic grandeur. The triumphal arches rather belong to ſculpture than architecture, and are therefore ſcarcely amenable to the rules of the latter art, otherwiſe they would be liable to ſimilar objections.

Together with the other fine arts, though not exactly with equal ſteps, architecture declined in the Roman empire; while the principles of the art were neglected or forgotten, the execution progreſſively barbarized. The palace of Diocleſian, at Spalatro, ſhews the ſenility of architecture; diſproportionate intercolumniations, pediments of which the horizontal cornices are ſuppreſſed; arches ſpringing immediately from columns, fantaſtic corbels, which, in defiance of the rules of ſolidity, ſupport columns; in theſe abuſes we trace the final degradation of Grecian architecture.

From this time commences the age of ſpoliation; impudent compilers of fragments, the barbarous builders of that period have but perpetuated their own ignominy. Conſtantine was the firſt of theſe depredators; he ruined the arch of Trajan to decorate his own with its appropriate ornaments, and erected his baſilicas with columns from the mauſoleum of Adrian. In this confuſion of ideas and practice, we may obſerve a certain characteriſtic ſtyle which marks the age. The builders, deficient in ſkill and ability, adopted a certain haſty and compendious mode of conſtruction, which influenced the forms of architecture. The columns which they had taken from other edifices, were placed with wide intercolumniations; and therefore the original entablatures became uſeleſs; to theſe were ſubſtituted arches, which, ſpringing from the capitals, ſupported the ſuperſtructures. The ornamental parts, being either wholly or in part the workmanſhip of former ages, preſented great incongruities, and diſgraced the rude imitations of that period. Taſte in decoration and execution, was a quality wholly wanting; but yet, whether it were the example of antient edifices, the want of fancy, or real judgment, the plans and general forms preſerved ſomewhat of a grand and venerable ſimplicity. The moſt complete example remaining of this ſtyle is to be ſeen at Rome, in the church of Saint Paul, without the walls; a building attributed to Conſtantine, and which preſerves ſome antique columns of ſingular beauty.

Thus the art lingered till the arrival of the Goths in Italy, when it may be ſaid to have expired by a violent death, eſpecially in the repeated ſacking and burning of Rome, which had for ſo many ages been the miſtreſs of the univerſe.

Having thus traced the progreſs, decline, and extinction of Grecian architecture, our next taſk will be to deſcribe its revival in modern times, leaving the ſtyles of building prevalent in the middle ages to be treated of under the articles of NORMAN, SAXON, and GOTHIC *Architecture.*

Brunelleſchi, born in 1377, may be regarded as the founder of modern architecture. After having exerciſed his talents in various arts, and formed his mind by the ſtudy of ancient authors, he undertook to revive the maxims of ancient architecture, and to diſinter them from the ruins in which they had been enveloped by time and barbarity. For this purpoſe he examined and meaſured the ruins of Rome with extreme diligence; he diſcovered the orders, and having recognized the rules of the art, was the firſt who made a proper application of them in his works. He allied theory to practice; and the profound ſtudy of ancient monuments led him to the true principles of ſimple and ſolid conſtruction.

The vaſt cathedral of St. Maria dei Fiore, at Florence, begun by Arnolfo Laſi in 1298, remained unfiniſhed; the original architect had died only two years after the beginning of the building; and to erect a cupola which he had intended as a termination of the edifice, was an undertaking beyond the power of the builders of that age. It was ever regarded as chimerical, and in a convocation architects from various countries aſſembled in 1420; the moſt extravagant plans were propoſed without coming to any determination. At length Brunelleſchi was entruſted with the enterprize, and he executed it with that facility which, in cauſing the difficulties to diſappear, is too apt to conceal the merit of an original deſign, which none could diſcover, but all can imitate.

The dome of St. Maria dei Fiore, which is only inferior in ſize to that of St. Peter's, is of an octangular ſhape, with a great elevation; it is double, being formed by two vaults which leave an interval between them. It was erected without centering, and it is the only dome which is ſupported by the ſpringing wall alone, without any kind of counterforts.

This edifice, and many others which Brunelleſchi erected, did as much honour to the architect as to the art, and awakened in Italy a general taſte for the true principles of architecture; which was further confirmed by the ſtudy of Vitruvius, whoſe writings began to excite the attention of the learned.

Alberti, born in 1398, ſucceeded to the talents and enterprizes of Brunelleſchi, but his great reputation is principally founded upon his treatiſe "De Re ædificatoria," a profound and valuable work, which has acquired him the title of the modern Vitruvius.

While the principles of conſtruction were advancing towards perfection, Bramante, following the example of Brunelleſchi in the ſedulous ſtudy of the remains of antiquity, reſtored to architecture the taſte and beauty which had been ſo long abſent from her works. Julius II. having formed the project of rebuilding the baſilica of St. Peter on a plan of unequalled magnificence, entruſted the execution to Bramante in 1513. This artiſt conceived the impoſing idea of raiſing in the air a cupola as large as that of the Pantheon, or, as he expreſſed it, of raiſing the Pantheon upon the Temple of Peace; and, in fact, we may trace a great reſemblance to theſe two antique edifices in his plan. It is to be lamented that this artiſt did not poſſeſs the practice as well as the theory of his art, and the works which he began with ſuch careleſs rapidity at St. Peter's have been almoſt obliterated by his ſucceſſors. This vaſt undertaking was carried on by Raphael, San Gallo, and Michael Angelo, to whom the final deſign of the edifice is principally due.

Under the great names of Vignola, Serlio, Palladio, and Scamozzi, architecture continued to flouriſh in the 16th century. Theſe diſtinguiſhed artiſts made the ancient edifices of Rome their ſchool, and all ſerved their art by their writings as well as by their buildings.

The liſt of good Italian architects cloſes with Bernini, the moſt eminent artiſt of the 17th century. His contemporary, Boromini, was the corruptor of architectural taſte: of an ungoverned fancy, and tormented with envy of the talents and ſucceſs of Bernini, he abandoned every principle of propriety in the wild purſuit of novelty, and buried the forms of art under the moſt abſurd and incredible caprices.

Pierre Leſcot is the firſt French architect who abandoned the Gothic for the revived antique ſtyle. He flouriſhed in the beginning of the 16th century. Philibert de Lorme, of the ſame age, contributed to the reſtoration of the principles of architecture. This architect had ſtudied the Roman antiquities, and was a great writer as well as builder.

Francois Manſart, born in 1598, is perhaps the greateſt architectural genius that France has produced, but he is reproached with a want of ſtability in his ideas, which cauſed him to make frequent alterations during the execution of his works, and prevented him from being employed in ſome of the greateſt undertakings of his age. The Chateau de Maiſons, near St. Germain, is one of the chef-d'œuvres of Francois Manſart.

Jules-Hardouin Manſart, a nephew of the preceding, was the chief architect of Louis XIV. and executed the principal works of that magnificent reign: the palace of Verſailles, St. Cyr, and, above all, the place and church of the Invalids.

The façade of the Louvre, one of the moſt beautiful examples of modern architecture, was the work of Claude Perrault, who alſo diſtinguiſhed himſelf by ſeveral other buildings, and a tranſlation of Vitruvius.

Blondel, born in 1617, is celebrated for his knowledge of the ſciences and the theory of architecture. His moſt celebrated building is the Porte St. Denis. The diſtinguiſhed name of Soufflot, the architect of the church of St. Genevieve, the preſent Pantheon of Paris, brings down the liſt of French architects to our own times.

Gothic architecture had declined in England during the reign of Henry VIII.; and Inigo Jones, the reſtorer of ancient architecture, may be regarded as the greateſt as well as the earlieſt Engliſh architect. He was born in 1572, and died 1651. His works are too familiarly known to require deſcription in this place, but Greenwich, Whitehall, and

Covent-Garden, will for ever ſecure him a name among the moſt eminent of his profeſſion. It might have been ſufficient to the fame of ſir Chriſtopher Wren to have erected the ſecond religious edifice of Europe, but innumerable other monuments atteſt his talent and ſcientific ſkill. Theſe two diſtinguiſhed names form our liſt of architectural worthies; of the reſt who, with various ſucceſs, have purſued the art, none can be ſaid to have attained any hiſtorical eminence.

CIVIL *Corporation*. See CORPORATION.

CIVIL *Day*. See DAY.

CIVIL *Death*, any thing that retrenches or cuts off a man from civil ſociety: as a condemnation to the gallies, perpetual baniſhment, condemnation to death, outlawry, and excommunication; all which make a man ceaſe to be looked on as a citizen.

The term is likewiſe applied to thoſe who are no longer capable of acting in temporal concerns; as thoſe who renounce the world, who retire and make vows in a monaſtery, &c.

CIVIL *Fruits*. See FRUITS.

CIVIL *Hiſtory*. See HISTORY.

CIVIL *Injuries*, or *Private Wrongs*, in *Law*, denote thoſe which are an infringement or privation of the private or civil rights belonging to individuals, conſidered as individuals; in contradiſtinction to *public wrongs*, which are a breach and violation of public rights and duties, which affect the whole community, conſidered as a community, and are diſtinguiſhed by the harſher appellation of *crimes* and *miſdemeſnors*, which ſee.

CIVIL *Law*, *Lex Civilis*, is defined in the Inſtitutes, to be the laws peculiar to each city, or each people; now more properly diſtinguiſhed by the name of "Municipal Law." But in the modern uſe, it properly implies the Roman law, contained in the *Inſtitutes*, the *Digeſt*, the *Code*, and the *Novels*; (which ſee reſpectively); otherwiſe called *lex ſcripta*, or the *written law*. The Roman law, at its commencement, was very inconſiderable. Under the kings, the people were governed by certain laws prepared by the ſenate, paſſed by the kings, and confirmed in an aſſembly of the people. Romulus, Numa, and Servius Tallus, are celebrated as the moſt ancient legiſlators; and each of them claims his peculiar part in the three-fold diviſion of juriſprudence. The laws of marriage, the education of children, and the authority of parents, which may ſeem to draw their origin from *nature* itſelf, are aſcribed to the untutored wiſdom of Romulus. The law of *nations*, and of religious worſhip, which Numa introduced, was derived from his nocturnal converſe with the nymph Egeria. The *civil* law is attributed to the experience of Servius; he balanced the rights and fortunes of the ſeven claſſes of citizens; and guarded, by fifty new regulations, the obſervance of contracts, and the puniſhment of crimes. The ſtate, which he had inclined towards a democracy, was changed by the laſt Tarquin into lawleſs deſpotiſm; and when the kingly office was aboliſhed, the patricians engroſſed the benefits of freedom.

Papirius, who flouriſhed ſomewhat before or after the "Regifugium," was the firſt who made a collection of the regal laws; which took its name from its author, and was called *jus Papirianum*.

The republic, after aboliſhing the regal government, ſtill retained the royal laws. For, though they were become odious or obſolete, the myſterious depoſit was ſilently preſerved by the prieſts and nobles; and, at the end of 60 years, the citizens of Rome ſtill complained that they were ruled by the arbitrary ſentence of the magiſtrates. Nevertheleſs, the poſitive inſtitutions of the kings had blended themſelves with the public and private manners of the city. To theſe they added the laws of the Twelve Tables, drawn by the decemviri, from the laws of twelve of the principal cities of Greece; and the more equitable among the laws hitherto practiſed at Rome. See DECEMVIRS and TWELVE TABLES.

During the time of the republic, and even under the emperors, there were juriſconſulti; who, making public profeſſion of the ſtudy of the law, were conſulted on the different ſenſes of the laws, and gave anſwers to the queſtions propoſed to them hereon; which were called *reſponſa prudentum*, and by Juſtinian, the *juriſprudentia media*.

The law of the Twelve Tables was at length found ſo ſevere, and conceived in ſuch obſcure terms, that it was judged proper to moderate, reſtrain, and aſcertain it, by other laws, propoſed to the ſenate by the conſuls, and paſſed at general aſſemblies of the people; according to the practice that had obtained under the kings themſelves: and theſe were called by way of emphaſis *leges*, or the *laws*. Afterwards, the common people differed with the nobility, and during their ſeceſſion enacted laws of their own, which were called *plebiſcita*; and, upon their ſubſequent reconciliation, theſe were admitted and univerſally enforced. The ſenate was likewiſe intruſted with a legiſlative authority; and new laws were made by them, and called *ſenatus conſulta*, and incorporated with the Roman civil law. The prætors, likewiſe, in the abſence of the conſuls, had a power of ſupplying and correcting the civil law of the Twelve Tables, and of propoſing edicts, which, when approved by the people, were incorporated into the civil law, under the title of *jus prætorium*. And the ædiles curules did alſo in ſome caſes enact and eſtabliſh laws. Theſe ſeveral parts, which have been enumerated, compoſed the Roman civil law during the republic.

In the time of Julius Cæſar, Offilius, a lawyer, began a collection of the edicts of the prætors; but this was not finiſhed till the time of Adrian, by another lawyer; who alſo digeſted the edicts of the ædiles curules, which were made perpetual by the Cornelian law. Accordingly, the deſign which had been conceived by the genius of Cæſar was accompliſhed by Adrian; and the prætorſhip of Salvius Julian, an eminent lawyer, was immortalized by the compoſition of the "perpetual edict." This well-digeſted code was ratified by the emperor and the ſenate; the long divorce of law and equity was at length reconciled; and inſtead of the Twelve Tables, the perpetual edict was fixed as the invariable ſtandard of civil juriſprudence. See EDICT.

In the year of Rome 723, B. C. 31, the republic expired; and the whole power of the people was transferred to Auguſtus, who was contented to publiſh his new laws in the aſſembly of the people; to keep up ſome image of the republic by this formality. Tiberius aboliſhed theſe occaſional aſſemblies, on pretence of their being too numerous; and in lieu thereof offered his laws to the ſenate, who never failed to confirm them; inſomuch that the laws of Tiberius and his ſucceſſors, who kept the ſame meaſures with the ſenate, were eſteemed *ſenatus conſulta*. They were alſo called *imperial conſtitutions*, and ſometimes *placita principum*. The *reſponſa prudentum*, obtained from thoſe to whom the emperors gave commiſſion, and to which the judges were obliged to conform, conſtituted a part of the *jus ſcriptum*, or written law. The *imperial conſtitutions* were digeſted into four codes, after they were become very numerous under ſucceeding emperors; their bulk being ſo great, or, as Livy expreſſes it, (l. iii. c. 34.) "tam immenſus aliarum ſuper alias acervatarum legum cumulus," that they were computed to be many camels' load by an author who preceded Juſtinian.

This was in part remedied by the collections of three private lawyers, Gregorius, Hermogenes, and Papirius; and then by the emperor Theodoſius the Younger, by whoſe orders a code was compiled, A. D. 438, being a methodical collection of all the imperial conſtitutions then in force; which Theodoſian code was the only book of civil law received as authentic in the weſtern part of Europe till many centuries after; for Juſtinian commanded only in the eaſtern remains of the empire.

Mr. Gibbon (Hiſt. Decl. and Fall of the Roman Empire, vol. viii.) divides the interval of almoſt 1000 years that elapſed from the Twelve Tables to the reign of Juſtinian, into three periods, almoſt equal in duration, and diſtinguiſhed from each other by the mode of inſtruction, and the character of the Civilians.

During the firſt period, A. U. C. 303—648, pride and ignorance contributed to confine within narrow limits the ſcience of the Roman law. On the public days of market or aſſembly, the maſters of the art were ſeen walking in the forum, ready to impart needful advice to the meaneſt of their fellow-citizens, from whoſe votes, on a future occaſion, they might ſolicit a grateful return. As their years and honours increaſed, they ſeated themſelves at home on a chair or throne, to expect with patient gravity the viſits of their clients, who, at the dawn of day, from the town and country, began to thunder at their door. The duties of ſocial life, and the incidents of judicial proceeding, were the ordinary ſubject of theſe conſultations, and the verbal, or written opinion of the "juriſconſulti," was framed according to the rules of prudence and law. The youths of their own order and family were permitted to liſten; their children enjoyed the benefit of more private leſſons; and the Mucian race was long renowned for the hereditary knowledge of the civil law.

The ſecond period, A.U.C. 648—988, the learned and ſplendid age of juriſprudence, may be extended from the birth of Cicero to the reign of Severus Alexander. A ſyſtem was formed, ſchools were inſtituted, books were compoſed, and both the living and the dead became ſubſervient to the inſtruction of the ſtudent. The "tripartite" of Ælius Pætus, ſurnamed Catus, or the Cunning, was preſerved as the oldeſt work of juriſprudence. Cato the cenſor derived ſome additional fame from his legal ſtudies, and thoſe of his ſon; the kindred appellation of Mucius Scævola was illuſtrated by three ſages of the law; but the perfection of the ſcience was aſcribed to Servius Sulpicius, their diſciple, and the friend of Tully; and the long ſucceſſion, which ſhone with equal luſtre under the republic and under the Cæſars, is finally cloſed by the reſpectable characters of Papinian, of Paul, and of Ulpian. Their names, and the various titles of their productions, have been minutely preſerved, and the example of Labeo may ſuggeſt ſome idea of their diligence and fecundity. That eminent lawyer of the Auguſtan age, divided the year between the city and country, between buſineſs and compoſition; and 400 books are enumerated as the fruit of his retirement. Of the collections of his rival Capito, the 259th book is expreſsly quoted; and few teachers could deliver their opinions in leſs than 100 volumes.

In the third period, A.U.C. 988—1230, between the reigns of Alexander and Juſtinian, the oracles of juriſprudence were almoſt mute. The meaſure of curioſity had been filled; the throne was occupied by tyrants and barbarians; the active ſpirits were diverted by religious diſputes, and the profeſſors of Rome, Conſtantinople, and Berytus, were humbly content to repeat the leſſons of their more enlightened predeceſſors. From the ſlow advances and rapid decay of theſe legal ſtudies, it may be inferred, that they require a ſtate of peace and refinement. From the multitude of voluminous civilians, who fill the intermediate ſpace, it is evident, that ſuch ſtudies may be purſued, and ſuch works may be performed, with a common ſhare of judgment, experience, and induſtry. The genius of Cicero and Virgil was more ſenſibly felt, as each revolving age had been found incapable of producing a ſimilar or a ſecond; but the moſt eminent teachers of the law were aſſured of leaving diſciples equal or ſuperior to themſelves in merit and reputation.

In the 7th century of the city, the juriſprudence, which had been groſsly adapted to the wants of the firſt Romans, was poliſhed and improved by the alliance of Grecian philoſophy. The Scævolas had been taught by uſe and experience; but Servius Sulpicius was the firſt civilian who eſtabliſhed his art on a certain and general theory. The logic of Ariſtotle and the Stoics introduced the light of order and eloquence.

After the example of Plato, Cicero, though he declined the reputation of a profeſſed lawyer, compoſed a republic; and for its uſe, a treatiſe of laws; in which he labours to deduce from a celeſtial origin the wiſdom and juſtice of the Roman conſtitution. Plato, Ariſtotle, and Zeno, he repreſents as the only teachers who arm and inſtruct a citizen for the duties of ſocial life. Of theſe, the armour of the Stoics was found to be of the firmeſt temper; and it was chiefly worn, both for uſe and ornament, in the ſchools of juriſprudence. Auguſtus and Tiberius were the firſt to adopt, as an uſeful engine, the ſcience of the civilians; and their ſervile labours accommodated the old ſyſtem to the ſpirit and views of deſpotiſm. Under the fair pretence of ſecuring the dignity of the art, the privilege of ſubſcribing legal and valid opinions was confined to the ſages of ſenatorian or equeſtrian rank, who had been previouſly approved by the judgment of the prince; and this monopoly prevailed till Adrian reſtored the freedom of the profeſſion to every citizen conſcious of his abilities and knowledge. The diſcretion of the prætor was now governed by the leſſons of his teachers; the judges were enjoined to obey the comment as well as the text of the law; and the uſe of codicils was a memorable innovation, which Auguſtus ratified by the advice of the civilians. Two ſages of the law, Ateius Capito and Antiſtius Labeo, adorned the peace of the Auguſtan age; and their reſpective ſchools maintained their inveterate conflict from the age of Auguſtus to that of Adrian. (See Capito and Cassiani.) The controverſies of the different ſects were in a great meaſure determined by the perpetual edict. The lawyers of the age of the Antonines, like the cotemporary philoſophers, diſclaimed the authority of a maſter, and adopted from every ſyſtem the moſt probable doctrines. An indulgent edict of the younger Theodoſius excuſed the judge from the labour of comparing and weighing the arguments of different competitors. Five civilians, Caius, Papinian, Paul, Ulpian, and Modeſtinus, were eſtabliſhed as the oracles of juriſprudence; a majority was deciſive: but if their opinions were equally divided, a caſting vote was aſcribed to the ſuperior wiſdom of Papinian.

When Juſtinian aſcended the throne, A.D. 527, the reformation of the Roman juriſprudence was an arduous but indiſpenſable taſk. In the ſpace of ten centuries, the infinite variety of laws and legal opinions had filled many thouſand volumes, which no fortune could purchaſe and no capacity could digeſt. Books could not eaſily be found; the ſubjects of the Greek provinces were ignorant of the language that diſpoſed of their lives and properties; and the barbarous dialect of the Latins was imperfectly ſtudied in the academies of Berytus and Conſtantinople. In theſe circumſtances, Juſtinian, finding the authority of the Roman law almoſt aboliſhed in the Weſt, by the declenſion of the empire, reſolved to make a general collection of the whole Roman juriſprudence, and committed the care thereof to his chancellor Trebonian or Tribonian.

Tribonian was eminently qualified for the office. To the literature of Greece he added the uſe of the Latin tongue; the Roman civilians were depoſited not only in his library but in his mind; and he moſt aſſiduouſly cultivated thoſe arts which opened the road of wealth and preferment. From the bar of the prætorian prefects, he raiſed himſelf to the honours of quæſtor, of conſul, and of maſter of the offices; the council of Juſtinian liſtened to his eloquence and wiſdom, and envy was mitigated by the gentleneſs and affability of his manners. This miniſter, aided by nine learned aſſociates, began, in the firſt year of the reign of Juſtinian, and under his direction, to reviſe the ordinances of his predeceſſors, as they were contained, ſince the time of Adrian, in the Gregorian, Hermogenian, and Theodoſian codes; to purge the errors and contradictions, to retrench whatever was obſolete or ſuperfluous, and to ſelect the wiſe and ſalutary laws beſt adapted to the practice of the tribunals and to the uſe of his ſubjects. The work was accompliſhed in 14 months, from A.D. 528, Feb. 13, to A.D. 529, April 7; and the twelve books, or tables, which the new decemvirs produced, might be deſigned to imitate the labours of their Roman predeceſſors. The new "Code" of Juſtinian was honoured with his name, and confirmed by his royal ſignature; authentic tranſcripts were multiplied by the pens of notaries and ſcribes; they were tranſmitted to the magiſtrates of the European, the Aſiatic, and afterwards the African provinces; and the law of the empire was proclaimed in ſolemn feſtivals at the doors of churches. It ſtill remained to extract the ſpirit of juriſprudence from the deciſions and conjectures, the queſtions and diſputes of the Roman civilians. Seventeen lawyers, with Tribonian at their head, were appointed by the emperor to exerciſe an abſolute juriſdiction over the works of their predeceſſors; and the "Digeſt," or "Pandects," were rapidly compoſed in three years, from A.D. 530, Dec. 15, to A.D. 533, Dec. 16. From the library of Tribonian, they choſe 40, the moſt eminent civilians of former times; 2000 treatiſes were compriſed in an abridgment of 50 books; and it has been carefully recorded, that 3,000,000 of lines, or ſentences, were reduced, in this abſtract, to the moderate number of 150,000. The edition of this great work was delayed a month after that of the "Inſtitutes;" and it ſeemed reaſonable that the elements ſhould precede the digeſt of the Roman law. The "Inſtitutes," completed A.D. 533, Nov. 21, which compriſe an ample ſyſtem reduced to a ſhort and elementary treatiſe, are comprehended in four books. (See INSTITUTES.)

The "Code," the "Pandects," and the "Inſtitutes," were declared to be the legitimate ſyſtem of civil juriſprudence; they alone were admitted in the tribunals, and they alone were taught in the academies of Rome, Conſtantinople, and Berytus. Juſtinian addreſſed to the ſenate and provinces his "eternal oracles;" and his pride, under the maſk of piety, aſcribed the conſummation of this great deſign to the ſupport and inſpiration of the deity.

In order to maintain the text of the "Pandects," the "Inſtitutes," and the "Code," the uſe of ciphers and abbreviations was rigorouſly proſcribed; and as Juſtinian recollected, that the perpetual edict had been buried under the weight of commentators, he denounced the puniſhment of forgery againſt the raſh civilians who ſhould preſume to interpret or pervert the will of their ſovereign. Six years, however, had not elapſed from the publication of the "Code," before the verſatile emperor condemned the imperfect attempt, by a new and more accurate edition of the ſame work (A. D. 534, Nov. 16.); which he enriched with 200 of his own laws, and 50 deciſions of the darkeſt and moſt intricate points of juriſprudence. Every year, or according to Procopius, each day, of his long reign, was marked by ſome legal innovation. Many of his acts were reſcinded by himſelf; many were rejected by his ſucceſſors; many have been obliterated by time; but the number of 16 "edicts," and 168 "novels," (A. D. 534—565.) has been admitted into the authentic body of the civil juriſprudence. (See AUTHENTICS and NOVEL.)

All theſe together, viz. the "Code," the "Digeſt," the "Inſtitutes," and the "Novels," form the *Corpus juris civilis*, or body of the civil law, as reduced by order of Juſtinian.

For the ſpace of about 300 years, this ſyſtem of law obtained without any innovation. But the new conſtitutions, made by the emperors from time to time, at length occaſioning ſome alterations; the emperor Baſil, and Leo his ſon, compoſed a new body of the Roman law, chiefly from the Juſtinian, in the Greek language; dividing it into ſeven volumes, and 60 books; under the title of "Baſilica." From which time, Juſtinian's body had but little credit in the Eaſt; the Baſilica taking place of it.

In the Weſt, the civil law had a different fortune; for, though ſome traces of its authority remained in Italy, yet it was little known in Europe, till a copy of Juſtinian's "Digeſts" was accidentally found at Amalfi, in Italy, about the year 1130; and this circumſtance, together with the policy of the Romiſh eccleſiaſtics, contributed to introduce it into ſeveral nations, and occaſioned that inundation of voluminous comments, with which this ſyſtem of law, more than any other, is now loaded.

It is true, however, it was never taught publicly till the 12th century; when the ſtudy of it was introduced into ſeveral univerſities abroad, particularly that of Bologna; where exerciſes were performed, lectures read, and degrees conferred in this faculty, as in other branches of ſcience; and from hence it was carried by Irnerius's diſciples into other countries, and in a little time was taught in all the univerſities.

Many nations, on the continent, juſt then beginning to recover from the convulſions conſequent upon the overthrow of the Roman empire, and ſettling by degrees into peaceable forms of government, adopted the civil law (being the beſt written ſyſtem then extant) as the baſis of their civil conſtitution; blending and interweaving it among their own feudal cuſtoms, in ſome places with a more extenſive, in others a more confined authority.

It was firſt brought over into England by Theobald, a Norman abbot, who was elected to the ſee of Canterbury in 1138; and he appointed a profeſſor, viz. Roger, ſirnamed Vacarius, prior of Beck in Normandy, who opened a ſchool in the univerſity of Oxford, to teach it to the people of this country. Nevertheleſs, it gained ground very ſlowly; king Stephen, A. D. 1149, iſſued a proclamation, prohibiting the ſtudy of it: upon which Vacarius returned into Normandy, and was choſen abbot of Beck. And though the clergy were attached to it, the laity rather wiſhed to preſerve the old conſtitution.

A kind of perſecution was raiſed againſt the profeſſors and ſtudents of the civil law, by the common lawyers and others; but John of Saliſbury ſays, "that, by the bleſſing of God, the more the ſtudy of it was perſecuted, the more it flouriſhed."

The biſhops and clergy, many of whom were foreigners, applied themſelves wholly to the ſtudy of the civil and canon laws, which now came to be inſeparably interwoven with each other; whereas the nobility and laity adhered with equal pertinacity to the common law. Theſe two parties manifeſted a reciprocal jealouſy of what they were unacquainted with, and neither of them perhaps allowed (ſays judge Blackſtone) the oppoſite ſyſtem that real merit which is abundantly to be found in each. This appears, on the one hand, from the ſpleen with which the monaſtic writers ſpeak of our municipal laws upon all occaſions; and, on the other, from the firm temper which the nobility ſhewed at the famous parliament of Merton. Stat. Merton. 20 Hen. III. c. 9. The ſame jealouſy appears above a century afterwards, (11 Ric. II.) when the nobility declared, with a kind of prophetic ſpirit, "that the realm of England hath never been unto this hour, neither by the conſent of our lord the king and the lords of parliament ſhall it ever be, ruled or governed by the civil law." The clergy, however, finding it impoſſible to root out the municipal law, began to withdraw themſelves by degrees from the temporal courts; and to that end, very early in the reign of king Henry III., epiſcopal inſtitutions were publiſhed, forbidding all eccleſiaſtics to appear as advocates *in foro ſeculari:* and wherever they retired, and wherever their authority extended, they diſplayed the ſame zeal to introduce the rules of the civil, in excluſion of the municipal law. This appears in a particular manner from the ſpiritual courts of all denominations, from the chancellor's courts in both our univerſities, and from the high court of chancery; in all which the proceedings are to this day in a courſe much conformed to the civil law; for which no tolerable reaſon can be aſſigned, unleſs that theſe courts were all under the immediate direction of the popiſh eccleſiaſtics, among whom it was a point of religion to exclude the municipal law; pope Innocent IV. having forbidden the very reading of it by the clergy, becauſe its deciſions were not founded on the imperial conſtitutions, but merely on the cuſtoms of the laity. And if it be conſidered, that our univerſities began about that period to recover their preſent form of ſcholaſtic diſcipline; that they were then, and continued to be till the time of the reformation, entirely under the influence of the popiſh clergy; (ſir John Maſon the firſt proteſtant, being alſo the firſt lay chancellor of Oxford), this will lead us to perceive the reaſon why the ſtudy of the Roman laws was in thoſe days of bigotry purſued with ſuch alacrity in theſe ſeats of learning; and why the common law was entirely deſpiſed, and eſteemed little better than heretical. The ſtruggle between the laws of England and of Rome was continued through the reign of king Henry II.; the former ſupported by the ſtrength of the temporal nobility, when the popiſh clergy endeavoured to ſupplant them in favour of the latter. This diſpute was kept on foot till the reign of Edward I.; when the laws of England, under the new diſcipline introduced by that ſkilful commander, obtained a complete and permanent victory.

Before the reformation degrees were as frequent in the canon law as in the civil law. Many were graduates *in utroque jure* or *utriuſque juris*. J. U. D. or *juris utriuſque doctor*, is ſtill common in foreign univerſities. But Henry VIII., in the 27th year of his reign, when he had renounced the authority of the pope, iſſued a mandate to the univerſity of Cambridge, to prohibit lectures, and the granting of degrees in canon law in that univerſity. It is probable that, at the ſame time, Oxford received a ſimilar prohibition, and that degrees in canon law have ever ſince been diſcontinued in England. See DEGREE.

However, the zeal and influence of the clergy prevailed; and the civil law acquired great reputation from the reign of king Stephen to the reign of king Edward III. both incluſive. Henry II., who ſucceeded Stephen, being a much greater politician, was far from diſcouraging the ſtudy of the civil law; which, in conjunction with that of the canon law, prevailed very much in the univerſities, but ſtill more in the cathedral ſchools and monaſteries.

Many tranſcripts of Juſtinian's Inſtitutes are to be found in the writings of our ancient authors, particularly of Bracton and Fleta; and judge Blackſtone obſerves, that the common law would have been loſt and over-run by the civil, had it not been for the incident of fixing the court of common pleas in one certain ſpot, and the forming the profeſſion of the municipal law into an aggregate body.

It is allowed, that the civil law contains all the principles of natural equity; and that nothing can be better calculated to form good ſenſe, and ſound judgment. Hence, though in ſeveral countries it has no other authority but that of reaſon, and juſtice, it is every-where referred to for authority.

It is not received at this day in any nation without ſome alterations: and ſometimes the feudal law is mixed with it, or general and particular cuſtoms; and often, ordinances and ſtatutes cut off a great part of it.

In Turkey the "Baſilics" are only uſed. In Italy the canon law and cuſtoms have excluded a good part of it. In Venice cuſtom hath almoſt an abſolute government. In the Milaneſe, the feudal law and particular cuſtoms bear ſway. In Naples and Sicily, the conſtitutions and laws of the Lombards are, ſaid to prevail. In Germany and Holland, the civil law is eſteemed to be the municipal law: but yet many parts of it are there grown obſolete; and others are altered, either by the canon law, or a different uſage.

In Friezeland, it is obſerved with more ſtrictneſs: but in the northern parts of Germany, the jus Saxonicum, Lubecenſe, or Culmenſe, is preferred before it. In Denmark and Sweden it hath ſcarce any authority at all. In France only a part of it is received; and that part is in ſome places as a cuſtomary law: and in thoſe provinces neareſt to Italy, it is received as a municipal written law. In criminal cauſes, the civil law is more regarded in France; but the manner of trial is regulated by ordinances and edicts.

The civil law, in Spain and Portugal, is connected with the jus regium and cuſtom. In Scotland, the ſtatutes of the ſederunt, part of the regiæ majeſtatis, and their cuſtoms, controul the civil law.

In England, it is uſed in the eccleſiaſtical courts; in the high court of admiralty; in the court of chivalry; and in the courts of the two univerſities: yet in all theſe it is reſtrained and directed by the common law. See CANON *Law*.

CIVIL *Liberty*. See LIBERTY.

CIVIL *Liſt*, the money allotted for the ſupport of the king's houſehold, and for defraying certain neceſſary charges of government. See KING and REVENUE.

CIVIL *Month*. See MONTH.

CIVIL *Obligation*. See OBLIGATION.

CIVIL *State*, conſiſts of the nobility and commonalty, excluſive of the clergy, and of the military and maritime orders.

CIVIL *Subjection*, in *Law*, is a ſpecies of compulſive obligation, whereby an inferior is conſtrained by a ſuperior to an action contrary to what his own reaſon and inclination would ſuggeſt; as when a legiſlator eſtabliſhes iniquity by a law, and commands a ſubject to do what is inconſiſtent with religion or ſound morality. This excuſe cannot be admitted in *foro conſcientiæ*, but obedience to the laws in being is a ſufficient extenuation of civil guilt before the municipal tribunal. Blackſt. Com. vol. iv. p. 28.

Civil *War*. See War.

Civil *Year*, is the legal year, or civil account of time, which every government appoints to be uſed within its own dominions. It is thus called in contradiſtinction to the natural year; which is meaſured exactly by the revolution of the heavenly bodies. See Year.

CIVILIANS' *College*. See College.

CIVILISATION, a law or judgment, which renders a criminal proceſs civil. Civiliſation is performed by turning the information into an inqueſt, or *vice verſa*.

Civilisation, in *Political Economy*, denotes the converſion or transformation of a country or people from a ſavage or barbarous ſtate into a ſtate formed by a due regard to the principles and obligations, the habits and manners of ſocial life, by the means of mental and moral inſtruction, ſalutary laws, and regular government.

CIVITA, or Civeda, in *Geography*, a town of Italy, in the Breſſan, ſeated on the Oglio, 25 miles W. of Breſcia.

Civita *Aquana*, a town of Naples, in the province of Abruzzo Ultra; 15 miles E. of Aquila.

Civita *d'Antina*, a town of Naples, in the province of Abruzzo Ultra; 12 miles S. of Celano.

Civita *Borello*, a town of Naples, in the province of Abruzzo Citra; 19 miles N.N.E. of Moleſe.

Civita *di Caſcia*, a town of Italy, in the ſtate of the Church, and province of Umbria; 5 miles S.W. from Norcia.

Civita *Caſtellana*. See Castellana.

Civita *di Chieti*. See Chieti.

Civita *Lavinia*, a town of Italy in the Campagna di Roma; 4 miles from Veletri.

Civita *Luparella*, a town of Naples, in the province of Abruzzo Citra; 2 miles N. of Civita Borello.

Civita *Mandonia*, a town of Naples, in the province of Calabria Citra; 15 miles N.N.E. of Biſignano.

Civita *à Mare*, a town of Naples, in the province of Capitanata; 13 miles E.S.E. of Termola.

Civita *Nuova*, a town of Italy, in the marquiſate of Ancona, on the road from Loretto to Fermo; 7 miles from the former and 9 from the latter. It is ſeated near the coaſt of the Adriatic or gulf of Venice, on a ſmall river or creek. N. lat. 43° 10″, E. long. 13° 46′.—Alſo a town of Iſtria, ſeated on the Adriatic ſea, N.W. from Ancona, and 20 leagues E. of Venice, within a ſmall creek or bay, on a prominent part of the coaſt, E. from Savori. N. lat. 45° 36′. E. long. 14° 2′.

Civita *di Penna*, a town of Naples, in the province of Abruzzo Ultra, the ſee of a biſhop, ſuffragan of Chieti; 10 miles S.E. of Teramo.

Civita *Real*, a town of Naples, in the province of Abruzzo Ultra, 13 miles N.W. of Aquila.

Civita *di St. Angelo*, a town of Naples, in the province of Abruzzo Ultra, ſeated on a mountain; 3 miles from Poto di Salino.

Civita *Tomaſſa*, a town of Naples, in the province of Abruzzo Ultra; 6 miles S.W. of Aquila.

Civita *Vecchia*, or Malta, a town ſeated on a hill in the centre of the iſland of Malta, ſtrongly fortified. It is the ſee of a biſhop, and contains, beſides a large and handſome cathedral, ſeveral other churches and convents. From the town may be ſeen the whole iſland, and ſometimes the coaſts of Africa and Sicily.

Civita *Vecchia*, a fortified ſea-port town of Italy, in the ſtate of the church and patrimony of St. Peter, ſituated in a bay of the Tuſcan ſea. The port was enlarged and rendered commodious by Trajan; it is the beſt in Italy, and was declared free by Benedict XIV. It is the uſual ſtation for the pope's galleys. The air is unhealthy and the water not good; 27 miles N.W. from Rome. N. lat. 42° 5′ 24″. E. long. 11° 46′ 15″. The alum-work, which is ſituated about an Italian mile N.W. from Tolfa, and ſix from Civita Vecchia, is reckoned by ſome Italian hiſtorians to have been the firſt; however it is certainly the oldeſt of any that is carried on at preſent. The founder of it was John di Caſtro, a ſon of the celebrated lawyer, Paul di Caſtro, (See Castro), who had an opportunity at Conſtantinople, where he traded in Italian cloths, and ſold dye-ſtuffs, of making himſelf acquainted with the method of boiling alum. Returning to his country upon the capture of the city, he found at Tolfa a plant (the *ilex aquifolium* or holly), which indicated alum in the ſoil, and which he had obſerved in the aluminous diſtricts of Aſia; and upon examining the ſoil diſcovered alum. Pope Pius II. availed himſelf of the diſcovery, which was made, according to his account, about the year 1460 or 1465, and this ſalt was afterwards manufactured in great quantities, and ſold to the Venetians, the Florentines, and the Genoeſe. See Alum.

CIVITALI, Matteo, in *Biography*, a ſculptor and architect of ſome eminence, who was born at Lucca, where, amongſt many other works, he conſtructed in 1444 the little temple, which contains the miraculous crucifix, in the church of St. Martino, a ſtatue of St. Sebaſtian, and another of the Madonna, which was placed at an angle of the church, on the outſide; which works Vaſari conſiders as no wiſe inferior to thoſe of his maſter, Giacomo della Quercia. But the greateſt work of Civitali in ſculpture, is in the chapel of St. John the Baptiſt at Geneva, where he left ſix admirable and highly finiſhed ſtatues of white marble, repreſenting Adam, Eve, Abraham, Abias, Zacharias, and Elizabeth. Soprani.

CIVITARA, in *Geography*, a town of Naples, in the province of Capitanata; 2 miles N.E. of Dragonera.

CIVITAS Equestrium, Novodunus, in *Ancient Geography*, a place of Gallian Lyonnenſis, which had been an epiſcopal ſee till the year 412; now Nions.

Civitas *Nova*, a town of Scythia.

CIVITATES Fœderatæ, were cities, which in conſequence of the alliance they had contracted with the Roman people, were obliged when required, although they were governed by their own proper magiſtrates, to furniſh a contingent of auxiliary troops.

CIVITELLA, in *Geography*, a town of Naples, in the province of Otranto; 5 miles N.E. of Tarento.—Alſo, a fortreſs of Naples, in the province of Abruzzo Ultra; 7 miles N. of Teramo.

CIVRAC, a town of France, in the department of the Gironde; 7 miles E. of Libourne.

CIVRAY, or Sivray, a town of France, and principal place of a diſtrict, in the department of the Vienne, ſeated on the Charente; 8½ leagues S.W. of Poitiers. The place contains 1484, and the canton 9728 inhabitants; the territory includes 207½ kiliometres, and 14 communes.

CIVRY, a town of France, in the department of the Eure and Loire, and chief place of a canton, in the diſtrict of Chateaudun; 7 miles E.N.E. of Chateaudun.

CIUS, in *Ancient Geography*, a river of Lower Mœſia, which had its ſource in the mountains of Thrace, and diſcharged itſelf into the Danube. Euſtathius ſays, that a town of the ſame name was ſituated near this river.

Cius, a town of Aſia Minor in Bithynia, ſituated on the ſea-coaſt, at a ſmall diſtance from Nicæa. It had been epiſcopal.

CIZARA, a town of Aſia, in the Leſſer Armenia, placed by Ptolemy near the Euphrates.

CIZE', in *Geography*, a valley of France, of which St. Jean-Pié-de-port is the capital.

CIZYA, in *Ancient Geography*, a town of Thrace, into which Euſtathius was ſent as an exile.

CKEBOE, in *Geography*, a town of Norway; 6 miles S.S.E. of Drontheim.

CLACKLAND, a ſmall iſland of Scotland, near the eaſt coaſt of the iſland of Arran.

CLACK *wool, to,* is to cut off the ſheep's mark, which makes it weigh lighter; as to force wool, ſignifies to clip off the upper and hairy part thereof; and to bard it, is to cut the head and neck from the reſt of the fleece. Stat. 8 H. VI. cap. 22.

CLACKMANNAN, in *Geography*, the principal town of the county of Clackmannanſhire, ſtands on an eminence 190 feet above the level of the Forth, which deſcends gradually on each ſide of the town, but on the weſtern, where the ancient tower of Clackmannan is ſituated, the ground is broken, and diſcovers vaſt rocks of the moſt romantic forms, which give great intereſt to the admirable view from the venerable ſtructure juſt mentioned, originally built by king Robert Bruce, and for a long time the reſidence of the Bruces. The town poſſeſſes few attractions; and though the principal ſtreet is broad and convenient, yet the mean appearance of many of the houſes gives an air of wretchedneſs to the place, which ſeems confirmed by the ruinous ſtate of the tolbooth and court-houſe, where the election for a member of parliament is held, and at intervals the ſheriff's court. The inhabitants are indebted to the river Devon for their harbour, which enters the Forth at Clackmannan, and to ſir Lawrence Dundas for its improvement in 1772: the mean depth of water is at preſent 20 feet at the mouth of the harbour, and 10 at the ſhipping-place. The town pays feu duty to the proprietor of the eſtate of the ſame name, on which it ſtands. The population amounts to 640.

Clackmannan pariſh is about ſix miles in length, and nearly five in breadth. Eight hundred acres of this pariſh are covered with natural woods, which are highly uſeful and ornamental; the remainder of the land is arable, and very productive, with the exception of a ſmall proportion that is clay, and conſequently wet. The gentlemen farmers of the county formed a club, twenty years ago, for the expreſs purpoſe of introducing agricultural improvements, from which great advantages have been derived; nor are the natives leſs indebted to the Devon Iron Company, who have furniſhed employment to numbers at their extenſive works, erected on the eſtate of lord Cathcart, near which is the new and flouriſhing village of Newtonſhaw. There are, beſides, two large diſtilleries at Kilbagie and Kennet-Pans: at the latter place is a commodious harbour. Coal, limeſtone, and freeſtone, are very plentiful throughout the pariſh, which is interſected by the rivers Ford and Devon. Population 2528, in 1791.

CLACKMANNANSHIRE, a county of Scotland. This diſtrict, which is about nine miles in length, and not exceeding eight in its greateſt breadth, is bounded on the ſouth and ſouth-weſt by Stirlingſhire and the frith of Forth, and on the weſt, north, and eaſt, by Perthſhire. The coaſt is highly favourable to the fiſherman and mariner, as it furniſhes many excellent harbours for ſhipping, and creeks for the reception of boats. The ſurface riſes from the ſhore, and forms the Ochil mountains, of which Bencleugh, in the pariſh of Tilly-coultry, is the higheſt; the plain near the Forth is extremely fertile, producing great crops of corn, and abounding with rich paſtures. Although the farmers of this county have made conſiderable improvements in agriculture, and are enabled to export a great deal of grain, they turn their attention rather to raiſing flocks and herds than wheat, for which they have ſtrong inducements in the plentiful feed for ſheep, furniſhed by nature on the ſides of the Ochil mountains. Theſe eminences contain valuable ores of ſilver, lead, copper, cobalt, and antimony, beſides beautiful ſpecimens of iron ore, agates, pebbles, and a few topazes. In addition to theſe advantages, the diſtrict abounds with coal throughout, freeſtone, and granite, the conveyance of which has lately been greatly facilitated by the introduction of turnpike roads. There are four pariſhes, the county town, and a large village named Alloa in Clackmannanſhire, which, in conjunction with the county of Kinroſs, ſends one member to parliament. "The valued rent is 26,482*l.* Scots, and the real land rent is about 14,200*l.* ſterling." The population, according to the enumeration returned to ſir John Sinclair, was 8749. The principal manſions ſituated within the county are Tullibody, the reſidence of the family of Abercromby; Clackmannan, that of Mr. Bruce of Kennet; Shawpark and Alloa, the former the ſeat of lord Cathcart, and the latter of the Erſkines of Alloa.

CLACKNACARRY, a village in Inverneſsſhire, in Scotland, about 1½ mile N. of the town of Inverneſs; it is ſituate on the S.W. ſide of loch Beauly, and at the eaſt end of the intended *Inverneſs and Fort-William,* or Caledonian Canal, the works of which are rapidly proceeding. The ſpring-tides here riſe about 11 to 15 feet, neap tides 7 feet. In 1804, the excavation of the baſon and ſea-lock at this place were begun; an immenſe embankment was begun, which, in May 1806, had extended 240 yards into the lock, or two-thirds of its intended length, for incloſing the ſite of the ſea-lock, which is therein to be built for the admiſſion of ſhips and veſſels as large as 32-gun frigates. A rail-way has been formed for bringing earth from the hill on the weſt ſide of the road from Inverneſs to Beauly, and under which it paſſes, for completing the embankment in the ſea above mentioned: another rail-way has been laid, from the Rubble-Stone Quarry in Clacknacarry to this embankment, and alſo to the ſecond lock on the canal, the maſonry of which is now (1807) in a great meaſure completed. Clacknacarry may be expected hereafter to become a conſiderable place of trade, when this ſtupendous and important canal of communication between the eaſt and weſt ſeas is completed.

CLADAUS, or CLADEUS, in *Ancient Geography*, a river of Peloponneſus, in that part of the Elide called Triphylia. It diſcharges itſelf into the Alpheus; and Pauſanias ſays, that the inhabitants of the Elide paid religious worſhip to this river.

CLADEUTERIA, in *Antiquity*, a feſtival celebrated at the time of pruning the vines. It was likewiſe called *biſbæa*.

CLADIUS, *in Natural Hiſtory*, a name given by the ancients to the ſtag or deer, when four years old; in this year, or at the end of it, it was called *ceraſtes*. The Greeks had names for all the years' growth of this animal up to its perfection: in the firſt year they called it *nebrus;* in the ſecond *pattalea;* in the third *dicrotus;* and in the fourth *cladius*, or *ceraſtes* towards the end of that year. This name the creature retained all its life afterwards, it being ſuppoſed at its full maturity at that time.

CLADODES, in *Botany*, Boſc. Nouv. Dict. Lour. Flor. Cochin. Claſs and order, *monæcia polyandria*.

Gen. Ch. *Cal.* four-leaved; leaves oval, concave. *Cor.* none. *Stam.* in the *male*, filaments eight, membranous. *Piſt.*

in the *female*, germ ſuperior, trigonous; ſtigmas three, ſeſſile, oblong. *Peric.* capſule nearly round, three-lobed, three-celled, three-valved. *Seeds* one in each cell.

Sp. C.—A ſhrub. *Leaves* alternate, lanceolate, ſmooth, wrinkled. *Flowers* ſmall, in terminal racemes. A native of Cochinchina.

CLADONIA, a genus formed, by Hoffman, out of the lichens of Linnæus. It is figured by him in Pl. 25. of his Plantæ lichenoſæ, and belongs to the Scyphiphora of Ventenat. See LICHEN and SCYPHIPHORA.

CLAESSEN, AERT, or ALAERT, in *Biography*, a painter of ſome eminence, born at Leyden in the year 1498. At a very early period he evinced a ſtrong inclination for painting. In 1516, he became the ſcholar of Cornelius Engelbrechtſen, and by his continued application ſhortly acquired proficency in his art. He chiefly employed his talents in painting ſubjects from the Old and New Teſtament, or other well known hiſtories; and rejected the allurements of poetical fictions, or fabulous images. Though his compoſitions were good, his manner of painting was by no means pleaſing. At firſt, his ſtyle reſembled that of his maſter, Engelbrechtſen; but this he changed upon ſeeing the works of John Schoorel: he imitated M. Hemſkerck in the richneſs of architectural decoration.

Claeſſen was as remarkable for his modeſty as for his profeſſional merit; and he could never be perſuaded to quit the tranquil obſcurity of his ſituation for the honours which his talents as an artiſt would have intitled him to. His facility in compoſing was aſtoniſhing; and he made a vaſt number of drawings for the painters on glaſs, for which he never received a greater price than ſeven-pence each. The family Buytenwegh, at Leyden, poſſeſſed three pictures of this artiſt, which were full of expreſſion. The firſt was Chriſt on the Croſs, between the Two Thieves, with the Maries, and other figures below. The ſecond repreſents our Saviour bearing the Croſs, followed by his diſciples and a multitude of people; and the third, Abraham conducting his ſon Iſaac, loaded with wood, to the place of ſacrifice. H. Galtzius at Haerlem, had another picture of this artiſt, which he highly eſteemed. The ſubject was the paſſage of the Red Sea: the variety of the figures, and the ſingularity of the dreſſes and turbans were ſurpriſing.

The death of Aert Claeſſen was occaſioned by his falling into a canal, where he was unfortunately drowned, in the year 1564. Deſcamps.

CLAGENFURT, in *Geography*, a town of Germany, and capital of the duchy of Carinthia, ſeated on the Glan, built in a ſquare form, and ſurrounded with a good wall. It has ſix churches and three convents; a manufacture of cloth, and a ſociety for the promotion of agriculture and uſeful arts; 50 miles N. of Trieſte. N. lat. 46° 45′, E. long. 14° 11′.

CLAGGAN BAY, a bay in the county of Galway, Ireland, ſouth of Claggan point. It is of eaſy acceſs, has clean, good holding ground, and pretty well ſheltered, with depth of water ſufficient for the largeſt ſhips. M'Kenzie.

CLAGGAN *Point*, a cape of Ireland on the weſt coaſt of the county of Galway, long. 10° 4′ weſt from Greenwich, lat. 53° 34′ N.

CLAIC, Fr. a hurdle, or ſort of rectangular wicker-work. Hurdles ſerve at ſieges in lieu of blinds or mantelets, when there is a want of them, to cover a lodgment, a ſap, or a paſſage of the ditch. They cover them with earth in order to guard them againſt fire-works. They make uſe of *pitched claics*, or hurdles, with good effect for making cauſeways in boggy or marſhy places, when the water is carried off from them by drains.

CLAIM, in *Law*, a challenge of intereſt in any thing that is in poſſeſſion of another; at leaſt out of a man's own. See NON-CLAIM.

There are divers ſorts of claims; as claim by charter, by deſcent, by acquiſition, &c.

Claim is otherwiſe defined to be a challenge of the ownerſhip or property which one hath not in poſſeſſion, but which is detained from him by wrong. It is either verbal, when a perſon by words claims or challenges the thing that is not in his poſſeſſion, or it is by an action brought, &c.; and it relates ſometimes to lands, and ſometimes to goods and chattels. Where any thing is wrongfully detained, this claim ſhould be made; and the perſon who makes it may thus avoid deſcents of lands, diſſeiſins, &c. and preſerve his title, which would otherwiſe be in danger of being loſt. Co. Litt. 250. A man who hath preſent right or title to enter, muſt make a claim; and in caſe of reverſions, &c. a perſon may make a claim, when he hath right, but cannot enter on the lands; and when he dares not make an entry on the land, for fear of perſonal injury, he may approach as near as he can to the land, and claim the ſame; and this ſhall be ſufficient to veſt in him the ſeiſin. 1 Inſt. 250. If nothing hinders a man, having right to land, from entering or making his claim; he muſt do it before he ſhall be ſued to be in poſſeſſion of it, or can grant it over to another; but where the party who hath right is already in poſſeſſion, and where an entry or claim cannot be made, it is otherwiſe. 1 Rep. 157. A claim may be made by the party himſelf, and ſometimes by his ſervants or deputy; and a guardian in ſocage, &c. may make a claim, or enter in the name of the infant that hath right, without any commandment. Co. Litt. 245. Claim or entry ſhould be made as ſoon as may be; and by the common law it is to be within a year and a day after the diſſeiſin, &c.; and if the party who hath unjuſtly gained the eſtate, do afterwards occupy the land, in ſome caſes an aſſiſe, treſpaſs, or forcible entry may be had againſt him. Litt. Sect. 426, 430. If a fine is levied of lands, ſtrangers to it are to enter and make a claim within five years, or be barred; infants after their age, feme-coverts after the death of their huſbands, &c. have the like claim, by ſtat. 1. R. III. c. 7.

CLAIM, *Continual*, a claim made from time to time, within every year and day, to land, or other thing, which, on ſome accounts, cannot be attained without danger.

Thus, if I am diſſeiſed of land, into which, though I have a right, I do not enter for fear of being beaten; I am to hold on my right of entry at my beſt opportunity, by approaching as near as I can, once every year, as long as I live: and thus I leave the right of entry to my heir. This claim, if it be repeated once in the ſpace of every year and day (whence it derives the name of continual claim), has the ſame effect with, and in all reſpects amounts to, a legal entry. Litt. §. 419. 423. By ſtat. 32 Hen. VIII. c. 43. five years muſt elapſe without entry or continual claim, in order that a deſcent on the diſſeiſor's death ſhould take away the entry of the diſſeiſee, or his heir; but after the five years, the diſſeiſee muſt make continual claim as before the ſtatute. And by ſtat. 4 Ann. c. 16. §. 14. no claim (or entry) ſhall be of effect to avoid a fine, unleſs an action ſhall be commenced thereon within a year, and proſecuted with effect.

CLAIM *of liberty*, a ſuit or petition to the king in the court of Exchequer, to have liberties and franchiſes confirmed there by the king's attorney-general.

CLAIM, *Falſe.* See FALSE.

CLAIM, *Quit.* See QUIT.

CLAIN, or Clane, in *Geography,* a ſmall fair town on the river Liffey, in the county of Kildare, Ireland, which gives name to the barony. At an abbey here, the ruins of which are ſtill ſeen, a ſynod was held in 1162. It is 16 miles W. from Dublin.

Clain, a river of France, which paſſes by Poictiers, and runs into the Vienne; 3 miles S. of Chatellerault.

CLAIR, Jean Marie Le, in *Biography,* a French violiniſt of great merit and celebrity for compoſition, as well as performance. Though contemporary with Rameau, his melody and ſtyle were ſuperior to thoſe of that eminent theoriſt and opera compoſer. The productions of Le Clair manifeſt original genius, as well as knowledge of harmony, and the finger-board of his inſtrument. His ſolos were printed in England by Walch, and uſed to be frequently and admirably played by Pinto.

Le Clair was born at Lyons, 1697, and died at Paris in 1764. His early inclinations led him to the art of dancing, and he firſt appeared on the ſtage at Rouen as a dancer. By a ſingular chance, the famous Dupré was at that time the leader of the orcheſtra at the Rouen theatre, as firſt violin; but both, diſcontented with their talents, did juſtice to each other, and changed places: Dupré became the firſt dancer that ever exiſted, and Le Clair ſoon opened a new path to harmony.

Batiſte and Guignon at that time enjoyed great reputation; but Le Clair eſtabliſhed his fame upon a more ſolid foundation, by the manner in which he performed double ſtops: a new ſtyle, at firſt introduced by Batiſte, but which Le Clair brought to the higheſt degree of perfection.

Le Clair, ſtill aſpiring at greater perfection in his art, went to Holland, and placed himſelf under the celebrated Locatelli, the greateſt performer on the violin of his time; and returning to Paris, excited admiration in all who heard him.

His ſolos, duets, trios, and concertos, were long in univerſal favour, and ſtill form the beſt ſchool for the violin in France, as the works of Corelli do in Italy. His opera of *Sylla* and *Glaucus* had no extraordinary ſucceſs; there are in it, however, many excellent parts, which have been inſerted in other operas, and are always heard with pleaſure.

The ſimplicity of Le Clair's character inclined him to diſlike the great world, and its turbulence, and determined him to retire to a ſmall houſe of his own in the ſuburbs of Paris: but in going home, after ſupping in town, October 22d, 1764, he was aſſaſſinated, without its ever being diſcovered by whom, or for what.

Clair, in *Geography,* a country of America, in the territory N.W. of the Ohio; laid out in April, 1790.

Clair, St. a fort of America in the ſtate of Ohio, ſituated 25 miles N. of fort Hamilton, on a ſmall creek which falls into the Great Miami, and 21 miles S. of fort Jefferſon.

Clair, St. the name of a *lake* lying about midway between lake Huron and lake Erie, about 90 miles in circumference, and comprehending, according to the meaſurement of Mr. Hutchins, 89,500 acres. It receives the waters of the three great lakes, Superior, Michigan, and Huron, and diſcharges them through the river or ſtrait, called Detroit, into lake Erie. This lake is of a circular form, and navigable for large veſſels, except a bar of ſand towards the middle, which prevents loaded veſſels from paſſing. The cargoes of ſuch as are freighted muſt be taken out, carried acroſs the bar in boats, and then re-ſhipped. The fort of Detroit is ſeated on the weſtern bank of the river of the ſame name, about 9 miles below lake St. Clair.

Clair, St. a town of France in the department of the Channel, and chief place of a canton, in the diſtrict of St. Lô; the place contains 644, and the canton 9647 inhabitants; the territory includes 127½ kilometres and 16 communes.

CLAIRA, a town of France, in the department of the Eaſtern Pyrenees; 5 miles N.E. of Perpignan.

CLAIRAC, a town of France, in the department of the Lot and Garonne, advantageouſly ſituated in a valley on the Drot, and containing about 3000 inhabitants; who cultivate tobacco and corn, and make a great quantity of wine and brandy; one league S.E. of Tonneins, and 4½ N.W. of Agen.

CLAIRAUT, Alexis-Claude, in *Biography,* a celebrated mathematician, was born at Paris in 1713, and, under the inſtruction of his father, who was a teacher of mathematics in that city, he made a ſurpriſing proficiency at a very early age in this department of ſcience. When he was 4 years old, he had learned to read and write; at the age of 9 and 10 years he appears to have been well acquainted with algebra, geometry, and conic ſections; and between 12 and 13 he read a memoir to the Academy of Sciences, concerning four geometrical curves of his own invention. At this early period he ſeems to have laid the foundation of his work on curves, having a double curvature, which he finiſhed in 1729, before he had completed his 16th year. At the age of 18, or in 1731, he was nominated adjunct mechanician to the Academy; in 1733 aſſociate, and in 1738 penſioner. Few, if any, of the members of this learned ſociety contributed a greater number and variety of ingenious papers on the ſubjects of aſtronomy, mathematics, optics, &c. to its memoirs, from the year 1727 to 1762, than M. Clairaut. His memoir "De l'Orbite de la Lune dans le Syſteme de Newton," was communicated to the Academy in 1743; and he proſecuted the ſubject in ſeveral ſubſequent memoirs and ſeparate publications. In 1750 the Academy of Peterſburgh propoſed a prize for the year 1752, on the ſubject of the lunar motions, with a view of aſcertaining "whether all the inequalities that had been obſerved in the motion of the moon are conformable to the theory of Newton, and what is the true theory of theſe inequalities, by means of which the place of the moon might be exactly determined at any given moment?" Clairaut obtained this prize, and his paper on the ſubject was printed at Peterſburgh in that year in 4to. He alſo gained another prize for his new lunar tables, publiſhed in 1754, under the title of "Tables de la Lune, calculées ſuivant la Théorie de la Gravitation univerſelle," Paris, 8vo. In 1765 he publiſhed a new edition of the piece which had gained the prize at Peterſburgh in 1752, and alſo new "Tables of the Moon," ſomewhat different in form from thoſe which he had preſented to the public in 1754. In the year 1756 M. D'Alembert publiſhed a new edition of his "Tables," which had appeared in 1754, in his "Recherches ſur differens points importans du Syſtéme du Monde," and which Le Monnier had publiſhed in his "Inſtitutions Aſtronomiques." About this period commenced the diſpute between Clairaut and D'Alembert, concerning their reſpective theories, which engaged the public attention for ſome years; the papers of Clairaut, relating to this controverſy, were communicated to the public in the "Journal des Savans" for 1758, 1759, 1761 and 1762. Beſides the various communications abovementioned, and others inſerted in the Memoirs of the Academy, M. Clairaut publiſhed the following works ſeparately, *viz.* "On Curves of a double Curvature," in 1730, 4to.; "Elements of Geometry," 1741, 8vo.; "Theory of the Figure of the Earth," 1743, 8vo.; "Elements of Algebra," 1746, 8vo.; and "Tables of the Moon," 1754, 8vo. Clairaut died, at the age of 52 years, on the 17th of May

1765. Montucla, Hiſt. des Mathem. by De la Lande, vol. iv.

CLAIRE, in *Geography*, a town of France, in the department of the Lower Seine, 10 miles N. of Rouen.

CLAIR-OBSCURE, or Chiaro Scuro, one of the great component parts of painting or drawing, is the art of diſtributing the lights and darks in a picture, in ſuch a manner as to give at once proper relief to the figures, the beſt effect to the whole compoſition, and the greateſt delight to the eye.

Chiaro-ſcuro, the original word is Italian, and compounded of *chiaro, light*, and *oſcuro, dark*.

Although the word chiaro-ſcuro is generally conſidered as ſynonymous with light and ſhade, yet it is proper to obſerve, that it is of a more extended ſenſe; as it denotes not only the lights and ſhades of a picture, but alſo its lights and darks, of what kind ſoever. In this latter ſenſe chiaro-ſcuro is ſo nearly allied to colouring, that, for ſome centuries, it was not thought poſſible to diſunite them.

The engravers, from the earlieſt period of their art till the time of Rubens, never attempted more than to give to each object in their engravings its proper lights and ſhades, leaving to painting alone the privilege of producing effect of chiaro-ſcuro, by the oppoſition of objects of dark local colour to light ones. Thus, the effect of chiaro-ſcuro, ſo forcible in the picture, was weak and incomplete in the print; the lights upon a piece of black drapery, or any other dark-coloured object, being left the ſame as thoſe upon a white, or light-coloured object. But engravers at preſent, by adopting a different principle, are enabled to make the effect of their prints, ſo far as relates to chiaro-ſcuro, as rich and powerful as it is in the pictures they copy: this is done by giving, beſides the lights and ſhades, the relative lightneſs or darkneſs of the local or proper colour of each object in the picture, thereby producing what is called by artiſts the tone of the picture.

A thorough conception and knowledge of the chiaro-ſcuro is of the greateſt importance to the painter. It is chiefly by the proper application of that branch of the art that he is enabled to make the various objects in his picture appear to project or recede, according to their relative ſituations or diſtances; and thus far the principles of it are neceſſary to the artiſt, ere he can hope to render his imitation juſt or intelligible. But, it being required in the works of fine art, not only that truth ſhould be told, or that beauty ſhould be repreſented, but likewiſe that the one and the other ſhould be made appear to every poſſible advantage; it has, therefore, ever been the ſtudy of great painters, not only to give the due appearance of roundneſs, or projection to the objects in their pictures, by proper lights and ſhadows; but likewiſe to unite or contraſt the maſſes of light and dark, in ſuch a manner as to give at once the moſt forcible impreſſion to the imagination, and the moſt pleaſing effect to the eye.

Chiaro-ſcuro may, therefore, be ſaid to be of two kinds; that which is neceſſary, and that which is expedient or ornamental.

The firſt kind has been, in a greater or leſs degree, underſtood and practiſed from the revival of painting in the thirteenth century; and, in ſhort, it was utterly impoſſible that any artiſt ſhould have attempted to imitate on a plain ſurface the appearances of round bodies, without diſcovering the neceſſity of lights and ſhades. However, even this, which may be called natural chiaro-ſcuro, was but very imperfectly underſtood till the time of Maſaccio, near the middle of the 15th century; the painters, prior to this period, having had very little idea of what are called projecting ſhadows; ſuch as are thrown upon one object, by another intervening between it and the rays of light. Indeed, in the pictures of moſt of the old painters who preceded Lionardo da Vinci, the ground on which the figures ſtand, is made ſo light on that ſide where this projecting ſhadow ſhould be thrown, that they frequently ſeem to have only air to ſupport them.

Lionardo da Vinci, towards the end of the 15th, and the beginning of the 16th century, was the firſt who, in his admirable writings, as well as in his pictures, treated the ſubject of chiaro-ſcuro ſcientifically; but although the few remaining works of his pencil have prodigious force, rotundity, and ſoftneſs; yet the ſyſtem which he recommends and generally adopted, of relieving the dark ſide of his figures by a light back-ground, and the light parts by a dark one, prevented that expanſion and breadth of effect which the great Coreggio ſoon after diſcovered could only be attained by a contrary mode of conduct, that of relieving one ſhadow by another ſtill darker, and of uniting ſeveral light objects into one great maſs.

The conduct of Coreggio, with reſpect to his lights and ſhadows, is worthy the moſt attentive conſideration; and there never, perhaps, was a painter who, independent of the advantage, which he well knew how to take, of the occaſional oppoſition of dark to light-coloured objects, produced ſo ſimple, ſo grand an effect of chiaro-ſcuro. His figures, as well as the other objects in his pictures, are at all times ſo diſpoſed, as naturally to receive the light exactly in thoſe parts where it is moſt wanted, and beſt ſuits the effect of the whole; and yet this is done ſo ſkilfully, and at the ſame time with ſuch an appearance of eaſe, that neither propriety nor grace of action ſeems in anywiſe to be ſacrificed in the aſtoniſhing combination.

The principal painters of the Venetian ſchool, Giorgione, Titian, Baſſan, Tintoret, and Paul Veroneſe, were great maſters of effect; but with them this effect is more frequently the reſult of accordance or oppoſition of the local colours of the different objects compoſing their pictures, than of any very ſtudied or remarkably ſkilful diſpoſition of the maſſes of lights and ſhadows.

Michelangiolo da Caravaggio, who flouriſhed at the end of the ſixteenth century, and Guercino, who came ſoon after, produced the moſt powerful effects of chiaro-ſcuro, by means widely different from thoſe adopted by any of their predeceſſors: but though they rendered their pictures moſt ſtriking, by reaſon of the very ſtrong oppoſitions of light and ſhadow, which they made almoſt conſtantly to pervade them, beauty of form and expreſſion was too frequently ſacrificed to force; and we are taught this truth, that chiaro-ſcuro, like many other parts of painting, cannot be carried beyond certain limits, but at the expence, more or leſs, of the other eſſentials of the art.

Gerard Hunthorſt, called by the Italians Gherardo della Notté, and Adam Elſhemer, produced aſtoniſhing effects of chiaro-ſcuro in their candle and moon-light pieces, which are deſervedly in the higheſt eſtimation with the lovers of painting; whilſt Rubens, with his all-commanding genius, graſped the various magic treaſures of the pencil, and by uniting the wide expanſive effect of Coreggio, the richly contraſted tints of the Venetians and the force of Caravaggio, has only left us to regret, that his magnificent inventions were not drawn with the purity of Raffaele, or the correctneſs and grandeur of Buonaroti.

If Rubens aſtoniſhes by his unbounded diſplay of light, the parſimonious uſe made of it by Rembrant, is not leſs captivating or ſurpriſing. Rembrant conſidered the lights in his pictures as ſo many gems, acquiring increaſed luſtre from their rarity; and indeed the ſtriking effect he has produced by the extraordinary means he adopted, happily ſhews, how vain the attempt to limit or reſtrain by rules the workings of genius in the human mind.

An attentive ſtudy of the works of theſe great maſters, either in their pictures or prints, together with a conſtant reference to nature, is the ſureſt method of attaining a knowledge of the chiaro-ſcuro; but although, in this caſe, precept can in no wiſe ſuperſede example, a few remarks may be of uſe in directing the ſtudent.

Effects of chiaro-ſcuro are produced by combinations of lights, middle tints, and ſhadows; to which may be added, as was before obſerved, the oppoſitions of dark coloured objects to light ones.

Light, as applicable to painting, may be conſidered of four kinds: firſt, that proceeding without interruption, immediately from the ſun to the object; this cauſes very forcible and cutting ſhadows, and ſtrong reflected lights, from one object to another; but though the chiaro-ſcuro thus produced is moſt brilliant and powerful, the means will ſeldom be reſorted to by thoſe artiſts who are unwilling to ſacrifice beauty of form, or delicacy and truth of expreſſion, to glitter and ſplendour of effect, unleſs indeed in landſcape, to which the glow of ſun-ſhine alone gives life and animation.

The ſecond kind of light is that produced when the rays of the ſun are interrupted by clouds or miſts: this is what Lionardo da Vinci calls the univerſal light, and which he particularly recommends, as it gives an effect at once broad, rich, ſimple, and tranquil, and in no degree deſtroying the beauty either of forms or expreſſion. In this caſe, the lights and ſhades are ſoftly and imperceptibly blended into each other, and the reflected lights are proportionally leſs diſcernible.

The third kind of light is that of the moon, of a cold hue, and infinitely leſs powerful than that of the ſun. The ſtill effects of moon-light have never been more truly deſcribed, than by the exquiſite and feeling pencil of Vanderneer, many of whoſe works in this way are beyond all price.

The fourth kind of light is ſuch as proceeds from torches, candles, or any other artificial flame. This kind of light tinges the object it illumines with its own yellow hue; its influence is but ſmall, except upon objects near it, and the ſhadows are proportionally dark and extended.

Painters have, by combining the various properties of theſe different ſorts of light, produced a fifth kind, which may be termed ideal, or pictureſque light; thus Rubens, amongſt others, has not unfrequently united in one picture the brilliant illumination cauſed by the direct rays of the ſun, and thoſe forcible reflections which in nature are only the conſequence of ſuch powerful light, with that ſoftneſs and repoſe which the more quiet, or what Da Vinci terms univerſal light, is alone calculated to occaſion. Caravaggio and Spagnoletto joined the deep ſhadows of night to meridian brightneſs; and many of their extravagant followers who painted at Venice about 1640, acquired by their diſmal and almoſt midnight effects, the appellation of the "*Setta de tenebroſi*," the gloomy ſect of painters.

However, when this ideal chiaro-ſcuro is uſed with diſcretion, and employed in ſuch a manner as to co-operate with, or increaſe the expreſſion of the picture, by its conformity to the character of the ſubject repreſented; more beautiful and ſtriking effects are the reſult, than could have been occaſioned by the moſt exact imitation of any real appearance in nature. For it is ever to be remembered, that not the mere imitation, but, as it were, the rivalſhip of nature, ſhould be the exalted aim of the artiſt who is ambitious of ſhining in the higher departments of painting, ſculpture, or indeed any of the fine arts.

The middle tint is occaſioned by the rays of light ſtriking in a ſide direction, or obliquely on the object; it is neither light nor dark, but that beautiful medium by which the ſkilful artiſt is enabled to blend, by imperceptible gradations, the extremes of both. The management of the middle tints is of the greateſt importance, but can only be learned by frequent examinations of the works of the greateſt painters, and an aſſiduous ſtudy of nature.

With reſpect to ſhadows, it has been before obſerved, that in nature they ever appear powerful and abrupt, in proportion as the light is forcible; and that in theſe caſes the reflected lights, caſt by reverberation, from the enlightened part of one object upon the ſhaded ſide of another object oppoſite to it, are ſtrong. Theſe reflected lights, when well managed, produce moſt beautiful effects upon fleſh and other ſemi-tranſparent bodies, and are frequently of great uſe in harmonizing and uniting thoſe maſſes of light which would otherwiſe have been broken into ſmall parts, or diſagreeable forms; beſides which, a greater appearance of projection can ſometimes be given by a reflected light, than could have been accompliſhed by the introduction of the ſtrongeſt ſhadow.

The doctrine of reflections, and indeed every thing that relates to chiaro-ſcuro, is clearly exemplified in the works of Rubens, Jordaens, and Rembrant; but it is proper to obſerve, that the former, both with reſpect to his effects of chiaro-ſcuro and colouring, ſometimes "o'erſteps the modeſty of nature."

The great merit of Rubens is moſt conſpicuous in his large works, where the diſtance intervening between the eye of the ſpectator and the picture effectually blends and harmonizes all the tints; in his eaſel-pictures, the artifice by which his effect is produced is generally too apparent, his tranſitions are too abrupt, and his reflections more powerful than nature can juſtify.

Shadows may perhaps be properly divided into two kinds: firſt, the ſimple ſhadow; ſuch as is naturally occaſioned upon that ſide of an object which is not turned towards the luminary; and, ſecondly, the projecting ſhadow, which takes place upon that ſide of an object which is turned towards the luminary, in conſequence of the intervention of ſome other object between it and the luminary. The projecting ſhadow is always darker in its origin, than the ſhaded ſide of the intervening body which occaſioned it, and for this reaſon: that ſide of an object upon which the projecting ſhadow is thrown, being turned towards the dark ſide of the object which occaſioned it, can receive no reflected light; whereas the ſhaded ſide of the intervening body which occaſioned the projecting ſhadow can receive reflected light, being turned towards the illuminated parts of other objects in the picture.

The knowledge of lights and ſhades is nearly connected with the ſcience of perſpective, and, in particular, when buildings or other regularly formed objects are to be repreſented; great benefit may be derived from the rules of Dr. Brooke Taylor. See PERSPECTIVE.

It may here be neceſſary to ſay a few words reſpecting what are called by painters accidental or catching lights, and accidental ſhadows. The accidental light is in fact generally no other than a ſmall portion of the common light, ſtriking as it were partially upon ſome ſmall object, or part of a large object, ſurrounded by large maſſes of ſhadow. Fine effects of this kind are to be obſerved in the landſcapes of Rembrant, where the ſcene, generally in ſhadow, or middle tint, is partially illumined by the rays of the ſun, ſtriking through the apertures of a cloud. Parmagiano, in a picture of the marriage of St. Catharine, has produced a very beautiful and ſtriking effect, by the introduction of a light which may be juſtly ſtyled accidental. The principal group, which is in a room, is illumined from the left; behind the Madonna is a door opening into another room, where Old Joſeph receives the light by means of a window opening to the right; thus two contrary lights are introduced in the ſame picture, and yet without departing from the laws of nature. This elegant work of genius was commented on by Lomazzo, in his "Treatiſe on Painting," and is now in the poſſeſſion of William Morland, eſq.

Another ſpecies of accidental light, is occaſioned by the introduction of a ſecond light in a picture, different in kind from the principal light. Thus, in the kitchen ſcenes of Baſſan, Teniers, or Oſtade, when a fire is introduced in ſome part of the picture, the compoſition being otherwiſe illumined by the light of day; this fire becomes an accidental light; and the caſe is ſimilar, when, in one corner of a moonlight, the fiſhermen are repreſented, by their warm fire, mending their nets againſt the morning's dawn.

In the Freſco of Raffaele, in the Vatican, of St. Peter delivered out of priſon, there are three diſtinct kinds of light; the firſt and principal light is occaſioned by irradiation from the angel, the ſecond proceeds from a torch, and the third from the moon. Such accidental lights, when ſkilfully and judiciouſly introduced, never fail to produce a beautiful and ſtriking effect; but they ſhould never be admitted, except in thoſe ſubjects which ſeem naturally to require, or to allow of them.

With regard to what are called accidental ſhadows, it may be ſufficient to obſerve, that if any difference exiſts between them, and projecting ſhadows, it is this only; the accidental ſhadow is generally cauſed by the intervention of a body, at ſome diſtance from the object overſhadowed, and conſequently, the accidental ſhadow is leſs powerful, and leſs edgy, than the projecting ſhadow. In landſcape, great ſcope is allowed in the introduction of accidental ſhadow, it being eaſily accounted for, by the ſuppoſition of clouds, mountains, or other objects; but, in hiſtorical painting, an accidental ſhadow ſhould never be reſorted to, unleſs the cauſe of that ſhadow can be made apparent in the picture; it is true that Sir Joſhua Reynolds, in one of his lectures, ſeems inclined to juſtify the conduct of Paul Veroneſe, when in one inſtance he departed from this rule; but, perhaps, a notion inadvertently ſtated, even by ſo great an artiſt, ſhould carry with it little weight, when oppoſed to the opinions and authorities of the moſt celebrated painters of every age; the circumſtance is here mentioned, becauſe this ſuppoſed licence has been ſo eagerly caught at, and ſo frequently, we might ſay unneceſſarily, reſorted to, by painters of the preſent day.

With reſpect to the knowledge of chiaro-ſcuro, poſſeſſed by the ancients, we are but imperfectly informed; however, if we can form any judgment from the paintings diſcovered at Herculaneum, and in the baths of Titus at Rome (which, although, perhaps, not executed by the moſt eminent artiſts, may nevertheleſs be reaſonably ſuppoſed to approach them in point of merit, as much with reſpect to chiaro-ſcuro, as to the other parts of the art), this part of painting, as well as perſpective, was but little underſtood by them. Mr. Webbe, however, in his Treatiſe on Painting, ſtrenuouſly ſupports the antients on this queſtion, but perhaps not upon ſufficient grounds; to him the reader is referred. See PAINTING *amongſt the Ancients*.

Amongſt the beſt eſtabliſhed maxims, relating to chiaro-ſcuro, are the following:

That there ſhould be one principal light in every picture; that other lights may, and ought to be admitted, but that they ſhould at all times, be either leſs in quantity or lower in tone, than the great principal light; that this principal light ſhould either be placed on the moſt important object in the picture, or be ſo managed, as to conduct the eye of the ſpectator to that object; that, independent of the forms of the objects and groups themſelves, each maſs of light, and dark, ſhould in itſelf be of an agreeable ſhape; and that theſe maſſes ſhould be ſo linked, as it were together, that no body, either of light or dark, may appear like a ſpot unconnected with the reſt.

One thing more ſhould be obſerved. Although, as has been before ſaid, the ſyſtem of Lionardo da Vinci, of conſtantly oppoſing a ſhade to a light, produces a poverty of effect; yet it gives a zeſt and appearance of truth to a picture, to introduce, in ſome ſmall part of it, a figure, or other object, relieved at once, by dark on a light ground.

For further information, reſpecting clair-obſcure, the reader is referred to Sir Joſhua Reynolds's Lectures, and to his Notes on Mr. Maſon's Tranſlation of Du Freſnoy's elegant poem on painting; where the ſubject, with the one exception we have taken the liberty to make, is treated with a perſpicuity, the reſult of deep inveſtigation and long profeſſional experience.

Although a knowledge of the chiaro-ſcuro is generally conſidered as neceſſary to the painter alone, yet the fine effects produced by it are well worthy the conſideration of the ſculptor and the architect. The ſculptor who, when modelling his deſign, avails himſelf not of the direction or peculiarities of the light afforded by the ſituation where his group, his ſtatue, or baſſo-relievo is to be placed, loſes one of the greateſt advantages afforded by his art. Michael Angelo's fine figure of Lorenzo da Medici in the ſagreſty of St. Lorenzo at Florence, and ſome of Bernini's monuments in St. Peter's at Rome, would forfeit half their claim to our admiration if removed to a light different from that for which they were compoſed.

Obſervations of the ſame tendency might be made reſpecting architecture; the fine chiaro-ſcuro occaſioned by the intercolumniation, and the broad projecting pediments of the temples of Peſtum, and the church of Covent Garden, leave the grandeſt impreſſions on the mind of every beholder. See SCULPTURE and ARCHITECTURE.

CHIARO-SCURO, is alſo uſed to denote a ſpecies of engraving, ſaid to have been diſcovered by Ugo di Carpi, an Italian painter at the commencement of the 16th century; in which he was followed by Andrea Andriani of Mantua, and others; but the Germans, and apparently with ſome reaſon, diſpute with the Italians the honor of the invention. Theſe prints are produced by three diſtinct impreſſions from the ſame number of blocks of wood; the firſt gives the outline, the ſecond, the middle tints, and the third, the ſhadows; ſo that the print, when complete, reſembles a drawing in biſtre upon a tinted paper, and touched with white.

CHIARO-SCURO is likewiſe uſed to ſignify thoſe pictures which are painted with different ſhades of the ſame colour only. Of this claſs are the fine friezes, by Polidor, and others, on the façades of the palaces at Rome, and other cities of Italy; and the ingenious imitations of cameos and baſſo-relievos, with which ſo many painters in diſtemper have ornamented the interior of magnificent dwellings.

For the illuſtration of this article ſee the following plates, *viz.*

1. The ſimple principles of Chiaro-Scuro illuſtrated.
2. The conduct of Correggio in the diſtribution of his

maſſes of light and ſhade, exemplified in one of his compoſitions in the Duomo at Parma.

3. An example of Rubens.

4. A ditto of Rembrandt.

CLAIRVAUX, in *Geography*, a town of France, in the department of Jura, and chief place of a canton in the diſtrict of Lons-le-Saulnier, 3 leagues S.E. of it. The place contains 1210, and the canton 7226 inhabitants; the territory includes 160 kiliometres and 33 communes.—Alſo, a town of France, in the department of the Aube, and diſtrict of Bar-ſur-Aube, which took its name from an abbey built there in the year 1115; 2 leagues S. of Bar-ſur-Aube.

CLAIRVILLE, St. a ſmall ſettlement of America, in the ſtate of Ohio, and county of Belmont, 12 miles from the river Ohio, on the poſt road from Wheeling to Kentucky.

CLAISE, a river of France, which runs into the Creuſe near La Haye.

CLAIX, a town of France, in the department of the Iſere, and diſtrict of Grenoble; 4 miles ſouth of Grenoble.

CLAKIS, in *Ornithology*, a name given by the people of Lancaſhire, and ſome other places, to the BARNACLE, a ſmall ſpecies of wild gooſe; the *Anas erythropa*, or *Anas cinerea, fronte alba*, of Gmelin. It is found in Hudſon's Bay, and the N. part of Europe, and in winter in England.

CLAM, in *Geography*, a town of Germany in the archduchy of Auſtria, 1 mile W. of Gran.

Clam *town*. See Egg *harbour*.

CLAMATOR, in *Antiquity*, was uſed to ſignify a domeſtic officer, whoſe buſineſs was to call the gueſts to dinner.

CLAMEA *admittenda in itinere per attornatum*, in *Law*, is a writ whereby the king commands the juſtice in eyre to admit a perſon's claim by an attorney, who, being employed in the king's ſervice, cannot come in perſon. Reg. Orig. 19.

CLAMECY, in *Geography*, a town of France, in the department of the Niévre, and principal place of a diſtrict, at the conflux of the Beuvron and the Yonne. The nominal biſhop of Bethlehem reſided in the fauxbourgs of this town; the ſee having been fixed here from the time when the Chriſtians were expelled the Holy Land; his revenue was ſmall, and his dioceſe limited to the place of his reſidence; 11 leagues N.N.E. of Nevers, and 7 ſouth of Auxerre.

CLAMOR, or Clameur *de Haro*, a popular term in the French laws, importing a complaint, or cry, whereby any one implores the aſſiſtance of juſtice againſt the oppreſſion of another.

Clamor, *βοη*, in *Medicine*, an intenſeneſs of the voice, or a loud outcry. This is ſometimes the cauſe of a rupture of the veſſels, and ſometimes of a diſorder, like an inflammation about the membranes of the fauces and muſcles; which may be compared to that ulcerous and inflammatory laſſitude, which affects the hands, legs, and loins, after exceſſive hard labour; the ſpirituous and humid particles being exhauſted, and the fibres and membranes dried and contracted. A clamor is ſometimes alſo a ſort of remedy, and preſcribed as ſuch in order to rouſe perſons out of a lipothymy, or ſyncope.

Clamor *bellicus*. See Charge and Shout.

CLAMPS, in *Gunnery*. See Cap-*ſquares* and Cannon.

Clamps, in *Ship Building*, are ſtrakes of plank, in large ſhips, on the gun-deck, eight or nine inches thick, fayed to the ſides, to ſupport the ends of the beams.

Clamp *hanging*, may be fixed to any place in the ſide of a ſhip for faſtening ropes to, in order to ſuſpend the ſtages for the workmen, &c.

Clamps, in a *Ship*, are alſo pieces of timber applied to a maſt, or yard, to ſtrengthen it, and prevent the wood from burſting.

Clamp is alſo a crooked iron plate, faſtened to the after end of the main cap of ſnows, to ſecure the try-ſail maſt.

Clamp, alſo denotes a little piece of wood, in form of a wheel; uſed inſtead of a pully in a mortice.

Clamp, is likewiſe the term for a pile of bricks built up for burning.

Clamp-*nails*, are ſuch nails as are uſed to faſten on clamps in building and repairing of ſhips.

CLAMPETIA, in *Ancient Geography*, a town of Italy, in Magna Græcia, in the country of the Brutians. It is placed by M. D'Anville S.W. of Conſentia, and is the modern Amamea.

CLAMPING, in *Joinery*, &c. When a piece of board is fitted with the grain, to the end of another piece of board croſs the grain; the firſt board is ſaid to be clamped. Thus the ends of large old tables were commonly clamped, to preſerve them from warping.

CLAMPONNIER, or Claponnier, in the *Manege*, a long-jointed horſe; that is, one whoſe paſterns are long, ſlender, and over-pliant. The word is obſolete, and is properly applicable only to the ox kind; for *la claponniere* in French, is in them what the paſtern is in a horſe.

CLAN, a term uſed in Scotland to denote a number of families of the ſame name, under a feudal head or chief, who protected them, and, in return for that protection, commanded their ſervices as his followers, and led them to war, and on military excurſions.

The diviſion of the country into clans, had no ſmall effect in rendering the nobles conſiderable. The nations which overrun Europe, were originally divided into many ſmall tribes; and when they came to parcel out the lands which they had conquered, it was natural for every chieftain to beſtow a portion, in the firſt place, upon thoſe of his own tribe or family. Theſe all held their lands of him; and as the ſafety of each individual depended on the general union, theſe ſmall ſocieties clung together, and were diſtinguiſhed by ſome common appellation, either patronymical or local, long before the introduction of ſurnames, or armorial enſigns. But when theſe became common, the deſcendants and relations of every chieftain aſſumed the ſame name and arms with him; other vaſſals were proud to imitate their example, and by degrees they were communicated to all thoſe who held of the ſame ſuperior. Thus clanſhips were formed; and in a generation or two, that conſanguinity, which was at firſt in a great meaſure imaginary, was believed to be real. An artificial union was converted into a natural one; men willingly followed a leader, whom they regarded both as the ſuperior of their lands, and the chief of their blood, and ſerved him not only with the fidelity of vaſſals, but with the affection of friends. In the other feudal kingdoms, we may obſerve ſuch unions as we have deſcribed, imperfectly formed; but in Scotland, whether they were the productions of chance, or the effect of policy, or introduced by an Iriſh colony, and ſtrengthened by carefully preſerving their genealogies, both genuine and fabulous, clanſhips were univerſal. Such a confederacy might be overcome, it could not be broken; and no change of manners or of government has been able, in ſome parts of the kingdom, to diſſolve aſſociations which are founded upon prejudices ſo natural to the human mind. How formidable were nobles at the head of followers, who, counting that cauſe juſt and honourable which their chief approved, were ever ready to take the field at his command, and to ſacrifice their lives in defence of his perſon, or of his fame? Againſt ſuch men a king contended with great diſadvantage; and that cold ſervice, which money purchaſes, or authority extorts, was not an equal match for their ardour and zeal. Robertſon's Hiſt. Scotland, vol. i. p. 27, 28.

CLANBRASSIL, in *Geography*, the name of an old territory in Ireland, part of the preſent county of Armagh, which has been retained in the Iriſh peerage. It is formed of the Iriſh word *clann*, (often called *glen* or *glan*), and the family name of the tribe that inhabited it.

CLANCARTHY, (ſometimes called *Clancare* and *Glencare*,) is a name formed like the preceding, from M'Carthy more ni Carra, a very powerful nobleman in the counties of Cork and Kerry, Ireland, whoſe deſcendant was made an earl with this title by queen Elizabeth. It is at preſent the title of the family of Trench.

CLANCULARII, in *Eccleſiaſtical Hiſtory*, a ſect of Anabaptiſts who denied the neceſſity of making an open profeſſion of the faith; and taught that a private one would be ſufficient. Theſe were called alſo Hortulani and Gardeners, from the places they choſe to aſſemble in, inſtead of churches.

CLANDESTINA, in *Botany*, Tourn. See LATHRÆA *Clandeſtina*.

CLANDESTINE, any thing done ſecretly, and without the knowledge of ſome of the parties intereſted in it; or without the proper ſolemnities.

The word comes from the prepoſition *clam*, of κλειω, *claudo*, *I ſhut*; or κλεμμα, *furtum*, *theft*.

Thus a marriage is ſaid to be clandeſtine, when performed without the publication of banns, the conſent of parents, or the knowledge of the ordinary. The council of Trent, and the French ordonnances, annul all clandeſtine marriages. See MARRIAGE.

CLANDON COLLIERIES, in *Geography*, are coal-pits in Somerſetſhire, to which a rail-way is conducted from the Radſtock line of the Somerſetſhire coal canal. See CANAL.

CLANEBOYS, the name of two diſtricts in Ireland, one in the county of Antrim, and the other in that of Down, which belonged to the O'Neils, and are often mentioned in Iriſh hiſtory. They are alſo called Clan-Hugh-boy, from Hugh boy O'Neil, the leader of the Sept when they conquered theſe territories on the death of William deBurgho, earl of Ulſter, in 1333. Leland—O'Brien.

CLANEUS, in *Ancient Geography*, an epiſcopal town of Aſia, in Galatia Salutaris; called alſo Clangis.

CLANGULA, in *Ornithology*, the *Anas* of Gmelin's Linnæus: varied with black and white, with a tumid violaceous head, and a white ſpot at the opening of the mouth; the ſmall reddiſh-headed duck of Willughby and Ray; the golden eye of Pennant and Latham; and the garrot of Buffon. See ANAS.

CLANIS, in *Ancient Geography*, *La Chiana*, a river of Italy, in Etruria. This river, called by the Greeks Glanis, was formed by the union of a great number of ſtreams and torrents which deſcended from the mountains; and when they became ſtagnant in their courſe, they produced ſmall lakes near Cluſium. The river ran towards the Tiber.

CLANIS, or CLANIUS, a river of Italy in Campania. It roſe in the mountain of Abella, and diſcharged itſelf into the ſea near Patria.—Alſo, a river of Spain.

CLANMAURICE, in *Geography*, a name given to one of the baronies in Kerry, that originally belonged to Maurice ſon of Raymond le gros, a companion of Strongbow's, from whom are deſcended the Fitzmaurices, earls of Kerry, and the preſent marquis of Lanſdown.

CLANRICKARD, (originally Clanrichard) a territory in Connaught, belonging to one branch of the family of Bourke, or Bourgho, the deſcendant of which is at preſent earl of Clanrickard.

CLANRICKARD, ULIAC, earl, and afterwards marquis of, in *Biography*, was the moſt reſpected, moſt powerful, and moſt effectual friend of Charles I. and the government in the weſt at the beginning of the rebellion of 1641. He was deputy to the marquis of Ormond, whom the king had appointed lord lieutenant, and after uncommon exertions in the royal cauſe, he was at laſt obliged to leave Ireland. Lord Clanrickard wrote memoirs of the tranſactions in which he bore ſo conſpicuous a part. Lord Clarendon refers to theſe as giving ſuch a full relation of all material circumſtances as to render it unneceſſary for himſelf to enter into detail. Biſhop Nicholſon, however, in his hiſtorical library, conſiders the publication under the name of the memoirs, &c. of the marquis of Clanrickard as "a lean collection of letters, warrants, orders, and other looſe and incoherent ſtate papers;" and blames the anonymous editor as wiſhing "to lay moſt of the bloodſhed of theſe diſmal times at the door of the Engliſh proteſtants." As the authenticity of the papers is not diſputed, they will of courſe be examined by thoſe who wiſh to know the melancholy events of that time. The marquis died in 1659 before the king's reſtoration. Leland. Nicholſon.

CLANUM, in *Ancient Geography*, a town of Gaul, in the environs of Arelate, between Cabellio and Ernuginum. Anton. Itin.—Alſo, a town of Gallia Lyonnenſis, on the road from Caracotinum to Auguſtobona, between Agredinum and Auguſtobona.

CLANWILLIAM, in *Geography*, the name of two baronies in Ireland; one in the county of Limerick, and the other in the county of Tipperary. The laſt gives the title of earl to the noble family of Meade.

CLAP, in *Surgery*, a vulgar name for Gonorrhœa, a puriform diſcharge from the urethra in men, and from the vagina in females. See BLENNORRHAGIA and GONORRHŒA. Dr. Samuel Johnſon derives the word *clap*, from the old French term *clapoir*; but we rather incline to believe it is of Saxon or German origin; *die klepperinn*, in German, ſignifies a lewd woman or proſtitute.

CLAP-*board*, a board cut, in order to make caſks or veſſels.

CLAP-*net*, in *Birding*, a ſort of net contrived for the taking of larks with the looking-glaſs, by the method called daring, or doring. The nets are ſpread over an even piece of ground, and the larks are invited into the place by other larks faſtened down, and by a looking-glaſs compoſed of five pieces, and fixed in a frame, ſo that it is turned round very ſwiftly, backwards and forwards, by a cord pulled by a perſon at a conſiderable diſtance behind a hedge. See DORING.

CLAPHAM, in *Geography*, a village in Suſſex, a rectory in the rape of Arundel, ſituate near the edge of the clay and ſand covering the chalk of the South-Downs. The ſituation of the ſteeple of its church was determined in the government trigonometrical ſurvey in 1792, by an obſervation from Chanctonbury Ring ſtation diſtant 27,201 feet; and another from Rook's Hill ſtation diſtant 68,929 feet, and bearing 75° 30′ 37″ N.W. from the parallel to the meridian of Dunnon; whence are deduced, its latitude 50° 50′ 38″ N. and longitude from Greenwich 27′ 43″ W. or $1^m\ 50^s.9$ in time.

CLAPHAM-*Common obſervatory*, belonging to Mr. Cavendiſh: the exact ſituation of the tall pole or objects affixed over this gentleman's tranſit-room, was determined in the government trigonometrical ſurvey in 1787, by an obſervation from Hundred-Acres ſtation diſtant 43,351 feet, and bearing 13° 45′ 28″ S.W. from the parallel to the meridian of Greenwich; and another from Severndroog Tower diſtant 47,295 feet; whence are deduced its latitude 51° 27′ 13″ N. and longitude from Greenwich 8′ 40″ W. or $34^s.7$ in time; alſo, that this obſervatory bears 26° 29′ 52″ W. from the S. meridian of the croſs on St. Paul's cathedral, diſtant 24,563 feet.

CLAR, or CLAER, in *Metallurgy*, bone aſhes perfectly calcined, and finely powdered, kept purpoſely for the covering of the inſides of COPPELS.

CLAR, ST. in *Geography*, a town of France, in the department of the Gers, and chief place of a canton in the diſtrict of Lectoure; the place contains 1290 and the canton 8509 inhabitants; the territory includes 160 kiliometres and 16 communes.

CLARA, a ſmall poſt town on the river Broſna, in the King's County, Ireland; 53 miles weſt from Dublin.

CLARA, LA, a town of the iſland of Cuba; 18 miles N.W. from Spirito Santo.

CLARA, or MEL, an iſland in the Indian Sea, near the coaſt of Siam; 25 miles long and 4 wide. N. lat. 11° 4′. E. long. 97° 50′.

CLARAC, a town of France, in the department of the Lower Pyrennées, and chief place of a canton in the diſtrict of Pau; the place contains 233 and the canton 9194 inhabitants: the territory comprehends 125 kiliometres and 15 communes.

CLARAMONT *powder*, the name of a medicinal powder, very famous in Venice, and ſome other places, for its virtues in ſtopping hæmorrhages of all kinds, and in the cure of malignant fevers. It has its name from the perſon who firſt found out its virtues, and who has written a book expreſsly about it. It is a white earth found near Baira, not far from Palermo, and is thence called alſo by ſome writers, *terra de Baira*.

CLARATUMBA, in *Geography*, a town of Poland, with a celebrated abbey, in the palatinate of Cracovia; 4 miles E. of Cracow.

CLARE, a county of Ireland in the province of Munſter, ſituated on the weſtern coaſt. It was anciently called Thomond, which implies *North Munſter*, and was a kingdom or principality under the O'Briens, deſcendants of Brien Borombe, the king of Ireland, who was ſlain, fighting againſt the Danes, in the battle of Clontarf, A.D. 1014. One of the family was acknowledged as king of Thomond by Henry III.; and Murrough O'Brien was made earl of Thomond by Henry VIII. on reſigning his old title of prince, and receiving a new grant of his lands from that monarch. Such agreements were then common, the petty Iriſh princes hoping thus to preſerve their poſſeſſions, and the Engliſh ſovereigns wiſhing to conciliate them; but the plan did not anſwer. The title of Thomond has continued, with ſome ſhort intervals, in the O'Brien family. Thomas de Clare, ſon of the earl of Glouceſter, having come to Ireland in 1276, and married a daughter of the earl of Deſmond, ſettled in this county. Some accounts ſtate, that a large portion of it was beſtowed on him by Brien Inath, king of Thomond, on condition of receiving aſſiſtance to regain his authority, which had been uſurped by another branch of the family. Other accounts ſay, that this diſtrict was given to De Clare by Edward I.; and it is not unlikely that he procured from the latter a confirmation of the grant of the Iriſh prince. This Thomas de Clare, and his ſon or brother Richard, built ſome caſtles and an abbey, and from them the county received its preſent name. Thomond, as its name implies, had always been conſidered as a part of Munſter; but when Connaught was divided into counties in 1562, Clare was added to it. At that time each province had a peculiar governor, called lord-preſident, and as the earls of Thomond had poſſeſſions in other parts of Munſter, and were moſtly connected with it, they naturally wiſhed Clare to be part of that province, which, on petition, was effected in 1602. Some have ſuppoſed that it ought to be reckoned in Connaught, becauſe it is on the ſame ſide of the Shannon; but the eaſieſt acceſs to it was through Limerick, the environs of which city extend into it, and its biſhopric is under the primate of Munſter.

Clare is bounded on the north by the county of Galway; on the eaſt and ſouth by the Shannon, which divides it from the counties of Tipperary, Limerick, and Kerry, and on the weſt and north-weſt by the Atlantic Ocean and the bay of Galway. It extends from north to ſouth 33 miles (42 Engliſh), and from eaſt to weſt 52 (66 Engliſh), containing 476,200 acres (765,042 Engliſh), or about 744 ſquare miles (1195 Engliſh). It is divided into nine baronies, and 79 pariſhes, moſt of which are in the united ſees of Killaloe and Kilfenora. Theſe 79 by unions, form only 30 benefices, and only 19 of them had churches, when Dr. Beaufort publiſhed his memoir. The number of houſes in the official return of 1791 was 17,396, according to which the population may be eſtimated at 104,000. Three members repreſent it in the Houſe of Commons, two of whom ſit for the county, and one for the borough of Ennis.

The county of Clare conſiſts of extenſive tracts of ground of various quality; much of fattening and meadow ground; much of light limeſtone paſture, fit for rearing ſheep and young cattle; much arable land; extenſive bogs, and ſome mountain. The lands called *Corcaſſes*, conſiſting of about 20,000 acres, along the Fergus and Shannon, are ſaid by Mr. Young to be peculiarly fit for fattening bullocks, 4000 of which were then annually fattened on them; and the ſtore cattle of Clare are at preſent more numerous than in the adjoining counties. The ſoil of the Corcaſſes is deſcribed by that intelligent traveller as either a rich black loam, or a deep rich blue clay; whilſt the higher lands are limeſtone or limeſtone-gravel. The bogs near the Shannon are valuable on account of the ſupply of turf they furniſh for the Limerick market; and thoſe in the interior, though they do not ſet ſo high, ſupply fuel to the neighbouring inhabitants. The worſt grounds are the eaſtern mountains, the peninſula north of the Shannon, and the barony of Burren. This laſt is exceedingly rocky, but its rocks are limeſtone, and ſuch is the luxuriance of the paſturage interſperſed among them, that theſe ſeemingly barren hills ſupport a great number of cattle and very large flocks of ſheep. The other tracts of mountain are generally gritſtone. Mr. Young ſtates the average rent of the Corcaſs lands at 20*s*., and the average rent of the whole county at 5*s*. per acre, in 1776. An intelligent proprietor of part of the Corcaſs lands has informed the writer, that they now ſet at from 3 guineas to 5 guineas per acre; and he ſuppoſes the average rent of the whole county not leſs than 30*s*. Rape is ſown in conſiderable quantities in mountain or boggy grounds, both of which are burned for it. Some of the rape ſeed is preſſed into oil at mills near Killaloe, and the rape cakes ſent to England for manure; but the greater part is exported to England, where it is preſſed for the uſe of the woollen manufacturers in Yorkſhire. One houſe in Limerick ſhipped the laſt ſeaſon (1805), near 5000 barrels of rape-ſeed, value above 10,000 pounds; but it is cultivated in the counties of Limerick and Tipperary as well as in Clare. Beans were grown in large quantities, when Mr. Young was in Clare, but the cultivation has been laid aſide, as they are no longer uſed for bread by the peaſantry. Flax is ſown in ſmall quantities for home conſumption, but ſpinning is not general, and ſcarcely a remnant of the manufacture of the excellent Clare dowlaſs now exiſts. The only manufactures, indeed, for which there is a market, are coarſe flannels and worſted ſtockings, which are chiefly ſold at Enniſtymon, on the weſtern coaſt.

Mr. Young has ſpoken in high terms of the cider orchards of this county. Since he wrote, in a time of ſcarcity they were very generally deſtroyed; but the price of cider being much increaſed, and the mode of making it much improved, they are now attended to, and in good keeping. The cacagee apple is peculiarly eſteemed, but the trees being bad bearers, it is ſcarce.

The whole weſtern coaſt of Clare does not afford one harbour in which ſhips may lie in ſafety, and its little ports on the Shannon can never rival Limerick. The only rivers that deſerve notice are the Shannon and Fergus. The former of theſe, when it firſt reaches the ſhores of Clare, is expanded into Lough Deirgheart; but its breadth is contracted as it approaches Killaloe. Between Clare and Kerry the breadth of this noble river varies from one mile to five. The Fergus, the principal river riſing in Clare, is of no importance, ſloops only being capable of navigating it. Its eſtuary, however, at its junction with the Shannon, is very wide and full of iſlands. This river and ſeveral others in Clare, dip under ground in ſome part of their courſe.

There are in this county many *turlachs*, *i. e.* ſpots which at one time are lakes, and at another ſound ſheep-walks. Of theſe, that at Kilcorney, in Burren, is moſt remarkable, the waters iſſuing, frequently more than once a year, from a ſpacious cave, and deluging the adjacent flats. There are ſome lakes, but none very conſiderable.

The county town is Ennis on the Fergus, and it is the only town of note in the county. The Ogham inſcription on Callan Mount, (ſee Callan), and ſeveral ruins, particularly thoſe of Quin Abbey, (ſee Ardsallis), and the iſland of Inis Scattery, render this county intereſting to the antiquarian, whilſt the plants and minerals with which its mountains and ſtony parts abound, make it equally deſerving the attention of the botaniſt and mineralogiſt.

The following plants found in Clare, are reckoned, by profeſſor Wade, amongſt the *plantæ rariores* of Ireland; *viz.* Iris fœtidiſſima, Aſperula cynanchiea, Lyſimachia vulgaris, Arbutus uva urſi, Butomus umbellatus, Sedum telephium, Potentilla fruticoſa, Rubus ſaxatilis, Dryas octopetala, Mentha pulegium, Turrites hirſuta, Cardamine bellidifolia, Cheiranthus ſinuatus, Gnaphalium dioicum, and Satyrium hircinum. An intelligent botaniſt, who is employed by the provoſt and fellows of Trinity College, Dublin, viſited Clare in the autumn of 1805; but the reſult of his reſearches has not yet been made public.

The mineralogy of Clare is very little known. Mr. Donald Stewart, the itinerant mineralogiſt of the Dublin Society, has, however, mentioned ſome particulars. Lead ore is ſaid to occur in various places; in ſome of which it was formerly raiſed and ſmelted. Manganeſe is abundant; and there are different ores of iron, particularly micacious iron ore, or *eaſingman*, and red iron-ſtone. Boate mentions iron-works, belonging to Engliſh merchants, in Clare, previous to the rebellion of 1641. Theſe probably contributed to its being ſo bare of timber. At Doolin in Burren there has been found a vein of purple fluor ſpar, ſimilar to that brought in ornaments from Derbyſhire. Some of the ſpecimens have cubic cryſtals; but the extent of the vein is not known, and no attempt has been made to apply it to any uſeful purpoſe. Beaufort, Young, &c. &c.

Clare, a poſt-town of the county of Clare, Ireland, on the river Fergus, which is navigable to it for ſmall veſſels, and about two miles S. from Ennis, which was alſo formerly called Clare. Between the two towns are the ruins of Clare abbey. It is 114 miles S.W. from Dublin.

Clare, a river of the county of Galway, Ireland, flowing into Lough Corrib. On this river is a ſmall fair-town of the ſame name, from which the barony of Clare is called.

Clare, the name of a high rocky iſland belonging to the county of Mayo, Ireland; ſituated at the entrance of Clew bay. It is about four miles long, but of very unequal breadth; and it affords good anchorage for ſhips in moderate weather. W. long. 9° 49′ from Greenwich. N. lat. 53° 49′.

Clare, an iſland lying ſouth of the county of Cork, Ireland, on which is the moſt ſouthern point of Ireland, generally known by the name of Cape Clear. This iſland, in Smith's time, contained about 400 families, which its produce was ſcarcely able to ſupport. The men are all fiſhermen, and they are good pilots. It is about three miles long, and nearly one wide. W. long. 9° 23′ from Greenwich. N. lat. 51° 21′. Smith.

Clare, at preſent an unpaved and inconſiderable market town in the county of Suffolk, England, was once a place of importance, and contains the ruins of a ſtrong caſtle. Gilbert de Clare, founded a Benedictine monaſtery here in 1090, which was removed in 1124, by his ſon Richard, to Stoke, near Clare, after which, Edmund Mortimer, earl of March, converted it into a college for ſecular prieſts, who were governed by a dean, and ſix prebendaries. Archbiſhop Parker was dean of this foundation in 1545, the date of its diſſolution. There was, beſides, a priory of monks of the order of St. Auguſtine, founded probably by Richard de Clare in 1248, who introduced that order into England: the monaſtic buildings were recently inhabited by a farmer, and the chapel is now a barn. Excluſive of the founder, Joan of Acres, Lionel, duke of Clarence, with his wife, and Edward Monthermer, earl of Glouceſter and Hereford, were buried in the priory chapel. The large and handſome pariſh church is ſuppoſed to have been built by an abbot of Bury. The civil and ſpiritual courts are held at Clare, and it gave the title of marquis to the dukes of Newcaſtle of the Holles family, as it afterwards did to thoſe of the Pelham. Without, and eaſtward of the town, is a large barrow. There are two annual fairs, the market day is Tueſday, and it is 56 miles N.E. from London.

Clare, a townſhip on St. Mary's bay, in Annapolis county, Nova-Scotia. It has about 50 families, and conſiſts of woodland and ſalt-marſh.

Clare. See *St.* Clair.

Clare, *Nuns of St.* in *Eccleſiaſtical Hiſtory*, were founded at Aſſiſe in Italy, about the year 1212. Theſe nuns obſerved the rule of St. Francis, and wore habits of the ſame colour with thoſe of the Franciſcan friars; and hence were called *Minoreſſes;* and their houſe, without Aldgate, the *Minories*, where they were ſettled when firſt brought over into England, about the year 1293. They had only three houſes beſides this.

CLAREMONT, in *Geography*, a townſhip of America, in Cheſhire county and ſtate of New Hampſhire, on the E. ſide of Connecticut river, oppoſite to Aſcutney mountain in Vermont, and on the N. ſide of Sugar river; 24 miles S. of Dartmouth college, and 121 S.W. by W. of Portſmouth. It was incorporated in 1764, and contains 1889 inhabitants.

Claremont, a county of America, in the ſtate of S. Carolina and diſtrict of Camden, containing 2479 white inhabitants, and 2110 ſlaves. The county-town is Stateſburg.

CLARENCE. See Chiarenza.

CLARENCEUX *King of Arms*, in *Heraldry*, the ſecond officer in the college of arms. It is uncertain when this office, which is held by patent under the great ſeal during good behaviour, was firſt created. It is ſtated by ſome authors to have been inſtituted by Edward III., by others, by Henry V.; who, they ſay, preferring the herald of his brother Thomas, duke of Clarence, conſtable of the army, created him a king of arms by the title of Clarenceux, (in Latin Clarentius) and placed the ſouth part of England under his province. After Henry VI. it ſunk into the office of a herald, but was again reſtored to the rank of a king of arms by Edward IV.

The official ſeal of Clarenceux is argent, a croſs gules, on a chief of the ſecond a lion paſſant guardant, crowned with an imperial crown or, and is borne on the dexter ſide impaled with his paternal coat. The badge, which is worn pendant from a gold chain, is enamelled with the above arms, ſurmounted by the crown of a king of arms on a green ground on one ſide, and on the reverſe, the royal arms on a white ground. He wears a collar compoſed of S. S. of ſilver gilt. See Collar.

The coronet of a king of arms is compoſed of a plain circle of gold, thereon 16 ſtrawberry leaves, eight of which are higher than the reſt, and round the rim the motto "Miſerere mei Deus ſecundum magnam miſericordiam tuam."

His tabard is of velvet, thereon embroidered the king's arms, emboſſed in gold and ſilver.

CLARENDON, in *Geography*. See *Cape* Fear *River*.

Clarendon, a county of America, lying in the Sumpter diſtrict, in the ſtate of S. Carolina, about 30 miles long and 30 broad, containing 2333 inhabitants.

Clarendon, a townſhip of America, near the centre of Rutland county, Vermont, watered by Otter creek, and its tributary ſtreams; 14 or 15 miles E. from Fairhaven, and 44 N.E. from Bennington. It contains 1764 inhabitants. On the S.E. ſide of a mountain, in the weſterly part of Clarendon, is a curious cave, 2½ feet in diameter at its mouth, and nearly the ſame through its whole length of 31½ feet; but at this diſtance from the mouth it opens into a ſpacious room, 20 feet long, 12½ wide, and 18 or 20 feet high. The floor, ſides, and roof appear to conſiſt of a ſolid rock, which is rough and uneven. The water percolating through the top has formed ſtalactites of various forms, ſome conical, and others having the appearance of maſſive columns. This room communicates by a narrow paſſage with others equally curious. Morſe.

Clarendon, a pariſh of Jamaica, in the county of Middleſex, the low lands of which are favourable for plantation of tobacco. In 1789 the number of ſugar-plantations in this pariſh was 56, and that of negroes 10,150.

Clarendon *Fort*, a fort on the W. coaſt of the iſland of Barbadoes in St. James's pariſh; 1¾ mile S. from Speight's town.

Clarendon, *Conſtitutions of*, in *Antiquity*, a charter or code of laws eſtabliſhed by the parliament at Clarendon in Wiltſhire, A. D. 1164; ſixteen articles of which related particularly to eccleſiaſtical matters, and were deſigned by king Henry II. to check the power of the pope and his clergy, and to limit the total exemption which they claimed from the ſecular juriſdiction. The ſubſtance of them is as follows: 1. All pleas between clergymen and laymen ſhall be tried in the king's courts. 2. Churches in the king's gift ſhall not be filled without his conſent. 3. All clergymen, when accuſed of any crime, ſhall be tried in the king's courts; and when convicted, ſhall not be protected from puniſhment by the church. 4. Clergymen ſhall not go out of the kingdom without the king's leave. 5, 6, Regulate the manner of proceedings in the eccleſiaſtical courts. 7. None of the king's miniſters or vaſſals ſhall be excommunicated without his knowledge. 8. Appeals from the archbiſhop to be made to the king. 9. Pleas between a clerk and a layman, whether an eſtate was in free-alms or a layfee, to be tried in the king's court by a jury. 10. One of the king's tenants might be interdicted, but not excommunicated, without the conſent of the civil judge of the place. 11. All prelates, who hold baronies of the king, ſhall perform the ſame ſervices with other barons. 12. The revenues of vacant ſees and abbeys belong to the king. The election of prelates ſhall be with the king's conſent; and they ſhall ſwear fealty, and do homage to the king, before their conſecration. 13, 14, 15, Direct the manner of proceeding, in caſe any of the king's barons ſhall diſſeiſe any of the clergy of the lay-fees which they held under them. 16. The ſons of villains ſhall not be ordained without the leave of their maſters.

Theſe conſtitutions were vehemently oppoſed by Becket, who, in a great meaſure, prevented their ſalutary effects. The king, however, by paſſing ſo many eccleſiaſtical ordinances in a national and civil aſſembly, fully eſtabliſhed the ſuperiority of the legiſlature above all papal decrees or ſpiritual canons, and gained a ſignal victory over the eccleſiaſtics. Apprehending that the biſhops, though overawed by the preſent combination of the crown and the barons, would take the firſt favourable opportunity of denying the authority, which had enacted theſe conſtitutions; he reſolved, that they ſhould all ſet their ſeal to them, and make a promiſe to obſerve them. None dared to oppoſe his will, except Becket, who obſtinately withheld his aſſent. At length, after much perſuaſion, and when he found himſelf deſerted by all the world, even by his own brethren, he was obliged to comply; and he promiſed "legally, with good faith, and without fraud or reſerve," to obſerve the conſtitutions; and he took an oath to that purpoſe. The king, thinking that he had now finally prevailed in this great enterpriſe, ſent the conſtitutions to pope Alexander III. who then reſided in France; and he required that pontiff's ratification of them. But Alexander, who, notwithſtanding the moſt important obligations to the king, plainly ſaw, that theſe laws were calculated to eſtabliſh the independence of England on the papacy, and of the royal power on the clergy, condemned them in the ſtrongeſt terms; abrogated, annulled, and rejected them. There were only ſix articles, of the leaſt importance, which, for the ſake of peace, he conſented to ratify. Becket repented of his aſſent, and redoubled his auſterities by way of puniſhment for his criminality; and he refuſed to exerciſe any part of his archiepiſcopal function, till he ſhould receive abſolution from the pope which was readily granted him. See the article Becket.

CLARET, Joan, in *Biography*, a Flemiſh painter, who lived about the year 1600, at Turin, where he painted many altar-pictures in a very bold and maſterly ſtyle, little inferior to thoſe of his cotemporary and friend Gio. Antonio Mulinari. Lanzi, Storia Pittorica.

Claret, or *Clairet*, *pale red*, a name which the French give to ſuch of their red wines as are not of a deep or high colour. See Wine.

The word is a diminutive of *clair*, *bright*, *tranſparent*. There are various accounts in the Phil. Tranſ. of attempts to improve the operation of tapping, by injecting the abdomen after the lymph is drawn off with claret and other aſtringents. Ibid. vol. xlix. part ii. N° 65. an. 1756.

Claret, *Claretum*, in the *Ancient Pharmacy*, was a kind of wine ſweetened with ſugar, and impregnated with aromatics; ſometimes alſo called *Hippocras*, or *vinum Hippocraticum*; becauſe ſuppoſed to have been firſt preſcribed by Hippocrates. It has its name *claret* from its being clarified by percolation through a flannel bag, called *manica Hippocratis*.

Claret, in *Geography*, a town of France, in the department of the Hérault, and chief place of a canton, in the diſtrict of Montpellier; 5 leagues N. of Montpellier. The place contains 774, and the canton 1834 inhabitants: the territory includes 172½ kiliometres, and 10 communes.—Alſo, a town of France, in the department of the Lower Alps, and diſtrict of Siſteron; 11 miles N. of it.

Claret, in *Muſic*. See Clarion.

CLARIÆ, in *Ancient Geography*, a people of Thrace, placed by Pliny near the Danube.

CLARIAS, or Clarias *Nilotica*, in *Ichthyology*, the name of a fiſh of the *ſilurus* kind, common in the Nile, and brought to market at Memphis, and in many other parts of Egypt, but of an inſipid taſte, and eaten only by the poorer ſort of people. The tail is broad and forked, and has externally two horny appendages of a round figure, and a hand's breadth in length, in which it differs from all other fiſhes. It is the *ſilurus clarias* of Gmelin. See Silurus.

Clarias is alſo the name given by Gronovius to the *Silurus anguillaris* of Gmelin. See Black-*fiſh*.

CLARICHORD. See Clavichord.

CLARIFICATION, is the ſeparation, by chemical means, of any liquid from ſubſtances ſuſpended in it, and rendering it turbid. If a difference can be made between clarification and filtration, it is, that the latter is effected by mere mechanical means, but the former either by heat or by certain additions.

The liquors, ſubjected to clarification, are generally ſolutions of animal on vegetable matter, in which the particles that produce the turbidneſs are ſo nearly of the ſame ſpecific gravity with the liquor itſelf, that mere reſt will not effect a ſeparation. In theſe too the liquid is generally rendered thicker than uſual by holding much mucilage in ſolution, which further entangles the turbid matter, and prevents it from ſinking. Hence it is that vinous fermentation has ſo powerful an effect as a clarifier (wine being much more limpid than the grape, or other ſaccharine juice of which it is made), ſince this proceſs always deſtroys a portion of ſaccharine mucilage, and generates alcohol, which is thin and limpid.

Coagulating fluids greatly aſſiſt clarification, when mixed with any turbid liquor; the proceſs of coagulation entangling with it every thing which is ſimply ſuſpended, and carrying it either to the top, in the form of a thick ſcum, or to the bottom, as a tough ſediment, according to circumſtances. Thus, to clarify muddy cider, the liquor is beaten up with a ſmall quantity of freſh bullock's blood, and ſuffered to ſtand at reſt for ſome hours; after which the liquor above is as clear as water, and almoſt as colourleſs, and at the bottom of the veſſel is a thick, tough cake, conſiſting of the coagulated blood, which has carried down with it all the matter which rendered the cider turbid. Many albuminous and gelatinous ſubſtances act in the ſame manner. Of theſe the beſt known is white of egg, which, when uſed for this purpoſe, ſhould be beat up cold with the liquor to be clarified, and afterwards, on applying a heat of about of 180°, the egg coagulates, and carries up with it all the opake particles of the fluid, in the form of a thick ſcum.

The firſt proceſs of ſugar-baking is carried on in this way either by white of egg or blood. The proportions required of theſe are always very ſmall, compared to the quantity of the liquor to be clarified.

Mere heat will clarify liquors, when the ſubſtance that rendered them turbid is coagulable by heat; thus the juice of cabbage, and many other green vegetables, when heated, throw up a curdy green coagulum, and the remaining liquor is limpid and colourleſs.

Heat alſo aſſiſts in another way, in diminiſhing the ſpecific gravity of liquors, which allows the coagulating matters to collect in a denſer form, and thus to be more eaſily ſeparable.

A moſt remarkable and unaccountable power is poſſeſſed by newly burnt charcoal, in clarifying all mucilaginous liquids, as already mentioned under the article Carbon.

Clarification is often found detrimental when uſed to prepare vegetable decoctions or infuſions for medicinal purpoſes; and hence it is a much leſs frequent proceſs in the Materia Medica than formerly.

Thus, if ſyrup of poppies be clarified till it becomes quite limpid, it loſes almoſt all its narcotic power, and is, as a medicine, little better than ſimple ſyrup. (See alſo the article Filtration.)

Sugar is clarified with the whites of eggs, and ſugar beat together with lime and with ox's blood, and with other materials. See Sugar.

For malt liquors, particularly beer, there are various methods of clearing; the beſt is by caſting into it fixed nitre: ſome add the quinteſſence of malt and wine; whites of eggs made into balls with a little flour and iſinglaſs: oil, and quinteſſence of barley, have the ſame effect. It is exceedingly cleared and ſtrengthened by adding to it, during the time of its fermentation, ſome ardent ſpirit. See Ale, Beer, and Malt *liquor*.

CLARIFIERS, a name given to the copper pans or cauldrons fixed in a boiling-houſe, and uſed for the purpoſe of clarifying ſugar. See Sugar.

CLARIGATIO, in *Roman Antiquity*, a ceremony that always preceded a formal declaration of war. It was performed in this manner; firſt four heralds, crowned with vervain, were ſent to demand ſatisfaction for the injuries done to the Roman ſtate. Theſe heralds, taking the gods to witneſs that their demands were juſt, one of them, with a clear voice, demanded reſtitution within a limited time, commonly 33 days; which being expired without any reſtitution made, then the *pater patratus*, or prince of the heralds, proceeded to the enemies' frontiers, and declared war.

Clarigatio is alſo uſed for apprehending a man, and holding him to bail. The Greeks called this action androlepsia.

CLARIGATION, in the *Law of Nations*, denotes a loud, clear call, or ſummons made to an enemy, to demand ſatisfaction for ſome injury received; in defect whereof, recourſe will be had to repriſals.

Clarigation amounts to much the ſame with what the Greeks call ανδροληψια. Though Naude uſes the word in a ſomewhat different manner. "Repriſals," ſays he, "ſignify the ſame as *pignorationes Budæo, aut clarigationes Hermolao*: for, as to the Greek word *androlepſia*, it is equivalent to the Latin *pignorandi poteſtas*."

CLARINET, the name of a muſical inſtrument, which has not been known in this country till within about 50 years ago, and which is ſaid to have been invented about the cloſe of the 17th century by John Chriſtopher Denner, a wind muſical inſtrument maker of Leipſic. This inſtrument has been found liable, by long uſe, to get out of tune by the widening of the bore, which is a fault that cannot afterwards be remedied. Meſſrs. Goulding and Co. of Pall-Mall, have lately obtained a patent for an improvement in the conſtruction of this inſtrument. In order to prevent the inconvenience above-mentioned, the patentees have conſtructed an inſtrument which is lined throughout with a tinned braſs tube, intended both to prevent the wood from decaying and to improve the tone of the inſtrument. Another inconvenience ariſing from the leathering of the keys, which was apt to be out of order in marching regiments, is remedied by lining the holes with a ſoft metal pipe ground perfectly flat upon the ſurface, to which a ſtopper is ſcrewed, that renders the pipe air-tight.

CLARINO, in the *Italian Muſic*, ſignifies a trumpet; thus, *a duoi clarini*, added to any compoſition, denotes that it was made for two trumpets. See CORNET and TRUMPET.

CLARION, probably the *claret* of Luſcinius, a kind of trumpet, whoſe tube is narrower, and its tone acuter and ſhriller, than the common trumpet.

Menage derives the word from the Italian *clarino*, of the Latin *clarus*, by reaſon of the clearneſs of its ſound. Nicod ſays, the clarion, as now uſed among the Moors, and the Portugueſe, who borrowed it from the Moors, ſerved anciently for a treble to ſeveral trumpets, which ſounded tenor and baſs. He adds, that it was only uſed among the cavalry and the marines.

CLARION, in *Heraldry*. Guillim ſays clarions are a kind of old-faſhioned trumpets, others imagine they repreſent the rudder of a ſhip, and others a reſt for a lance.

CRARISIA, in *Botany*, Boſc. Nouv. Dict. Flor. Peruv. Pl. 28. Claſs and order, *diœcia diandria*.

Gen. Ch. *Male*. Catkins filiform, imbricated. *Cal.* a one-flowered ſcale, containing two ſtamens. *Female. Cal.* a very ſmall ſcale. *Piſt.* Germ oval; ſtyles two, awl-ſhaped; ſtigmas two. *Peric.* Drupe oval. *Seed* one. Two ſpecies, both trees, are mentioned in the Flora Peruviana.

CLARISSIMI, among the Romans, a title of honour belonging to the third rank of nobility under the emperors. See SPECTABILES.

CLARITAS JULIA, in *Ancient Geography*, alſo called *Attubi* according to Pliny, a town of Spain, in Boetica.

CLARIUM, a fortreſs of Greece, in the Peloponneſus, ſituate, according to Polybius, in the middle of the territory of Megalopolis.

CLARK-*gooſe*, in *Ornithology*, a ſpecies of wild gooſe found in Zetland. Phil. Tranſ. N° 473. ſect. 8.

CLARKE, SAMUEL, in *Biography*, a miniſter and writer of conſiderable reſpectability, was born in 1599, at Woolſton in Warwickſhire. He received his grammar education at Coventry, whence he removed to Emanuel college, Cambridge. When he had taken the degree of bachelor of arts, he left the univerſity, and after having acted for a ſhort period as private tutor in a gentleman's family, he removed to Cheſhire, and afterwards to Warwickſhire, in which counties he long officiated as a miniſter with the greateſt reſpect and acceptance. On the publication of the *et cætera* oath he was one of the deputies choſen by the miniſters of the dioceſe of Worceſter to preſent a petition on their behalf to the king, Charles I., who was then at York. He was nominated to preſent a petition on the ſame ſubject to the parliament; and in 1660 he preſented an addreſs of thanks from the London miniſters to Charles II., on his declaration reſpecting eccleſiaſtical affairs. He had this year been choſen miniſter of St. Bennet's Fink in London, and in 1661 we find him named among the commiſſioners of the Savoy for reforming the "Book of Common Prayer." At St. Bennet's Fink he continued in the diligent exerciſe of his profeſſion, until the publication of the fatal act of uniformity, which turned him and about two thouſand others out of their places. After this meaſure had been carried into effect, he did not altogether ſeparate from the eſtabliſhed church; but frequently attended its ſervices both as a hearer and a communicant. He died on the 25th December 1682. He was a man of conſiderable learning and extenſive reading; of plain, ſimple, and unaffected manners; of exemplary piety and moral purity of life. He was an indefatigable ſtudent, and a voluminous writer, as appears by the number and the extent of his publications. We ſhall content ourſelves with naming the principal of them; which were his "Martyrology," "Lives of ſundry Eminent Perſons," "Marrow of Eccleſiaſtical Hiſtory," and "Marrow of Divinity," all printed in folio.

Mr. Clarke had a ſon of his own name, who was ejected from Grendon in Buckinghamſhire; he was the author of a work intitled "Annotations on the Bible," which has been highly ſpoken of by Dr. Owen and Mr. Baxter. Clark's Narrative of his own Life. Calamy. Neal.

CLARKE, SAMUEL, an oriental ſcholar of the firſt eminence, was born at Brackley, in the county of Northampton; and in 1638, when he was in the fifteenth year of his age, entered as a ſtudent at Merton college, Oxford. Three years afterwards the city being garriſoned for the uſe of the king, he was obliged to leave the univerſity; but in 1648, after it had ſurrendered to the parliament, he returned, ſubmitted to the viſitors they had appointed, and took the degree of maſter of arts. The year following he was deſigned firſt archi-typographus of the univerſity; to which was added the grant of the ſuperior beadleſhip of civil law. He kept a boarding ſchool at Iſlington about the year 1650, and lent his aſſiſtance towards the publication of the "Polyglot Bible." In 1658, however, he returned to the univerſity, was elected archi-typographus, and ſuperior beadle of civil law, ſituations which he continued to retain to the end of his life. His works conſiſt of "Variæ Lectiones, et Obſervationes in Chaldaicam Paraphraſin," which appeared in the ſixth volume of the "Polyglot Bible." "Scientia Metrica, et Rhythmica; ſeu Tractatus de Proſodia Arabica ex Authoribus probatiſſimis eruta." "Septimum Bibliorum Polyglotorum volumen, cum Verſionibus antiquiſſimis, non Chaldaica tantum, ſed Syriacis, Æthiopicis, Copticis, Arabicis, Perſicis contextum." He made a tranſlation from the original manuſcript in the Cambridge public library, of "Paraphraſtes Chaldæus in Libr. Paralipomenωn," a work which the learned Caſtell ſays he conſulted in compoſing his elaborate "Lexicon Heptaglotton." He reviewed alſo, with great care, the Hebrew text, the Chaldee Paraphraſe, and the Perſian Goſpels in the Polyglot Bible, and tranſlated the laſt into Latin. There is, beſides, aſcribed to him a Latin tranſlation from the Hebrew, of a work entitled "Maſſeceth Beraioth, Titulus Salmudicus, in quo agitur de Benedictionibus, Precibus, et Gratiarum Actionibus, adjectâ Verſione Latinâ. In uſum Studioſorum Literarum Talmudicarum in Æde Chriſti." He died near Oxford on the 27th of December 1669. Wood's Athenæ Oxon.

CLARKE, SAMUEL, a learned divine of the eſtabliſhed church, was born at Norwich, in the month of October 1675; his father, Mr. Edward Clarke, was a gentleman of high reſpectability in that city, one of its aldermen, and for ſome years one of its repreſentatives in parliament. He received the firſt part of his education at the free ſchool of his native town, where he made a rapid progreſs in the acquiſition of the learned languages. In the year 1691 he entered a ſtudent at Caius college, Cambridge, and ſoon diſtinguiſhed himſelf by his ardent deſire of knowledge, and by his unremitting diligence and ſucceſs in the proſecution of his ſtudies. The ſyſtem of Des Cartes was at this time in high eſteem, and taught with much zeal and confidence at the univerſities; but Mr. Clarke, even at this early age, had too much acuteneſs and penetration to miſtake its fallacious inductions for demonſtration, or its hypothetical fancies for ſound philoſophy. He had ſeen and carefully peruſed the Principia of Newton, then juſt publiſhed; and to his ſcrutinizing mind the more rational ſyſtem; the more clear, ſolid, and concluſive reaſonings of that great philoſopher carried irreſiſtible conviction. In the firſt ardour of his zeal for the principles he had newly embraced, and without regarding the deference which he knew to be due to the learning and talents of his reſpectable tutor, Mr. John Ellis, and to the other profeſſors of the univerſity, he performed a public exerciſe, with a view to his firſt degree, upon a queſtion taken from the Principia, in the diſcuſſion of which he aſtoniſhed his auditory by the clearneſs of his perceptions, and the ſolidity and force of his argumentation. Having thus become, upon enlightened conviction, a convert to the Newtonian ſyſtem, he directed his thoughts to the beſt means of enſuring for it a more general reception. The work then in common uſe as a text-book was Rohault's Syſtem of Philoſophy, upon Carteſian principles, which was written in very corrupt and barbarous Latin. Mr. Clarke, at the age of twenty-one, undertook the arduous, but commendable, taſk of making a more pure and claſſical tranſlation of it; and he embraced this opportunity to diſſeminate his own ſyſtem by ſubjoining to the original text a variety of ſuch judicious and excellent notes as were calculated to lead the ſtudent, inſenſibly, to perceive the fallacy of the author's hypotheſis. This plan produced its intended effect; Clarke's edition of Rohault, which paſſed through four editions, continued for ſome years the ſtanding text-book of the univerſity, until it undermined its own authority, and gave way to the publications of Rutherforth and Rowning, who were both avowedly the diſciples of Newton. It being Mr. Clarke's deſign to take orders, he now directed his attention to the ſubjects more immediately connected with the ſacred function. He began by ſtudying the ſcriptures of the Old and New Teſtament in their original languages, and by carefully peruſing the writings of the earlier Chriſtian fathers, which contain much valuable matter relative to the principles and the evidences of Chriſtianity. Shortly after he had been ordained he was introduced by Whiſton to Dr. Moore, the biſhop of Norwich, who was a warm friend to literature, and a great patron of learned men. Biſhop Moore was ſo much pleaſed with Mr. Clarke, that on the collation of Whiſton to the living of Loweſtoffe, in the year 1698, he appointed him to be his domeſtic chaplain. In this ſituation he remained twelve years, enjoying every mark of the eſteem and friendſhip of his learned patron, and aſſociating with him on all occaſions, rather with the intimacy of a brother than the diſtant reſerve of a dependant. At his death, Dr. Moore evinced the confidence he had in him by entruſting to his care the entire management of his domeſtic affairs; it were almoſt ſuperfluous to add that Mr. Clarke acquitted himſelf of his truſt with honour and fidelity.

In the year 1699 he may be ſaid to have commenced his literary career, as a divine, by the publication of "Three Practical Eſſays on Baptiſm, Confirmation and Repentance;" and alſo "Reflections" on a work entitled "Amyntor," known to be the production of Mr. Toland, and which related to the writings of the Primitive Fathers, and the Canon of the New Teſtament. Theſe works of Mr. Clarke, although not to be ranked with his ſubſequent publications in point of literary merit, diſplay the author's piety to great advantage, and ſhow him to have been deeply verſed in the writings of the earlier chriſtians. As he was at this period intenſely engaged in a critical ſtudy of the ſcriptures, he availed himſelf of the advantages he enjoyed, in the uncontrouled diſpoſal of his time, and the free acceſs allowed him to the valuable library of his patron, to impart the benefit of his labours to the public. In purſuance of this deſign he publiſhed, in the year 1701, a Paraphraſe on the Goſpel of St. Matthew, which was ſoon followed by Paraphraſes on the Three Goſpels of Mark, Luke, and John. Theſe are plain, judicious, and learned expoſitions on the original text; and, being, in a great degree, free from the verboſity and circumlocution ſo common in works of a ſimilar nature, may be read with great pleaſure, and with great advantage, by all who ſeek their real improvement in chriſtian knowledge and practice. It was originally the intention of the author to have carried on his undertaking through the whole of the books of the New Teſtament, and he had made ſome progreſs in the Acts of the Apoſtles, when other avocations, more urgent it ſhould ſeem, diverted him from his purpoſe. Dr. Moore's great eſteem and partiality for Mr. Clarke made him ſolicitous to advance him in his profeſſion, by every means within his power and influence. He preſented him with the rectory of Drayton, near Norwich, and obtained for him a pariſh in that city, which together produced a conſiderable addition to his income. At this time Mr. Clarke preached without notes, a practice in which, it is ſaid, he was peculiarly happy, and which he continued until he removed to St. James's, where his more polite auditory induced him to read his diſcourſes, and to compoſe them with every poſſible attention to method and ſtyle.

In the year 1704 Mr. Clarke's increaſing reputation procured for him the appointment to preach Mr. Boyle's Lecture, and he choſe for his ſubject the Being and Attributes of God. The general ſatisfaction which he gave, on this occaſion, cauſed him to be reappointed the year following to the ſame office, when he delivered a courſe of ſermons on the Evidences of Natural and Revealed Religion. Theſe two courſes were afterwards printed together, having been previouſly compreſſed and arranged into continued diſcourſes, and paſſed through ſeveral editions with ſucceſſive additions and improvements. The mode of reaſoning purſued by Mr. Clarke, in proving the Being and Attributes of God, from arguments *à priori*, excited conſiderable attention on the appearance of his work, and led to much curious and intereſting diſcuſſion. It was alleged againſt him that ſuch reaſoning was objectionable, as being too metaphyſical and ſubtil for the generality of mankind to comprehend, and as, in many caſes, inconcluſive and unſatisfactory to the moſt cultivated and enlightened minds. It is to be obſerved, however, in juſtification of Mr. Clarke, that he has declared he did not himſelf conſider the arguments *à priori* to be equally forcible and demonſtrative with thoſe which might be drawn from the works of creation, on the evidence of which he conſidered that the belief in the exiſtence of God muſt ultimately reſt. Nevertheleſs he thought, that as unbelievers had made great uſe of the arguments *á priori* on the other ſide of the queſtion, in ſupport of their atheiſtical tenets, it were highly deſirable and proper that they ſhould be met on their own ground, that the world might ſee, in the moſt ſtriking point of view, the fallacy of their deduction, and that the being of God was proved, almoſt to demonſtration, by the very mode of argumentation employed by them to infer his non-exiſtence. So far as this Mr. Clarke's explanation is ſatisfactory; and muſt be admitted to hold him very free from meriting the waſpiſh and illiberal reflection caſt upon his labours by Pope, in the following lines of his Dunciad :

> "Let others creep by timid ſteps and ſlow,
> On plain experience lay foundations low;
> By common ſenſe to common knowledge bred,
> And laſt to nature's cauſe through nature led.
> We nobly take the high *priori* road,
> And reaſon downward till we doubt of God."
> B. 4. line 455, &c.

Mr. Clarke has executed his undertaking with great ability; and has deſerved well of the friends of religion for having ſet this particular proof of the exiſtence of God in the cleareſt light of which it will, perhaps, admit in the preſent limited ſphere of our knowledge and capacities. He has diſplayed, throughout the whole performance, a clearneſs and accuracy of apprehenſion, a depth and ſolidity of judgment, and a force and acuteneſs of reaſoning, which give him a juſt title to be ranked in the firſt claſs of metaphyſicians. Mr. Clarke's ſecond treatiſe, on the Evidences of Natural and Revealed Religion, was not more fortunate than the other in eſcaping animadverſion and controverſy. The foundation, on which he built his ſyſtem, was the eternal differences, relations, and fitneſſes of things; and as thoſe terms frequently recur in his book, they became, in a conſiderable degree, faſhionable in the ethical vocabulary of the day. Notwithſtanding this, his hypotheſis was rejected by many; and it loſt much of the authority it had gained on the promulgation of the more ſentimental notions of Lord Shaftſbury, afterwards more ſyſtematically treated by Profeſſor Hutcheſon, in his "Inquiry into the Original of our Ideas of Beauty and Virtue," in which the principle of diſtinct moral inſtincts is propoſed and ſupported. Mr. Clarke's work is, however, as a whole, ineſtimably valuable, as containing the moſt ſatisfactory proofs of the divine origin, authority, and obligation of the chriſtian religion. It has had many able defenders, and among others Dr. Price, who was himſelf a hoſt.

In the year 1706 Mr. Clarke's patron ſucceeded in his wiſh to remove him to London, where he thought he would find a wider field of uſefulneſs for the exerciſe of his great talents; his intereſt procured for him the rectory of St. Bennett's, Paul's Wharf, where he continued for ſome time to officiate with the higheſt reputation. In the courſe of this year he publiſhed a letter addreſſed to Mr. Dodwell; it was in anſwer to a treatiſe which that gentleman had recently publiſhed to prove, among other things, that the ſoul was not naturally immortal, but became ſo at baptiſm. Although Dr. Hoadly, in his memoirs of Clarke, obſerves that this letter gave general ſatisfaction, it does not appear to have enforced univerſal conviction even at that time; for the philoſophical part of the argument, on the materiality of the human ſoul, was taken up and ably defended by Mr. Collins, and the diſpute has been ſubſequently revived by ſeveral writers of ability and reputation. Mr. Clarke publiſhed alſo this year an elegant Latin tranſlation of ſir Iſaac Newton's "Treatiſe on Optics," which he had undertaken at the ſolicitation of the author, and was, by this means, inſtrumental in diſſeminating the light which this great philoſopher had thrown upon that ſubject, among the learned and inquiſitive in other parts of Europe. Newton complimented him for this favour with the ſum of one hundred pounds for each of his five children.

The biſhop of Norwich having brought his friend to London, now introduced him at court, and procured for him from queen Anne, the appointment to be one of her majeſty's chaplains in ordinary; and the rectory of St. James becoming ſhortly after vacant, ſhe, at the biſhop's requeſt, preſented it to Mr. Clarke. On this elevation to a ſituation, where he would be attended by and be obliged to aſſociate with the higheſt characters in the ſtate, it was deemed deſirable that he ſhould take the degree of doctor in divinity. With this view he repaired to Cambridge, where he performed a public exerciſe which was long remembered, and which, at the time, filled thoſe who heard it with aſtoniſhment and delight, by the erudition it diſplayed, and the eloquence and claſſical purity of language with which it was compoſed and delivered. Mr. Clarke's theſis was an elaborate diſquiſition on the following queſtion; "Nullum Fidei Chriſtianæ Dogma, in S. Scripturis traditum, eſt rectæ rationi diſſentaneum." "No Article of the Chriſtian Faith, delivered in the Sacred Scriptures, is contrary to right Reaſon;" which he maintained in a moſt maſterly manner, againſt his acute and learned opponent, Dr. James, the regius profeſſor.

In the year 1712, Dr. Clarke appeared in a new character, and diſplayed his taſte in philological erudition, by the publication of a moſt ſplendid edition of Cæſar's Commentaries in folio, enriched with many judicious notes and corrections, and embelliſhed with ſome beautiful engravings. Mr. Addiſon ſpeaks, in deſerved commendation of this book in the 367th number of the Spectator, as a work that did honour to the Engliſh preſs. Since that time it has continued to riſe in value, and is now ſold at very advanced prices. An octavo edition of it was afterwards publiſhed. This year Dr. Clarke involved himſelf in a protracted, and, on many accounts, painful controverſy by the publication of his "Scripture Doctrine of the Trinity." An application was made to him previous to its appearance by ſome of the miniſters of queen Anne, to deſire he would abandon his intentions, or at leaſt delay the publication; but he, much to his honour, diſregarded their requeſt, and boldly ſubmitted his opinions to the examination of the public. The method purſued by him in treating ſo tender a ſubject, was certainly the moſt candid and unobjectionable that could well be deviſed. The firſt part contains a "Collection and Explication of all the Texts in the New Teſtament relating to the Doctrine of the Trinity;" in the ſecond, "The foregoing Doctrine is ſet forth at large, and explained in particular and diſtinct Propoſitions;" and in the third part, "The principal Paſſages in the Liturgy of the Church of England relating to the Doctrine of the Trinity are conſidered." Nothing could be more fair than to try a doctrine aſſerted by its abettors to be excluſively a doctrine of revelation, by the language and expreſſions in which that revelation is conveyed, and by a full and critical examination, collectively and ſeparately, of all the paſſages wherein it is ſuppoſed to be taught. It is impoſſible that any method can be more likely to elicit the truth, and to point out to the ſerious inquirer what he ought to believe. But notwithſtanding Dr. Clarke's candid manner of bringing the ſubject forward into diſcuſſion, it occaſioned a controverſy, in which paſſion and bigotry had far too large a ſhare of influence. Dr. Hoadly remarks, however, that the diſpute lay at laſt principally between the author and a writer (who was known to be Dr. Waterland), whom he ſtyles very ſkilful in the management of a debate, and very learned and well verſed in the writings of the ancient fathers. But Dr. Clarke was not to be let off with the ſimple warfare of printed controverſy, in which, indeed, he appeared to combat his adverſaries with manifeſt ſuperiority in point of weapons and ſkill. A complaint was formally made to the biſhops by the lower houſe of convocation, in 1714, of the heterodox opinions and dangerous tendency of the work in queſtion; and, at the requeſt of the upper houſe, they afterwards delivered in extracts from it in proof of their charges. To theſe extracts Dr. Clarke wrote a reply; but from ſome cauſe or other, not now to be aſcertained, it was not laid before the houſe. The biſhops evinced on this occaſion a very becoming ſpirit of conciliation and peace; and endeavoured to calm the violence which was ſo conſpicuous in the proceedings of their brethren of the lower houſe. Dr. Clarke, we are told, was *prevailed upon* to lay before the upper houſe a paper, which was regarded as his ſubmiſſion, and which certainly tended to convey the impreſſion, that he believed in the doctrine of the trinity in the ſenſe wherein it is commonly underſtood. His declarations are not, indeed, explicit; nor were they admitted by the lower houſe as a ſatisfactory exculpation from their charges; but they were, nevertheleſs, ſuch as it ill became ſo great a man, ſo learned an advocate, and ſo liberal and enlightened a philoſopher, to condeſcend to make. His friend Whiſton, who had a bolder ſpirit, did not ſcruple to cenſure his conduct; and, in juſtice to Dr. Clarke, it muſt be obſerved, that he afterwards condemned it himſelf, and ſaw, but too late, the error he had committed. He drew up a paper in explanation of the former, which was given in to the upper houſe of convocation; but the ſeaſon was paſſed, and his enemies had caught the opportunity to triumph over his failing. On the conſideration of his firſt paper the biſhops, though much to the diſſatisfaction of thoſe who had preferred it, diſmiſſed the complaint. It was ſuppoſed and aſſerted by ſome, particularly by chevalier Ramſay, that Dr. Clarke after this changed his opinions reſpecting the Trinity, and relinquiſhed the ſentiments maintained by him in his "Scripture Doctrine;" but this charge has been diſproved by the ſtrongeſt evidence, and by the moſt reputable and competent authorities,—by Dr. Clarke's own writings and emendations in the liturgy made but a ſhort time previous to his death,—by the teſtimonies of his friend and biographer doctor Hoadly,—and of his own ſon Mr. Samuel Clarke.

In the years 1715, 1716, Dr. Clarke engaged in an amicable controverſy with the learned Leibnitz, on the abſtruſe, metaphyſical doctrines of philoſophical liberty and neceſſity, in which each of theſe able diſputants diſplayed all the ſkill in argumentation and debate, of which they were reſpectively maſters. The papers written on this occaſion were printed in the year 1717, and inſcribed to the princeſs of Wales, afterwards queen Caroline, through whoſe hands they had all paſſed, and whom Dr Hoadly calls the witneſs and judge of every ſtep of the controverſy. Dr. Clarke, in the year 1718, gave riſe to a curious controverſy reſpecting apoſtolical and primitive doxologies, by introducing ſome alterations into thoſe of the ſinging pſalms which had been that year reprinted for the uſe of his church. The alteration complained of conſiſted in aſcribing glory to God *through* Chriſt, inſtead of paying *equal* honours to each of the three perſons of the Trinity. On this occaſion the biſhop of London thought the ſubject of ſufficient importance to publiſh a paſtoral letter to the clergy of his dioceſe, to warn them againſt innovations, and to forbid them to uſe the new doxologies. This letter was anſwered by Whiſton, and occaſioned the publication of ſeveral pamphlets on both ſides of the queſtion. Whiſton, however, obſerves, that the biſhop of London, in the way of *modern authority*, was quite too hard for Dr. Clarke in the way of primitive Chriſtianity. About this period Dr. Clarke was preſented to the maſterſhip of Whigſton Hoſpital, a poſt which he did not ſcruple to accept, as it did not require him to renew his ſubſcription, and which was rendered doubly agreeable to him by the handſome manner in which it was conferred by Mr. Lechmere, chancellor to the Duchy of Lancaſter. In 1724 he publiſhed ſeventeen ſermons in an octavo volume, eleven of which had never before been printed. On the death of ſir Iſaac Newton, the maſterſhip of the Mint, which by that event became vacant, was offered to him; but being a ſecular preferment, Dr. Clarke, with a very becoming reſpect to the dignity of his character, and agreeably to the opinion of his beſt friends, declined to accept it. In the year 1728, he publiſhed in the Philoſophical Tranſactions (No. 401), a letter addreſſed to Mr. Benj. Hoadly, on the velocity and force of bodies in motion; which is an able vindication of the doctrine of ſir Iſaac Newton on that ſubject.

Dr. Clarke's philological labours, as editor of Cæſar's Commentaries, have already been noticed. In the year 1729, he gave new proofs of his refined taſte and critical ſkill in the learned languages, by the publication of the 12 firſt books of Homer's Iliad, which he accompanied with an elegant Latin verſion, and illuſtrated with a number of very learned and moſt excellent notes and annotations. Homer, we are told, was his favourite author; and he has acted towards him in a manner worthy of his partiality, by ſtripping him of the ambiguities in which ignorance had involved his meaning, and preſenting him to the learned world in his native ſimplicity and beauty. The twelve laſt books were publiſhed in 1732 by Dr. Clarke's ſon; from whom we learn that Dr. Clarke had himſelf finiſhed his annotations on the three firſt of them, and part of the fourth. This work ſtill maintains its well-deſerved reputation, and continues to be received into our principal ſchools.

In the midſt of theſe various labours of public utility, Dr. Clarke was interrupted and cut off in the full maturity and ſtrength of his intellectual powers, by a pleuritic indiſpoſition, by which he was attacked on the 11th of May, 1729, after he had gone to Serjeants' Inn to preach before the judges. It baffled all medical aid, and, after ſubjecting him to very acute ſufferings, proved fatal to him on the 17th of the ſame month. Since his death his brother has publiſhed an "Expoſition of the Church Catechiſm," which compriſed the ſubſtance of a courſe of lectures which Dr. Clarke had delivered on this ſubject while miniſter of St. James's pariſh. He had carefully reviſed them before his death, and left them ready for publication. But his poſthumous publication of greateſt importance is the collection of his ſermons in ten volumes, which were given to the public by the ſame reſpectable relation. As a writer of ſermons, Dr. Clarke had many excellencies. Whatever ſubject he treats, his matter is ſolid and important, his arrangement lucid and comprehenſive, his illuſtrations apt and impreſſive, and his language plain, perſpicuous, nervous and perſuaſive. In his explications of Scripture he is peculiarly happy; for if it be objected to them in any inſtance, that they are more elaborate and circumſtantial than neceſſary, their length will be found to be amply compenſated by their intrinſic excellence and value. Dr. Clarke's character as a writer on all the ſubjects to which he directed his attention, ſtands deſervedly high. His works, although they diſplay no brilliancy of imagination or dazzling coruſcations of genius, are a ſtanding monument of a great and comprehenſive mind, which could bring within its graſp all uſeful and ornamental learning, and treat whatever ſubjects came under its obſervation with equal ability, accuracy, and preciſion. In theology, in metaphyſics, in natural philoſophy, and in claſſical erudition, he has eſtabliſhed a credit which will be as laſting as ſcience itſelf. His penetration was on all occaſions lively and ſtrong, his memory retentive and faithful, and his judgment equally perfect to direct him in the application of its vaſt ſtores.

To theſe high intellectual endowments, Dr. Clarke joined a mild, modeſt, and unaſſuming temper, the moſt amiable and affectionate diſpoſition, ſincere and elevated piety, and the moſt unimpeachable uprightneſs, and purity of conduct and behaviour.

Hoadly's Account of the Life, &c. of Dr. S. Clarke, prefixed to his works. Whiſton's Hiſtorical Memoirs of the Life of Dr. Samuel Clarke, 8vo. Biog. Brit.

CLARKE, WILLIAM, an eminent antiquary, was born at Haghmon abbey, in the county of Salop, in 1696. The firſt part of his education he received at the grammar-ſchool in Shrewſbury; whence he removed to Cambridge, and became a fellow of St. John's, in that univerſity, in January 1716-17. His riſing reputation ſoon procured for him the ſituation of domeſtic chaplain to Dr. Ottley, biſhop of St. David's; and on that prelate's death, in 1723, he was appointed domeſtic chaplain to the duke of Newcaſtle. In this ſituation he did not continue long; for archbiſhop Wake, from motives of perſonal reſpect, as well as a regard to the ſolicitation of Dr. Wotton, whoſe daughter Mr. Clarke had married, preſented him to the rectory of Buxted, in Suſſex. It is remarkable that Mr. Clarke did not take his bachelor's degree before the year 1731, nor that of maſter of arts before 1735. In 1738 he was made prebendary and reſidentiary of the cathedral church of Chicheſter. Mr. Clarke's firſt appearance as a writer was in a preface to Dr. Wotton's "Leges Walliæ, or the Eccleſiaſtical and Civil Laws of Howel Dda, and other Princes of Wales." It has been ſuppoſed, that a valuable "Diſcourſe on the Commerce of the Romans," re-printed by the learned Bowyer, with whom he was in the habit of correſponding, in his "Miſcellaneous Tracts," came from his pen. But the work on which Mr. Clarke's character as an antiquary is chiefly founded, is that on "The Connection of the Roman, Saxon, and Engliſh Coins; deducing the Antiquities, Cuſtoms, and Manners of each People to modern Times; particularly the Origin of Feudal Tenures and Parliaments; illuſtrated throughout with critical and hiſtorical Remarks on various Authors, both ſacred and profane:" it was publiſhed in 1767, in one volume in quarto, and dedicated to the duke of Newcaſtle. This publication was occaſioned principally by the diſcovery which Mr. Martin Folkes had lately made of the old Saxon pound: it received ſome improvements from the ſuggeſtions of Arthur Onſlow, eſq., the ſpeaker, and was greatly indebted to Mr. Bowyer for ſome notes, a diſſertation on the Roman ſeſterce, and a valuable index. The work has been much eſteemed by learned men, as elucidating many obſcure, but intereſting ſubjects, connected with the hiſtory of this country. Mr. Clarke aſſiſted Mr. Bowyer in tranſlating "Trapp's Lectures on Poetry;" and wrote ſeveral notes to the Engliſh verſion of "La Bleterie's Life of Julian." Several other writings were left by him in manuſcript, particularly ſome ſermons, and ſome curious papers relating to the hiſtory, &c. of the county of Suſſex. Although antiquities appear to have engroſſed the principal part of his attention, he is ſaid to have poſſeſſed a taſte for poetry; and ſome lines of his, publiſhed by his friend Mr. Hayley, prove him to have had conſiderable talent for epigrammatic compoſition. In 1768 he reſigned the rectory of Buxted to his ſon Mr. Edward Clarke, and in 1770 he was preſented to the vicarage of Amport, and appointed chancellor of the dioceſe of Chicheſter: but he did not long live to enjoy this promotion, being taken away by death in October 1771. In private life Mr. Clarke was diſtinguiſhed by the mildneſs and amiableneſs of his character, and in his public conduct, by his unremitting attention to his profeſſional duties. His ſon, Mr. Edward Clarke, above-mentioned, paſſed ſome time in Spain, in the capacity of chaplain to the earl of Briſtol, the Engliſh ambaſſador; and, on his return, publiſhed ſome "Letters concerning the Spaniſh Nation," containing much uſeful information reſpecting that country. Biog. Brit.

CLARKE, JEREMIAH, an Engliſh organiſt and eccleſiaſtical compoſer, had his education in the Chapel Royal, under Dr. Blow, who ſeems to have had a paternal affection for him. In 1693 he reſigned, in his favour, the place of maſter of the children and almoner of St. Paul's, of which cathedral Clarke was ſoon after likewiſe appointed organiſt. In 1700 Dr. Blow and his pupil were appointed gentlemen extraordinary in the King's chapel; of which, in 1704, on the death of Mr. Francis Piggot, they were jointly admitted to the place of organiſt.

The compoſitions of Clarke are not numerous, as an untimely and melancholy end was put to his exiſtence before his genius had been allowed time to expand.

Early in life he was ſo unfortunate as to conceive a violent and hopeleſs paſſion for a very beautiful lady of a rank far ſuperior to his own; and his ſufferings, under theſe circumſtances, became at length ſo intolerable, that he reſolved to terminate them by ſuicide. The late Mr. Samuel Wiley, one of the lay-vicars of St. Paul's, who was very intimate with him, related the following extraordinary ſtory. "Being at the houſe of a friend in the country, he found himſelf ſo miſerable, that he ſuddenly determined to return to London; his friend obſerving in his behaviour great marks of dejection, furniſhed him with a horſe, and a ſervant to attend him. In his way to town, a fit of melancholy and deſpair having ſeized him, he alighted, and giving his horſe to the ſervant, went into a field, in the corner of which there was a pond ſurrounded with trees, which pointed out to his choice two ways of getting rid of life; but not being more inclined to the one than the other, he left it to the determination of chance; and taking a piece of money out of his pocket, and toſſing it in the air, determined to abide by its deciſion; but the money falling on its edge in the clay, ſeemed to prohibit both theſe means of deſtruction. His mind was too much diſordered to receive comfort, or take advantage of this delay; he therefore mounted his horſe and rode to London, determined to find ſome other means of getting rid of life. And in July 1707, not many weeks after his return, he ſhot himſelf in his own houſe in St. Paul's church-yard; the late Mr. John Reading, organiſt of St. Dunſtan's church, a ſcholar of Dr. Blow, and maſter of Mr. Stanley, intimately acquainted with Clarke, happening to go by the door at the inſtant the piſtol went off, upon entering the houſe, found his friend and fellow-ſtudent in the agonies of death."

The anthems of this pathetic compoſer, which Dr. Boyce has printed, are not only more natural and pleaſing than thoſe of his maſter Dr. Blow, but wholly free from licencentious harmony and breach of rule. He is mild, placid, and ſeemingly incapable of violence of any kind. In his firſt anthem (vol. ii.) which required cheerfulneſs and jubilation, he does not appear in his true character, which is tender and plaintive. The ſubject of the next is therefore better ſuited to the natural bias of his genius. There is indeed nothing in this anthem which indicates a maſter of grand and ſublime conceptions; but there are a clearneſs and accuracy in the ſcore, and melancholy caſt of melody and harmony ſuitable to the words, which are likewiſe well accented, that cannot fail to ſoothe and pleaſe every appetite for muſic which is not depraved.

His full anthem, "Praiſe the Lord, O Jeruſalem," is extremely natural and agreeable, and as modern and graceful as the gravity of the choral ſervice will with propriety allow.

And in his verſe anthem, the movements in triple time are as pathetic, and even elegant, as any muſic of the ſame period, eccleſiaſtical or ſecular, that was produced, either at home or on the continent. There is a very agreeable verſe anthem of his compoſition in a collection publiſhed by Walſh, "The Lord is my ſtrength and my ſong," with more ſpirit in it than we thought he could muſter. But the verſe, "O Lord, ſend us now proſperity," on a ground-baſe in Purcell's manner, is extremely pleaſing and ingenious. Tenderneſs is, however, ſo much his characteriſtic, that he may well be called the muſical Otway of his time.

CLARKE, JOHN, an engraver, who reſided at Edinburgh, where he engraved the portraits of William Prince of Orange, and the princeſs Mary, in the form of a medallion; it is dated 1690. Amongſt other portaits by him, are thoſe of Sir Matthew Hale and Andrew Marvell; beſides which, he engraved two ſets of prints, called the Humours of Harlequin and Columbine.

Strutt and Heinecken mention another John Clarke, who lived in England at the ſame period; and two other engravers, called William and Thomas Clarke. The latter flouriſhed in 1635.

CLARKE, in *Geography*, a county of Kentucky, between the head-waters of Kentucky and Licking rivers. Its chief town is Wincheſter.

CLARKE, a town of America, in the ſtate of Virginia, 9 miles N.W. of Richmond.

CLARKSBURG, the chief town of Harriſon county, in Virginia; ſeated on the E. ſide of Monongahela river, 40 miles S.W. of Morgan-town, and containing about 40 houſes, a court-houſe, and gaol.

CLARKSTOWN, a town of America, in the ſtate of New-York, and county of Orange, lying on the W. ſide of the Tappan ſea, at the diſtance of 2 miles, and 29 miles from the city of New-York; by the ſtate cenſus of 1796, 224 of its inhabitants are electors.

CLARKSVILLE, the chief town of the diſtrict, which, till of late, was called Tenneſſee county, in the ſtate of Tenneſſee, in America, pleaſantly ſeated on the E. bank of Cumberland river, and at the mouth of Red river, oppoſite to that of Muddy creek; containing about 30 houſes, a court-houſe, and a gaol, and diſtant 45 miles N.W. from Naſhville, and 940 W. by S. from Philadelphia. N. lat. 36° 25'. W. long. 88° 57'.

CLARKSVILLE, a ſmall ſettlement of America, in the N.W. territory, which contained in 1791 about 60 perſons. It is ſituated on the northern bank of the Ohio, oppoſite to Louiſville, a mile below the Rapids, and 100 miles S.E. of Port Vincent. It is often flooded when the river is high, and inhabited by people who cannot at preſent find a better ſituation.

CLARO-OBSCURO. See CLAIR-*obſcure*.

CLAROS, in *Ancient Geography*, a wood and temple of Apollo in Ionia, in the country of the Colophonians, according to Strabo, who adds, that they were ſituated before the town of Colophon, and that they were conſecrated to Apollo, who had formerly an oracle there.—Alſo, a town of Aſia, in Ionia.—Alſo, a mountain of Aſia Minor, in Ionia, near the town of Colophon. Apollo is ſuppoſed by ſome to have derived from this place his appellation of "Clarian."—Alſo, an iſland of the Ægean ſea, ſince called "Calamo," and the "Calymna" of Pliny.

CLARTHY, in *Geography*, a river of Wales in the county of Cardigan, which joins the Clarwen at the N.W. extremity of the county of Brecknock.

CLARWEN, a river of Wales, which runs into the Wye near Rhaiadr-Gwy.

CLARY, in *Botany* and *Gardening*. See SALVIA.

CLARY, in *Geography*, a town of France, in the department of the north, and chief place of a canton in the diſtrict of Cambray; the place contains 1494, and the canton 17,205 inhabitants; the territory includes 132½ kiliometres, and 17 communes.

CLARY-*water*, is compoſed of brandy, ſugar, clary-flowers, and cinnamon, with a little ambergris diſſolved in it. It helps digeſtion, and is cardiac. This water is rendered either purgative or emetic, by adding reſin of jalap and ſcammony, or *crocus metallorum*. Some make clary-water of brandy, juice of cherries, ſtrawberries and gooſeberries, ſugar, cloves, white pepper, and coriander ſeeds; infuſed, ſugared, and ſtrained.

CLASMIUM, in *Natural Hiſtory*, the name of a genus of foſſils, of the claſs of the GYPSUMS; the characters of which are, that they are of a ſoft texture, and of a dull and opake look, being compoſed, like all the other gypſums, of irregularly arranged flat particles.

The word is derived from κλασμος, *a fragment*, or *ſmall particle*, from the flaky ſmall particles of which theſe bodies are compoſed. Of this genus there is only one known ſpecies; this is of a tolerably regular and even ſtructure, though very coarſe and harſh to the touch. It is common in Italy, and is greatly eſteemed there; we have of it alſo in ſome parts of Derbyſhire; but with us it is not particularly regarded, but burnt among the reſt. It neither gives fire with ſteel, nor ferments with *aqua fortis*; but calcines readily in the fire, and affords a very valuable plaſter of Paris.

CLASP-*nails*. See NAILS.

CLASPERS, in *Botany*. See CIRRUS.

CLASS, *Claſſis*, a diſtribution of perſons or things, ranged according to their merit, value, or nature. See RANK, &c.

The word comes from *claſſis*, derived by ſome from the Greek καλεω, *congrego*, *convoco*; a *claſs* being nothing but a multitude aſſembled apart.

CLASS is particularly uſed for a diſtinction among ſcholars, who are diſtributed into ſeveral claſſes or forms, according to their capacities and attainments.

Quintilian uſes the word *claſſis* in this ſenſe, in the firſt book of his "Inſtitutiones."

CLASS, in *Botany*, a term firſt employed by Geſner, afterwards taken up by Tournefort, and finally eſtabliſhed by Linnæus, to denote the primary diviſion of plants into large groups, each of which is to be ſubdivided, by a regular downward progreſſion, into orders, or ſections, as they are called by Tournefort, genera and ſpecies, with occaſional intermediate ſubdiviſions, all ſubordinate to the diviſion which ſtands immediately above them. So that the claſſes may be compared to the firſt layer of a truncated pyramid, which increaſes gradually as it receives the orders, genera, and occaſional intermediate ſubdiviſions, till at length it terminates in an immenſe baſe, conſiſting entirely of ſpecies. A claſs is thus defined by Tournefort in the Iſagoge in Rem Herbariam, prefixed to his "Inſtitutiones Rei Herbariæ," p. 51: Claſſis autem nomine intelligitur congeries generum, quibus nota quædam communis adeo propria eſt, ut ab omnibus aliis generibus plantarum prorſus differant. "A claſs is a collection of genera, all poſſeſſing ſome peculiar common character, by which they may be readily diſtinguiſhed from all other genera." The definition given by Linnæus in his "Philoſophia Botanica," p. 100, is more particular. Claſſis eſt generum plurium convenientia in partibus, fructificationis ſecundum principia naturæ et artis. "A claſs is founded on the agreement of ſeveral genera with each other, in the parts of fructification, according to the principles of nature and art." Tournefort, following the ſteps of Geſner, had before determined, though he did not include it in his definition, that the diviſion into claſſes ought to depend, either ſolely on the flower, or ſolely on the fruit; at the ſame time aſſigning the reaſon why, in his own practice, he gave the preference to the former. Iſag. p. 65, 66. In the formation of claſſes, it is of eſſential importance that they ſhould not be very numerous, and that their boundaries ſhould be ſtrongly and diſtinctly marked. See Classification.

CLASSENDORF, in *Geography*, a town of Bohemia, in the circle of Leitmeritz; 5 miles N. of Kamnitz.

CLASSIC, Classical, a term chiefly applied to authors read in the claſſes at ſchools, and who are in great authority there. In this ſenſe, Aquinas, and the maſter of the ſentences, were claſſic authors in the ſchool-divinity; Ariſtotle, in philoſophy; Cicero and Virgil, in the humanities. Aulus Gellius ranks among claſſic authors, Cicero, Cæſar, Salluſt, Virgil, Horace, &c.

The term claſſic ſeems properly applicable only to authors who lived in the time of the Roman republic, and the Auguſtan age, when the Latin was in its perfection.

It appears to have taken its riſe hence, that an eſtimate of every perſon's eſtate being appointed by Servius Tullius, he divided the Roman people into ſix bands, which he called *claſſes*. The eſtate of thoſe of the firſt *claſſis* was not to be under two hundred pounds: and theſe, by way of eminence, were called *claſſics*, *claſſici*.

Hence, alſo, authors of the firſt rank came to be called *claſſics*: all the reſt were ſaid to be *infra claſſem*.

The firſt *claſſis*, again, was ſubdivided into centuries; making fourſcore centuries of footmen, and eighteen of horſemen. Each *claſſis* conſiſted, one half of the younger ſort, who were to make war abroad; and the other of old men, who ſtaid at home for the defence of the city.

CLASSICA Colonia, in *Ancient Geography*, one of the names of a town in Gallia Narbonnenſis, called by Cæſar *Forum Julii*.

CLASSICAL *Learning* may be underſtood to ſignify ſuch an acquaintance with the beſt Latin and Greek writers, as ſhall enable the reader to perceive and admire the peculiar beauty of their compoſitions, and to adopt their diction and ſentiment. The principal claſſic Greek authors are, Homer, Heſiod, Plato, Demoſthenes, Æſchines, Xenophon, Plutarch, Iſocrates, Epictetus, Lucian, Sophocles, Euripides, Longinus, Theocritus, Anacreon, Pindar, Ariſtophanes, &c. The chief Latin writers are, Cicero, Livy, Cæſar, Salluſt, Virgil, Horace, Terence, Plautus, Juvenal, Ovid, Pliny, Valerius Paterculus, Tacitus, &c.

CLASSICUM, in *Ancient Military Language*, the ſound of a trumpet, or a trumpet itſelf. When the Romans wiſhed to give the ſignal for combat, one man by order, and in preſence of the general, ſounded with the trumpet. Several others, on an elevated ſituation, if there was one near them, anſwered the ſignal with the ſound of their trumpets; and at this ſecond ſignal, the trumpets of all the cohorts ſounded at once.

CLASSIFICATION, in a general ſenſe, denotes the arrangement or aſſortment of various objects into thoſe ſeveral claſſes, denoted by appellatives, which, in the ſchools, are called *genera* and *ſpecies*. It is, ſays the ingenious Dr. Smith, (Diſſertation on the Origin of Languages, annexed to his Theory of Moral Sentiments), an application of the name of an individual to a great number of objects, whoſe reſemblance naturally recals the idea of that individual, and of the name which expreſſes it, that ſeems originally to have given occaſion to the formation of thoſe claſſes and aſſortments, which, in the ſchools, are called *genera* and *ſpecies*; and for the origin of which Rouſſeau finds himſelf ſo much at a loſs to account. What conſtitutes a *ſpecies* is merely a number of objects, bearing a certain degree of reſemblance to one another; and, on that account, denominated by a ſingle appellation, which may be applied to expreſs any one of them.

This claſſification of different objects, as profeſſor Dugald Stewart accurately and ſatisfactorily ſtates it, (Elements of the Philoſophy of the Human Mind, p. 155, &c.) ſuppoſes a power of attending to ſome of their qualities or attributes without attending to the reſt; for no two objects are to be found without ſome ſpecific difference; and no aſſortment or arrangement can be formed among things not perfectly alike, but by loſing ſight of their diſtinguiſhing peculiarities, and limiting the attention to thoſe attributes which belong to them in common. This power of conſidering certain qualities or attributes of an object apart from the reſt; or the power, as the ingenious profeſſor chuſes to define it, which the underſtanding has of ſeparating the combinations which are preſented to it, is diſtinguiſhed by logicians by the name of "abſtraction," which ſee. Abſtraction, which ſome philoſophers have ſuppoſed to form the characteriſtical attribute of a rational nature, is the ground-work of claſſification; and without this faculty of the mind we ſhould have been perfectly incapable of general ſpeculation, and all our knowledge muſt have been limited to individuals; while ſome of the moſt uſeful branches of ſcience, particularly the different branches of mathematics, in which the very ſubjects of our reaſoning are abſtractions of the underſtanding, could never have poſſibly had an exiſtence.

Classification *of Animals for Comparative Anatomy*. The firſt ſyſtematic arrangements of animals were founded upon their external figure and moſt obvious habits of life; conſequently they were always imperfect, and often erroneous; thus, the diviſion of animals into terreſtrial, aërial, and aquatic, although apparently natural, included, under the ſame title, individuals no way allied to each other, except in the form of their bodies, and the element they inhabited: it is in this manner that the vulgar determine the rank of animals at preſent; thus, the whale tribe, and even ſeals, are called fiſhes, and many molluſca and other marine animals are very generally termed fiſh.

In proportion to the cultivation and advancement of the ſtudy of zoology, it became neceſſary to inſtitute claſſes and orders founded upon leſs obvious characters than the general appearance or economy of the animals; for which purpoſe, the number and arrangement of the toes, teeth, claws, beaks, ſcales, and other obſcure or minute parts were employed; and by theſe means the primary diviſions and ſubdiviſions of the animal kingdom were made more numerous; the tranſition from them to the genera leſs abrupt; and the diſcrimination of ſpecies more eaſy and accurate.

It was on this plan that Linnæus proceeded in the formation of his great ſyſtem, which has been ſo much and ſo generally admired; the characters he choſe, however, were confeſſedly artificial; and as his objects chiefly ſeemed to be the aſcertainment and deſcription of the ſpecies, he often diſregarded natural order, and frequently violated it in the moſt palpable manner: his diſtinctions are more eſpecially at variance with the anatomical ſtructure of animals; even where he propoſed to form his ſyſtem upon this foundation, he frequently fell into error.

In order to juſtify our departure from a ſyſtem which the naturaliſts of this country have not yet rejected, it will be neceſſary to point out ſome of its more objectionable parts. Linnæus makes two grand diviſions of animals, the *red* and the *white-blooded;* and under the latter denomination, he includes many animals in whom no blood or circulating fluid exiſts, and ſome others whoſe blood is really red. The claſs of *vermes*, which moſt people would expect to ſignify worms, contains all the inferior orders of animals, except inſects; thus aſſembling together genera having as little alliance to each other, with reſpect to form, habits, and organization, as there exiſts between a quadruped and a fiſh. For example, what reſemblance is there between a cuttle fiſh, an earth-worm, and a hydatid? or how can the common attributes of worms, *viz.* an unilocular heart and cold white blood be applied to them? The cuttle-fiſh has three hearts, placed at ſome diſtance from each other; its blood is tranſparent; the male and female organs of generation exiſt in ſeparate individuals; the animal is furniſhed with numerous external organs, and poſſeſſes the ſenſes of viſion and hearing, and reſides in the ſea. The earth-worm has no heart; its blood is red; has both male and female organs in the ſame individual; can ſcarcely be ſaid to poſſeſs any projecting external parts; is deſtitute of the ſenſes of ſight and hearing, and is an inhabitant of the earth.

Laſtly, the hydatid has neither blood nor circulating veſſels; is without ſex; is unprovided with any organs of ſenſe or of motion, and lives in the interior of other animals.

The conſtitution of the Linnæan orders is not more natural than that of the claſſes. One of the moſt remarkable examples of artificial arrangement preſents itſelf in the firſt order of mammalia; in which we find man and the bat aſſociated together; two animals, between whom there is no circumſtance of agreement, except the ſituation of their mammæ, which Linnæus makes an eſſential character of the order.

The animal, to which man bears the greateſt reſemblance with reſpect to external form, is the monkey; but from which he is ſo diſtinguiſhed by his mode of progreſſion, that he ſhould be placed, even on that account, in a ſeparate order, if not in a diſtinct claſs.

The poſition of the head, by which it is equipoiſed upon the vertebral column, the forward direction of the eyes, the want of a cervical ligament to aſſiſt the muſcles of the neck in ſuſtaining the weight of the head, the capacity of the cheſt, which would interfere with the employment of the ſuperior extremities, as feet, the ſhape of the pelvis, and of the cavity for receiving the head of the thigh bone, the length of the inferior extremities, the ſtrength of the poſterior muſcles of the leg, and the projection of the heel, which increaſes their power, the poſition of the ſole of the foot, the conjunction of the great toe with the others, and the original thickneſs of the integuments of the bottom of the feet, are all peculiarities of the human body; and concur to prove that man was deſigned by nature to walk erect, whilſt the ſtructure of the moſt perfectly formed monkey prevents the animal's ſuſtaining the upright poſition for any length of time without an effort, or without clinging to ſome external ſupport.

The mental character, the inſtincts, and the habits of the human kind, are, however, ſo very peculiar, and ſo very important in their conſequences, that in all ſyſtems of natural arrangement, man ought to conſtitute a claſs diſtinct from all other animals. Man alone is endowed with the faculty of reaſoning and a moral ſentiment; for in thoſe inſtances where animals have appeared to act from judgment, it was the reſult of imitation, inſtinct, or a previous education. Human language is almoſt always artificial, and formed by convention, and may be uſed as the ſigns of abſtract ideas; whilſt that of animals conſiſts of inſtinctive cries or ſounds, which commonly expreſs only immediate wants or ſenſations. No animal is capable of conſtructing tools or machinery for the purpoſe of diminiſhing labour; whilſt mankind perform almoſt all their actions with the aid of inſtruments or machines. The mechanical powers of the human race have a moſt extenſive influence upon its natural hiſtory: it is by theſe that man is able to maintain his dominion over the reſt of the creation, for no animal is naturally ſo defenceleſs. Born without weapons, and even any covering, he would be incapable of reſiſting the attacks of rapacious animals, or of ſuſtaining the extreme effects of climate; it is alſo by mechanical means that we are enabled to profit by our own or others' experience, and to tranſmit the inventions and diſcoveries of one generation to another, which forms one of the moſt diſtinguiſhing characteriſtics of mankind, and to which they chiefly owe their ſuperiority over the brute creation. The ſocial habits and ſexual inſtincts of the human ſpecies are very different from thoſe of animals; almoſt all the works of man are produced by co-operation, and ſubordination amongſt the agents; but animals commonly act independently, and without controul; for even where their inſtincts lead them to conduct their labours in concert, every individual performs its own taſk, without receiving any inſtructions or commands from others. To live in a ſtate of organized ſociety is, therefore, only natural, and peculiar to the human kind.

In animals the deſires of the ſexes occur at determined ſeaſons, at which times they are ungovernable, and to their gratification commonly ſucceeds a ſentiment of averſion; whilſt the intercourſe of the ſexes in the human ſpecies is not the effect of a periodic inſtinct, and is always regulated by taſte, or ſome other mental ſentiment or conſideration, not immediately concerned in the performance of the procreative act.

Many other circumſtances might be enumerated, as diſtinguiſhing attributes of the human kind, but the above have been adduced as being more peculiarly claſſific characters, or more properly belonging to natural hiſtory; and are ſufficient in themſelves to ſhew the impropriety of arranging man with other animals.

In ſome other Linnæan orders of mammalia, ſeveral of the genera have no natural alliance to each other. Thus, in the order *bruta*, we meet with the elephant, the walrus, the ſloth, and the anteaters, animals extremely different in their form, organization, and all their habitudes. The order *feræ* includes, with the real beaſts of prey, the ſeal, whoſe mode of life is ſo peculiar, and the hedge-hog, mole, and ſhrew, which are really fugitive animals; and in the order *belluæ* we find the hippopotamus, hog, and tapir, whoſe uncouth figure, ſlow, heavy gait, and general economy, plainly declare their relation to the elephant and rhinoceros, with whom they ſhould have been united, rather than with ſuch a fleet and finely proportioned quadruped as the horſe.

Although the orders which Linnæus inſtituted in birds are more natural than thoſe of mammalia, they are not unexceptionable. The genus *lanius* perhaps more properly belongs to the *paſſerine* tribe, than to the birds of prey. The order *picæ* is unqueſtionably too extenſive, and contains many genera, which, in their general form and modes of life, ought to be placed amongſt the paſſeres. All the orders of birds ſeem to require a further diviſion; and the peculiarities in the ſtructure and mode of progreſſion in the ſtruthious birds would point out the propriety of forming them into a diſtinct order. The appellations alſo of all the orders may be thought to admit of improvement; but where names do not lead to errors, with reſpect to fact, it is of little conſeqence whether they be quite appropriate or not.

The orders of the claſſes, amphibia and fiſhes, as they appear in the later editions of the Syſtema Naturæ, are leſs objectionable than any other part of the Linnæan claſſification, and, conſequently, have undergone leſs alterations by modern naturaliſts.

It is in the arrangement of the inferior orders of animals that Linnæus appears to have been moſt cenſurable. The order of *apterous inſects* is compoſed of genera differing ſo much from each other in anatomical ſtructure, that they have given riſe to the formation of ſome new claſſes by late naturaliſts. The orders *molluſca* and *teſtacea*, of the claſs *vermes*, are by far the worſt conceived parts of the Linnæan ſyſtem: under the denomination of *molluſca*, we find ſome animals that have all the external characters, as well as anatomical ſtructure, of *worms*, properly ſo called; others, which have ſo many peculiarities of form and of organization, that they almoſt deſerve to conſtitute a diſtinct claſs; and others again, which are ſo ſimple in their formation, that they might be conſidered as the link between the animal and the vegetable kingdoms. The ſeparation of the teſtaceous from the naked molluſca is a glaring impropriety, unleſs the objects of natural hiſtory were merely to deſcribe the coverings or habitations of animals, without regard to the real form, ſtructure, and habits of the individuals they contain.

The number of the genera and ſpecies of animals in every claſs is infinitely increaſed ſince the days of Linnæus, which is partly the conſequence of modern diſcoveries, and partly owing to a more accurate examination and compariſon of the ſpecies which were already known.

At the ſame time that we have thus ventured to cenſure, without reſerve, the errors of Linnæus, we cannot forbear acknowledging with admiration the talents, zeal, and induſtry which he exerted in the ſervice of natural hiſtory; he has not been ſurpaſſed by any, as a patient and laborious collector of facts, and few have ſhewn more ability in the arrangement of their materials. Had he but paid as much attention to natural order, and the anatomy of animals, as he did to artificial characters, his ſyſtem would have remained a laſting monument of his indefatigable induſtry, and comprehenſive genius; and it would have been only left to ſucceeding naturaliſts to fill up his orders with ſuch genera and ſpecies as later diſcoveries might afford.

It is from accurate and enlarged views of the organization of animals that almoſt all the modern improvements with reſpect to the claſſification of animals have ariſen; we cannot wonder, therefore, that we receive them almoſt entirely from the naturaliſts of France and Germany, who ſtudy comparative anatomy with a degree of zeal and attention unknown in this country.

Of thoſe who have contributed to the introduction of a natural method in zoology, we may enumerate Daubenton, Vic d'azir, Blumenbach, Fabricius, Geoffroy, Cuvier, Brongniard, La Cepede, La Marck, Latreille, Dumeril, &c.

In compoſing the following claſſification of animals we have made a free uſe of the works of the above writers, not however, by ſervilely copying them, but by adopting their arrangement wherever we conſidered it juſt and natural. In ſome inſtances, when we thought it neceſſary, we have ventured to differ decidedly even from ſuch celebrated authorities, and in other caſes we have added ſuch new diviſions of animals, as appeared to be required, more eſpecially for the convenience of anatomical deſcription. The claſſification of mammalia is nearly the ſame as that propoſed by Geoffroy and Cuvier; we have, however, given different names to ſeveral of the families, and have ſeparated the genus Lamantin from the ſeal and whale tribes, as differing from both in form and in anatomical ſtructure. The claſs of birds is formed upon the plan of that contained in Cuvier's Tableau Elementaire de l'Hiſtoire naturelle, except that we have made a diſtinct order of the running birds, and have tranſpoſed ſome of the other genera. In the arrangement of reptiles we have followed that of Brongniard and Daudin, with the inſtitution of the additional family of amphibia, including the ſirens which we have judged it proper to ſeparate from the frog kind, until it be determined whether they are animals in a tadpole ſtate of exiſtence or not. In the claſs of fiſhes we have adopted the ſyſtem of La Cepede, as lately modified by Dumeril, in which are introduced the genera of Bloch, La Cepede, Commerſon, &c. In the conſtitution of the molluſca, the lateſt improvements of Cuvier have been admitted, who was the author of the claſs, and to theſe we have added ſome other ſubdiviſions, which appeared to be both natural and conſonant. The arrangement of winged inſects is the ſame which Dumeril has formed from the Linnæan and Fabrician ſyſtems, but we have replaced the two genera cancer and monoculus of Linnæus amongſt the apterous inſects, although all the French naturaliſts had agreed that they ſhould conſtitute a diſtinct claſs to which they gave the name of cruſtacea. The eſtabliſhment of the claſs cruſtacea does not appear to reſt upon good principles. It was inſtituted upon the grounds of the animal compoſing it having divided blood veſſels, and the preſumption of there being no vaſcular ſyſtem in the other families of inſects. There would ſeem, however, to be a regular gradation from the heart and large arteries of cruſtacea to the dorſal veſſel of flying inſects. In ſome that hold an intermediate place, ſuch, for example, as ſpiders, ramifications of the dorſal veſſel can be detected; and analogy would lead us to conclude that the dorſal veſſel of flying inſects performs at leaſt ſome of the functions of the heart and principal arteries of cruſtacea, and that the large veins of the latter may be ſo much extended as at laſt to occupy the entire cavity of the body of the inſect, and thus elude our obſervation. But granting the opinion of the French naturaliſts to be correct, (which is not probable) that inſects have no apparatus for preparing the nutritious fluid previous to its converſion into the organic ſtructure of the animal, ſtill there are ſo many circumſtances of reſemblance between cruſtaeceous and other inſects, that they cannot with propriety be placed in ſeparate claſſes; they have both the external ſkeleton, both poſſeſs a ſimilar ſtructure of the muſcles and the ſame arrangement of the nerves, they are alike furniſhed with antennæ and compound eyes, which exiſt in no other claſs of animals. The lateral poſition of the jaws, and the want of glandular viſcera, which are ſupplied by numerous tubes connected with the alimentary canal, are alſo peculiarities of ſtructure only found in cruſtaceous and other inſects. After fully conſidering all the characters of the cruſtacea of Cuvier we have judged it beſt to form theſe animals into two orders of apterous inſects, one of which is the true cruſtacea and correſpond to the genus cancer (Linn.) and the other is the genus monoculus (Linn.) or the teſtaceous inſects of Muller. We have alſo inſtituted ſome other natural families of apterous inſects, one of which nearly anſwers to the *arachnides*, a claſs lately formed by ſome of the French naturaliſts upon ſtill leſs pretence than that of cruſtacea.

The diviſion of worms into thoſe reſiding in the earth or water, and thoſe inhabiting the interior of other animals, is ſo very obvious that it has been made by moſt naturaliſts; but La Marck and Dumeril have gone farther, and have ranked inteſtinal worms amongſt zoophytes, which the ſimplicity of their organization might perhaps authoriſe; but on account of their uſual form and affinity which ſome of the ſpecies bear to the external worms, we have been induced to ſtill retain them in the claſs of vermes.

The claſs of zoophytes is formed upon the plan generally adopted by the French naturaliſts: we have, however, made ſome more ſubdiviſions, eſpecially of the zoactinia, or radiated animals.

It is not expected that the annexed claſſification will meet univerſal approbation from Engliſh readers; ſome entertain ſo high a reverence for every thing belonging to Linnæus, that they will not hear of the leaſt deviation from his ſyſtem; not remembering that the nature of truth and error is the ſame, whether it be ſanctioned by authority or not. Others may object to the introduction of ſo many ſubdiviſions of the claſſes, and the employment of new terms, from an apprehenſion that they will increaſe the difficulties (already too numerous) attending the ſtudy of natural hiſtory. To theſe it may be obſerved that the acquiſition of every ſpecies of knowledge is facilitated by judicious ſubdiviſions and appropriate terms, and that all the obſcurity and confuſion of natural hiſtory have ariſen from the want of a proper nomenclature. It has been long known that the ſpecies are eaſily diſcovered after we are acquainted with the characters of the genus to which they belong, and that the moſt difficult part, both of zoology and botany, is to attain a knowledge of the genera; the obvious reaſons for which are, that the paſſage from the genera to the ſpecies is ſhort and eaſy, while the former are too much eſtabliſhed upon independent characters, and are not the branches of the orders, or the ſubdiviſion next above them. The inſtitution of ſub-orders is eminently calculated to remove theſe difficulties; and if they be conſtructed ſo as to form natural families, they greatly facilitate and extend our acquaintance with the habits, manners, and economy of animals, which are the true objects of natural hiſtory.

To fully perceive the utility of ſub-diviſions and general terms in zoology, we ſhould ſuppoſe the ſubject in its two extremes; one when all the names are individual, or at moſt ſpecific; the other where there are regular and natural gradations from the claſs to the ſpecies; in the firſt caſe the ſtrongeſt memory would hardly embrace the number of individuals contained in one genus, while, in the other, the whole animal kingdom might be ſurveyed with eaſe; but it is needleſs to dwell upon the convenience and neceſſity of arrangement in a ſcience which eſſentially conſiſts in the generalization and compariſon of facts.

The improvements in the claſſification of the ſubjects of natural hiſtory, like the new chemical nomenclature, have been treated in this country with contempt and deriſion, and like it, alſo, they will be ſlowly, yet univerſally acknowledged. One reaſon alone, if there exiſted no other, would juſtify our adoption of the modern ſyſtem of claſſification, upon the preſent occaſion: it is becauſe it is the moſt conſonant with the anatomical ſtructure of animals, which we have to deſcribe, and in reference to which, alone, the following tables are conſtructed.

VIEW of the CLASSES of ANIMALS.

					Classes.
ANIMALS.	A brain containing cavities; an internal oſſeous ſkeleton	warm blood, and heart with two ventricles	viviparous, and ſuckle their young	I.	MAMMALIA.
			oviparous, and without mammæ	II.	AVES.
		cold blood, and heart with one ventricle	having lungs, and wanting fins	III.	REPTILIA.
			with gills and fins	IV.	PISCES.
	Without a brain or internal ſkeleton.	An articulated external ſkeleton		V.	INSECTA.
		No articulated members	Simple nerves	VI.	MOLLUSCA.
			Knotted nerves	VII.	VERMES.
			Without nerves	VIII.	ZOOPHYTA.

CLASS I. MAMMALIA.

		Orders.
The Feet	divided into digiti or toes, which are furniſhed with claws or nails	1. Digitata.
	having the parts correſponding to the toes enveloped in horny caſes or hoofs	2. Ungulata.
	degenerated into the form of fins, and employed for ſwimming	3. Pinnata.

DIGITATA.—Firſt Order of MAMMALIA.

	FAMILIES.	GENERA.		SUB-GENERA.	
Teeth of three ſorts; members diſtinct; the thumb or pollex ſeparate on both hands and feet	QUADRUMANA	Simia	Ape	Pithecus Callitrix Cercopithecus Cynocephalus Papio Cebus	Orang. Sapajou. Guenon. Macaque. Baboon. Alouate.
		Lemur	Maki	Lemur Indri Lori Galago Tarſius	Maki or Maucauco Indri. Lori. Galago. Tarſier.
Teeth of three ſorts; members diſtinct; the thumb or pollex ſeparate on the feet only	PEDIMANA	Uomlatus	Womlat.		
		Didelphis	Opoſſum	Didelphis Daſyurus Phalangiſta Coeſcoes.	Sarigue. Daſyure. Phalanger.
		Perameles	Peramele.		
Teeth of three ſorts; members diſtinct; the thumb or pollex not ſeparate; walk on the toes	DIGITIGRADA	Muſtela.	Weazel	Muſtela Lutra Mephitis	Weazle and Martin Otter. Mouffete.
		Viverra	Civet.		
		Felis.	Cat.		
		Canis	Dog	Canis Hyæna	Dog. Hyæna.
Teeth of three ſorts; members diſtinct; the thumb or pollex not ſeparate; walk on the ſole of the feet	PLANTIGRADA	Erinaceus	Hedge Hog	Erinaceus Setiger	Hedge Hog. Tenrec.
		Sorex	Shrew	Sorex Mygale Chryſochloris Scalops	Shrewmouſe. Deſman or Muſk Shrew. Chryſochlore. Scalope.
		Talpa	Mole.		
		Urſus	Bear	Urſus Taxus Naſua Procyon Potos Ichneumon	Bear. Badger. Coati. Racoon. Kinkajou. Mangouſte.
Teeth of three ſorts; members united by a membrane in form of a wing	CHEIROPTERA	Veſpertilio	Bat	Pteropus Veſpertilio Rinolophus Phylloſtoma Noctilio	Rouſſet. Common Bat. Rinolphus. Phylloſtome. Noctilio.
		Galeopithecus	Flying Lemur.		
		Phaſcolomys	Phaſcolome.		
Teeth leſs than three ſorts; want the canine only; a leaping gait	SALTIGRADA	Kangurus	Kanguroo.		
		Hyſtrix.	Porcupine	Hyſtrix Coendus	Porcupine. Coendu.
		Lepus	Hare	Lepus Lagomys	Hare. Pica.
		Cavia	Cavy	Hydrochærus. Cavia	 Agouti.
		Caſtor	Beaver.		
		Hydromys.			
		Sciurus	Squirrel	Pteromys Sciurus	Polatouche, or Flying Squirrel. Squirrel.
		Cheiromys	Aye-Aye, or Madagaſcar Squirrel.		
		Mus	Rat	Arctomys Lemmus Fiber Mus Cricetus Spalax Dipus Myoxus	Marmot. Campagnol. Ondatra. Rat. Hamſter. Mole Rat. Jerboa. Dormouſe.
Teeth leſs than three ſorts; want the inciſors and canine	EDENTATA	Ornitherincus	Duckbill.		
		Myrmecophaga	Ant-eater	Myrmecophag Echidna Manis	Ant-eater. Porcupine Ant-eater Pangolin or Scaly Lizard.
		Orycteropus	Cape Ant-eater.		
		Daſypus	Armadillo.		
Teeth leſs than three ſorts; want the inciſors only; slow motion	TARDIGRADA	Bradypus	Sloth	Megatherium	Megather.

UNGULATA.—Second Order of MAMMALIA.

		FAMILIES.	GENERA.		SUB-GENERA.	
Hoofs	three at leaſt	MULTUNGULATA	Elephas	*Elephant.*		
			Tapir	*Tapir.*		
			Sus	*Hog.*		
			Hippopotamus	*River Horſe.*		
			Hyrax	*Daman*		
			Rhinoceros	*Rhinoceros*		
	two; the foot appearing as if cleft in two parts	BISULCA	Camelus	*Camel.*	Camelus	*Camel.*
					Lama	*Peruvian Camel.*
			Moſchus	*Chevrotin, or Muſk.*		
			Cervus	*Deer.*		
			Camelo-Pardalis	*Giraffe.*		
			Antilope.			
			Capra	*Goat.*		
			Ovis	*Sheep.*		
			Bos	*Ox.*		
	one only; the foot appearing ſolid	SOLIPEDA	Equus	*Horſe.*		

PINNATA.—Third Order of MAMMALIA.

		FAMILIES.	GENERA.	
Poſterior feet	with the toes united and turned backwards for ſwimming	NECTOPODA	Phoca	*Seal.*
			Trichechus	*Morſe.*
	concealed in the tail	CRYPTOPODA	Manatus	*Lamantin.*
	completely obliterated, giving the animal the appearance of a fiſh	CETACEA	Balæna	*Whale.*
			Balenoptera	*Finned Whale.*
			Narwhalus	*Narwal.*
			Anarnacus	*Anarnak.*
			Catodon	*Cachelot.*
			Phyſalus	*Phyſalus.*
			Phyſeterus	*Phyſeter*
			Delphinus	*Dolphin.*
			Delphinapterus.	
			Hyperoodon	*Grampus.*

CLASS II. AVES.

ORDERS.

- Number of poſterior toes
  - two, and two anterior toes; tarſus ſhort, and the limbs altogether conſtructed for climbing. — 4. SCANSORIÆ.
  - one, or none; the anterior
    - entirely free; bill and claws ſtrong and ſharp; legs very muſcular, and fitted for graſping. — 7. ACCIPITRINÆ.
    - united
      - entirely by broad membranes; legs ſhort, and placed backwards, and adapted for ſwimming. — 6. ANSERINÆ.
      - partially,
        - all at their baſe; tarſus
          - moderately long and ſtrong. — 2. GALLINACEÆ.
          - long; leg very ſtrong, and fitted for running — 1. CURSORIÆ.
        - the two external; tarſus
          - very long, and calculated for wading — 5. GRALLATORIÆ.
          - moderately long, and ſlender — 3. PASSERINÆ.

CURSORIÆ.—Firſt Order of BIRDS.

		FAMILIES.	GENERA.	
Number of anterior toes	two	DIDACTYLÆ	Struthio	*Oſtrich.*
	three	TRIDACTYLÆ	Rhea	*Tougou.*
			Caſſuarius	*Caſſowary.*

CLASSIFICATION.

GALLINACEÆ.—Second Order of Birds.

The wings		Families.	Genera.		Sub-genera.	
fitted for flight; bill	ſtraight, ſoft, and deſcending towards the extremity	COLUMBINÆ	Columba	*Pigeon.*		
	hard, horny, and ſharp, with the ſuperior mandibule arched	ALECTRIDES	Tetrao	*Grous*	Tetrao Perdrix Coturnix	*Grous.* *Partridge.* *Quail.*
			Pavo	*Peacock.*		
			Phaſianus	*Pheaſant*	Phaſianus Gallus	*Pheaſant.* *Cock.*
			Numida	*Pintado.*		
			Meleagris	*Turkey.*		
			Crax	*Curaſſow.*		
			Penelope	*Guans.*		
			Otus	*Buſtard.*		
very ſhort; unfit for flying, body very heavy		BRACHYPTERÆ	Didus	*Dodo.*		

PASSERINÆ.—Third Order of Birds.

Bill				Families.	Genera.		Sub-Genera.	
notched; with	one or two indentations at moſt			CRENIROSTRES	Lanius	*Shrike.*		
					Muſcicapa	*Flycatcher.*	Tyrannus Muſcivora Muſcicapa	*Tyrant Flycatcher.* *Moucherolle.* *Common Flycatcher.*
					Turdus	*Thruſh.*		
					Ampelis	*Cotinga or Chatterer.*		
					Tanagra	*Tanager.*		
	three indentations at leaſt			DENTIROSTRES	Phytotoma	*Plant clipper.*		
					Momotus	*Motmot.*		
					Buceros	*Hornbill.*		
not notched	ſtrong and ſolid	ſtraight, elongated, compreſſed		PLENIROSTRES	Gracula	*Grakle.*		
					Corvus	*Crow.*		
					Coracias	*Roller.*		
					Paradiſea	*Bird of Paradiſe.*		
		ſlightly curved, ſhort, conic		CONIROSTRES	Oriolus	*Caſcique or Oriole.*	Cacicus Icterus Xanthornus	*Cacique.* *Troop-Oriole.* *Carouge or Bonana Bird.*
					Sturnus	*Stare.*		
					Loxia	*Groſsbeak.*	Loxia Cruci-roſtra Chloris Pyrrhula Colius	*Groſsbeak.* *Croſsbill.* *Greenfinch.* *Bullfinch.* *Coly.*
					Fringilla	*Sparrow.*	Fringilla Cælebs Carduelis Vidua	*Sparrow.* *Chaffinch.* *Goldfinch.* *Widow Bird.*
					Emberiza	*Bunting.*		
	feeble, flexible	ſhort	ſlender, round	SUBULIROSTRES	Parus	*Titmouſe.*		
					Pipra	*Manakin.*		
					Alauda	*Lark.*		
					Motacilla	*Wagtail.*	Silvia Erithacus Ficedula Regulus Motacilla	*Warbler.* *Redbreaſt.* *Fig-eater.* *Wren.* *Wagtail.*
			broad, flat	PLANIROSTRES	Hirundo	*Swallow.*	Hirundo Apus	*Swallow.* *Martin.*
					Caprimulgus	*Goatſucker.*		
		very long and ſlender		TENUIROSTRES	Sitta	*Nuthatch.*		
					Certhia	*Creeper.*		
					Trochylus	*Humming Bird.*	Trochylus Orthorincus	*Humming Bird.* *Straight-billed Humming Bird.*
					Upupa	*Hoopoe.*		
					Merops	*Bee-eater.*		
					Alcedo	*King Fiſher.*		
					Todus	*Tody.*		

SCANSORIÆ.

SCANSORIÆ.—Fourth Order of Birds.

Bill	Families.	Genera.		Sub-genera.	
narrow at the baſe, not denticulated	**Cuneirostres**	Galbula	*Jacamar.*		
		Picus	*Woodpecker.*		
		Yunx	*Wryneck.*		
		Cuculus	*Cuckoo.*		
large at the baſe, or denticulated	**Levirostres**	Crotophaga	*Ani.*		
		Turacus	*Touraco.*		
		Muſophaga			
		Trogon	*Curucui.*		
		Bucco	*Barbet.*		
		Ramphaſtos	*Toucan.*		
		Pſittacus	*Parrot*	Kakatoe	*Cockatoo.*
				Pſittacus	*Parrot.*
				Ara	*Maccaw.*
				Pſittacula	*Parraket.*

GRALLATORIÆ.—Fifth Order of Birds.

Bill		Families.	Genera.		Sub-genera.	
long	ſtrong, and like a knife	**Cultrirostres**	Ardea	*Heron*	Hians	*Open-bill.*
					Ardea	*Heron.*
					Ciconia	*Stork.*
					Grus	*Crane.*
					Scopus	*Umbre.*
			Myćteria	*Jabiru.*		
			Tantalus	*Ibis.*		
	weak, and flattened horizontally	**Latirostres**	Platalea	*Spoonbill.*		
	ſlender, and weak	**Longirostres**	Recurviroſtra	*Avoſet.*		
			Charadrius	*Plover.*		
			Tringa	*Lapwing*	Tringa	*Lapwing.*
					Totanus	*Gambet.*
					Calidris	*Sandpiper.*
			Phalaropus	*Phalarope.*		
			Scolopax	*Woodcock*	Scolopax	*Woodcock.*
					Numenius	*Curlew.*
middle-ſized and compreſſed		**Pressirostres**	Haematopus	*Oyſter-catcher.*		
			Rallus	*Rail.*		
			Fulica	*Coot*	Fulica	*Coot.*
					Gallinula	*Water-hen.*
			Parra	*Jacana.*		
ſhort and thick		**Brevirostres**	Pſophia	*Trumpeter.*		
			Palamedea	*Screamer.*		
			Cancroma	*Boat-bill.*		
			Phenicopterus	*Flamingo.*		

ANSERINÆ.—Sixth Order of Birds.

Number of the anterior toes			Families.	Genera.		Sub-genera.	
four, or the poſterior toe concealed in the ſame membrane with the others			**Pinnipedes**	Pelecanus	*Pelican.*	Pelécanus	*Pelican.*
						Phelacrocorax	*Cormorant.*
				Phæton	*Tropic-bird.*	Fregata	*Frigate.*
						Sula	*Booby.*
				Plotus	*Darter.*		
three; bill	ſerrated		**Serrirostres**	Anas	*Duck.*		
				Mergus	*Merganſer.*		
	not denticulated; wings	very long	**Longipennes**	Sterna	*Tern.*		
				Larus	*Gull.*		
				Rhynchops	*Skimmer.*		
				Procellaria	*Petrel.*		
				Diomedea	*Albatroſs.*		
		very ſhort	**Brevipennes**	Colymbus	*Grebe*	Colymbus	*Grebe.*
						Urinator	*Diver.*
				Alca	*Auk*	Uria	*Guillemot.*
						Alca	*Puffin.*
						Pinguin	*Penguin.*
				Aptenodyta	*Manchot.*		

ACCIPITRINÆ.—Seventh Order of Birds.

The eyes		Families.	Genera.		Sub-genera.	
lateral; head or part of the neck	without feathers	Nudicolles	Vultur	*Vulture*	Vultur	*Vulture.*
					Sarcoramphus	*Sarcoramphus.*
	with feathers	Plumicolles	Falco	*Falcon*	Gypaetos	*Griffon.*
					Aquila	*Eagle.*
					Niſus	*Sparrow hawk.*
					Buteo	*Buzzard.*
					Milvus	*Kite.*
					Falco	*Falcon.*
					Secretarius	*Secretary.*
in the front of the head; head large, fly without noiſe; ſeek their food by night		Nycterobiæ	Strix	*Owl*	Otus	*Hibou* or *Horned Owl.*
					Strix	*Common Owl.*
					Surnia	*Surnia.*

CLASS III. REPTILIA.

Heart			Orders.
with two auricles; jaws	of horn; without teeth; a back ſhell	1.	Chelonia.
	with teeth; no back ſhell	2.	Sauria.
with one auricle; body	without feet; often covered with ſcales	3.	Ophidia.
	naked with two or four feet	4.	Batrachia.

CHELONIA.—Firſt Order of Reptiles.

The Feet	Families.	Genera.	
palmated	Marina	Chelonia	*Turtle.*
	Hurcatilia	Emys	
		Chelus	*Matamata.*
with claws	Terrestria	Teſtudo	*Tortoiſe.*

SAURIA.—Second Order of Reptiles.

Tail moſt commonly very long,	Families.	Genera.	
flattened ſuperiorly, or upon the ſide	Planicaudata	Crocodilus	*Crocodile.*
		Dracæna.	
		Tupenamlus.	
		Urcplatus.	
		Lophyrus.	
		Baſiliſcus	*Baſiliſk.*
conic, round	Tereticaudata	Iguana	*Quana.*
		Draco	*Dragon.*
		Agama.	
		Chamæleon	*Chameleon.*
		Gecko.	
		Stellio.	
		Analis.	
		Lacerta	*Lizard.*
		Scincus.	
		Ahalcides.	
		Seps.	

OPHIDIA.—Third Order of Reptiles.

		Families.	Genera.	
Skin	naked, or equally covered with ſcales under the belly and the tail	Homodermata	Cæcilia.	
			Amphiſbæna.	
			Acrochordus.	
			Ophiſaurus.	
			Anguis	*Snake.*
	with ſcales above; plates under the belly and under the tail	Heterodermata	Hydrophis	*Water-ſerpent.*
			Platurus.	
			Crotalus.	
			Scytale.	
			Vipera	*Viper*
			Coluber.	
			Boa.	
			Erpeton.	
			Erix.	

BATRACHIA.—Fourth Order of Reptiles.

			Families.	Genera.	
Body	ſhort and thick, without tail; anterior feet ſhort; both lungs and gills in the young ſtate		Anoura	Pipa.	
				Bufo	*Toad.*
				Rana	*Frog.*
				Hyla	*Tree Frog.*
	elongated; with a tail; feet equal in length; both lungs and gills	in the young ſtate	Deloura	Triton.	
				Salamandra.	
		during life	Amphibia	Proteus.	
				Siren.	

CLASS IV. PISCES.

		Sub-classes.				Orders.
Body	with cartilaginous ſkeleton	CARTILAGINEI.	Gills	with gill covers, and	with membrane; the gills being complete.	4. Teleobranchiati.
					without membrane; gill covers being free	3. Eleutheropomati.
				without gill covers, and	with membrane; reſpiring through a fiſſure	2. Chismopnes.
					without membrane; reſpiring through holes	1. Trematopnes.
	with oſſeous ſkeleton	OSSEI.	Gills	with gill covers, and	with membrane; the gills being entire, or containing all their parts	5. Holobranchiati.
					without membrane; plicated breaſt	6. Sternoptyges.
				without gill covers, and	with membrane; gills concealed	7. Cryptobranchiati.
					without membrane; form of the animal between that of a ſerpent and a fiſh	8. Ophichthoides.

TREMA-

CLASSIFICATION.

TREMATOPNES.—Firſt Order of FISHES.

		FAMILIES.	GENERA.	
Ventral fins	none; mouth round and at the end of the ſnout	CYCLOSTOMATI	Petromyzon	*Lamprey.*
			Gaſtrobranchus	*Myxine.*
	very diſtinct; mouth wide and tranſverſe	PLAGIOSTOMATI	Torpedo	*Torpedo.*
			Raia	*Ray.*
			Rhinobatus.	
			Squatinus	*Angel.*
			Squalus	*Shark.*
			Aodon.	

CHISMOPNES.—Second Order of FISHES.

		GENERA.	
The poſterior pair of fins under	the gullet	Batrachus	*Frog-fiſh.*
		Lophius	*Angler.*
	the pectoral fins	Baliſtes	*File-fiſh.*
	on the belly, behind the pectoral	Chimæra	*Sea monſter.*

ELEUTHEROPOMATI.—Third Order of FISHES.

			GENERA.	
Body	protected by a mailed covering; mouth	without cirrhi	Pegaſus	*Pegaſus.*
		with cirrhi	Acipenſer	*Sturgeon.*
	naked and unprotected; ſnout as long as the body		Spatularia	*Spatula-fiſh.*

TELEOBRANCHIATI.—Fourth Order of FISHES.

			FAMILIES.	GENERA.	
Poſterior pair of fins	diſtinct	under the pectoral; mouth elongated like a ſucker	APHYOSTOMATI	Macrorhyncus	*Macrorhyncus.*
				Centriſcus	*Bellows-fiſh.*
		behind the pectoral-ventral fins veined	PLECOPTERI	Cyclopterus	*Sucker.*
				Lepidogaſterus	*Lepidogaſterus.*
	wanting; ſkin covered with a coat of armour or with oſſeous grains		OSTEODERMATI	Oſtracion	*Trunk-fiſh*
				Tetraodon	*Tetraodon.*
				Diodon	*Porcupine-fiſh.*
				Spheroides	*Spheroides.*
				Orcides.	*Orcides.*
				Cephalus	*Sun-fiſh.*
				Sygnathus	*Pipe-fiſh.*

HOLOBRANCHIATI.—Fifth Order of FISHES.

			SUB-ORDERS.
The inferior or ventral pair of fins	wanting		1. APODES.
	diſtinct, under	the gullet	2. JUGULARES.
		the pectoral fins	3. THORACICI.
		the belly	4. ABDOMINALES.

CLASSIFICATION.

APODES.—Firſt Sub-order of OSSEOUS FISHES with perfect branchiæ.

		FAMILIES.	GENERA.	
The other fins beſides the ventral	all exiſt	PEROPTERI	Cæcilia	*Blind Eel.*
			Monopterus.	
			Leptocephalus	*Morris.*
			Aſtroblepus	*Aſtrobleps.*
			Gymnotus	*Gymnote.*
			Trichiurus	*Trichiure.*
			Trichomycterus.	
			Notoplerus.	
			Ophiſurus.	
			Apteronotus.	
	altogether, or partly wanting	PANTOPTERI	Muræna	*Eel.*
			Ammodytes	*Land Eel.*
			Ophidium.	
			Xiphias	*Sword Fiſh.*
			Anarhichas	*Wolf Fiſh.*
			Comephorus.	
			Stromateus.	
			Rhombus.	
			Triurus	*Triple Tail.*
			Odontognathus.	
			Macrognathus.	

JUGULARES.—Second Sub-order of OSSEOUS FISHES with perfect branchiæ.

			GENERA.	
Body	elongated; apertures of the gills	upon the neck; head thicker than the body	Callionymus	*Lyre.*
		lateral	Calliomorus.	
			Murenoides.	
			Uranoſcopus	*Stargazer.*
			Trachinus	*Dragonet.*
			Gadus	*Cod.*
			Batrachoides.	
			Blennius	*Blenny.*
			Oligopodus.	
	oval, compreſſed		Kurtus	*Hunchback.*
			Chryſoſtromus.	

THORACICI.—Third Sub-order of OSSEOUS FISHES with perfect branchiæ.

			FAMILIES.	GENERA.	
Body very thin	more high than long; eyes	on each ſide	LEPTOSOMATI	Chætodon	*Chætodon.*
				Acanthinion	*Acanthinion.*
				Chetodipterus	*Chetodipterus.*
				Pomacentrus	*Pomacentrus.*
				Pomadaſys	*Pomadaſys.*
				Pomacanthus	*Pomacanthus.*
				Holacanthus	*Holacanthus.*
				Enopleſus	*Enopleſus.*
				Glyphiſodon	*Glyphiſodon.*
				Acanthurus	*Acanthurus.*
				Aſpiſurus	*Aſpiſurus.*
				Acanthapodus	*Acanthapodus*
				Selene	*Selene.*
				Argyreioſus	*Argyreioſus.*
				Gallus	*Gallus.*
				Zeus	*Dory.*
				Chryſoſteſus	*Chryſoſteſus.*
				Capres	*Capres.*
		on one ſide	HETEROSOMATI	Pleuronectes	*Flounder.*
				Acherus.	
	long, and in the form of a plate or band		PETALOSOMATI	Lepidopus.	
				Cepola	*Band Fiſh.*
				Tæniodes.	
				Boſtrichus.	
				Boſtrichoides.	
				Gymnetrus.	

CLASSIFICATION.

THORACICI.—Third Sub-order of Osseous Fishes with perfect branchiæ *(continued)*.

- Body thick
  - compreſſed; remarkable from having the
    - head
      - ſimple
        - lips fleſhy; gill covers
          - ſpinous or denticulated — ACANTHOPOMATI
            - Trachichthys.
            - Lutjanus . . *Lutjan.*
            - Centropomus . *Centropomi.*
            - Bodianus . . . *Bodian.*
            - Sciæna.
            - Micropterus.
            - Holocentrus.
            - Perca . . . *Perch.*
          - without ſpines or denticulation — LEIOPOMATI . .
            - Hiatula.
            - Coris.
            - Gompheſus.
            - Oſphrenemus.
            - Trichopodus.
            - Monodactylus.
            - Plectorhinchus.
            - Pegonias.
            - Labrus.
            - Cheilinus.
            - Cheilodipterus.
            - Ophicephalus.
            - Helegymnoſus.
            - Sparus . . . *Spare.*
            - Diplerodon.
            - Cheilio.
            - Mullus . . . *Surmullet.*
        - jaws, projecting and oſſeous . . . . . OSTEOSTOMATI
          - Scarus . . . *Scare.*
          - Leiognathus.
          - Oſtorhinchus.
      - in general very large . . . . CEPHALOTI . .
        - Gobieſox.
        - Aſpidophorus.
        - Aſpidophoroides.
        - Cottus . . . *Bull-head.*
        - Scorpæna.
    - dorſal fin very long . . . . LOPHIONOTI . .
      - Coryphæna . . *Dorado.*
      - Hemipteronotus.
      - Coryphæneides.
      - Tænianotus.
      - Centrolophus.
      - Æques.
    - pectoral fins with ſome ſeparate rays or digittal proceſſes . DACTYLOTI . .
      - Dactylopterus.
      - Prieonotus.
      - Trigla . . . *Gurnard.*
      - Periſtedion.
  - round
    - fuſiform or thickeſt in the middle . . . . ATRACTOSOMATI
      - Scomber . . *Mackarel.*
      - Scomberoides.
      - Caranx.
      - Trachinotus.
      - Caranxomorus.
      - Cæſio.
      - Cæſiomorus.
      - Scomberomorus.
      - Gaſteroſteus . . *Stickle back.*
      - Centropodus.
      - Centronotus.
      - Lepiſacanthus.
      - Cephalacanthus.
      - Iſleophorus.
      - Nomatomus.
    - cylindric; pectoral fins . . . . .
      - united . . . PLECOPODI . .
        - Gobius . . . *Goby.*
        - Gobioides.
      - diſtinct or free . ELEUTHEROPODI
        - Gobiomorus.
        - Gobiomoroides.
        - Echeneis . . *Remora.*

ABDOMINALES.

CLASSIFICATION.

ABDOMINALES.—Fourth Sub-order of OSSEOUS FISHES with perfect branchiæ.

FAMILIES. — GENERA.

- The Body
  - cylindric; mouth . .
    - at the extremity of a long ſnout . . SIPHONOSTOMATI
      - Fiſtularia.
      - Auleſtomus.
      - Solenoſtomus.
    - not prolonged; lips not extended . . CYLINDROSOMATI
      - Anableps.
      - Cobïtis . . . *Loche.*
      - Miſgurnus.
      - Fondulus.
      - Colubrina.
      - Amia.
      - Butyrinus.
      - Tripteronotus.
      - Ompok.
  - conic, or compreſſed; the rays of the pectoral fin
    - free, diſtinct
      - the firſt only, or the firſt ray of the dorſal fin, ſtiff, ſharp, and often denticulated, and uſed as a weapon — OPLOPHORI . . .
        - Silurus . . . *Silure.*
        - Macropteronatus.
        - Malapterurus.
        - Pimelodus.
        - Doras.
        - Pogonathus.
        - Cataphractus.
        - Plotoſus.
        - Ageneioſus.
        - Macroramphoſus.
        - Centranodon.
        - Loricaria.
        - Hypeſtomus.
        - Corydoras.
        - Tachyſurus.
      - many, flexible; the pectoral fins appearing to be of two parts — DIMEREDES . . .
        - Chalodactylus.
        - Cirrhitus.
        - Polynemus . . *Polyneme.*
        - Polydactylus.
    - united; the opercule
      - covered with ſcales; mouth without teeth — LEPIDOPOMATI . .
        - Mugil . . *Mullet.*
        - Mugiloides.
        - Chanos.
        - Mugilomorus.
        - Exocetus . . *Flying Fiſh.*
      - ſmooth; the jaws
        - not remarkable
          - dorſal fins with oſſeous rays — GYMNOPOMATI .
            - Argentina.
            - Hydrargyra.
            - Atherina.
            - Stolephorus.
            - Buro.
            - Clupea . . . *Herring.*
            - Myſtus.
            - Clupanodon.
            - Gaſteropelecus.
            - Mene . . .
            - Dorſuarius.
            - Xyſter.
            - Cyprinus . . *Carp.*
          - one of the dorſal fins without oſſeous rays — DERMOPTERI . .
            - Salmo . . . *Salmon.*
            - Oſmerus.
            - Corregonus.
            - Characinus.
            - Serraſalmus.
        - much prolonged . . . . SIAGONOTI . . .
          - Elops . . . *Sein Fiſh.*
          - Megalops.
          - Eſox . . . *Pike.*
          - Synodon.
          - Sphyræna.
          - Lepiſoſteus.
          - Polypterus.
          - Scombreſox.

STERNOPTYGES.—Sixth Order of FISHES.

	GENUS.	
Contains only	Sternoptyx . .	*Sternoptyx.*

CRYPTOBRANCHIATI.—Seventh Order of FISHES.

Ventral fins		GENERA.	
	diſtinct; upon the abdomen . .	Mormyrus . .	*Mormyrus.*
	wanting	Stylophorus . .	*Stylophorus.*

OPHICHTHOIDES.—Eighth Order of Fishes.

			Genera.
Aperture of the gills	lateral; the ſingle fins	very plain . .	Murenophis.
		not very apparent	Gymnomuræna.
		entirely wanting	Murenollenna.
	under the gullet, being a	double orifice .	Sphagebranchus.
		ſingle orifice . .	Synbranchus.

CLASS V. INSECTA.

					Orders.
Wings	none;	breathe by laminæ or gills; covered	with a calcareous cruſt; the ſhape of the body		1. Crustacea.
			uſually with a horny ſubſtance, which has the form of ſhells		2. Testacea.
		breathe by ſpiracles and air tubes, or cells; abdomen	indiſtinct; numerous feet . .		4. Polypoda.
			diſtinct, and larger than the thorax	ſix feet	5. Hexapoda.
				eight feet	3. Octopoda.
	four; mouth	with jaws; having wings	of two kinds; the inferior folded	tranſverſely . . .	12. Coleoptera.
				longitudinally . . .	11. Orthoptera.
			of one kind; the nervules	reticulated	10. Neuroptera.
				veinous	8. Hymenoptera.
		without jaws; forming	a roſtrum, not ceiled		7. Hemiptera.
			a tongue, ceiled		9. Lepidoptera.
	two; never have jaws				6. Diptera.

CRUSTACEA.—Firſt Order of Insects.

				Families.	Genera.	
Head	united to the corcelet; the tail	ſhort; corcelet more	broad than long	Carcinoidea . .	Calappa.	
					Hepatus.	
					Dromia.	
					Cancer.	
					Matuta.	
					Portunus.	
					Podopthalmus.	
					Oecypodi.	
					Porcellana.	
					Grapſus.	
					Pinnotheres.	
			long than broad	Oxyrinchia . .	Ranina.	
					Orithyia.	
					Dorippe.	
					Leuceſia.	
					Maja.	
		long in proportion to the body . . .		Macroura . .	Pagurus . .	*Hermit.*
					Albunæa.	
					Hippa.	
					Scyllarus.	
					Palinurus.	
					Galathæa.	
					Aſtacus . .	*Craw-fiſh.*
					Penneus.	
					Palemon.	
					Crangon . .	*Shrimp.*
	diſtinct and connected to the corcelet by articulation . .			Arthrocephala	Myſis.	
					Squilla.	
					Plecanima.	
					Thalitrus.	
					Gammarus.	

TESTACEA.

TEST ACEA.—Second Order of Insects.

			Families.	Genera.
The body covered by	a ſhell . .	in form of a buckler . .	Aspidiota	Limulus. Calygus. Binoculus. Ozelus. Apus.
		compoſed of two valves	Ostracoda	Lyncæus. Daphnia. Cypris. Cythere.
	an integument the ſhape of the animal		Gymnota	Argulus. Cyclops. Polyphemus. Zoe. Branchiopes.

OCTOPODA.—Third Order of Insects.

		Families.	Genera.	
Head	not diſtinguiſhable ; without antennæ, having jaws	Araneiformia	Aranea . . .	*Spider.*
			Mygale . . .	*Mygale.*
			Scorpio . . .	*Scorpion.*
			Phrynus . .	*Phrynus.*
			Chelifer . . .	*Chelifer.*
			Galiodes . .	*Galeodes.*
			Phalangium .	*Shepherd.*
			Hydracna . .	*Water ſpider.*
	diſtinct and ſmall; pediform palpi; no jaws; the mouth a ſucker	Suctaria . . .	Acarus . . .	*Mite.*

POLYPODA.—Fourth Order of Insects.

		Families.	Genera.	
Feet	too numerous to be eaſily counted; body much elongated	Longiformia	Scutigera.	
			Scolopendra . .	*Centipede.*
			Polyxenus.	
			Julus.	*Julus.*
			Polydeſmus.	
			Glomeris.	
	fourteen ; uſually ſeveral pair of jaws, and four antennæ; body of an oval figure	Oviformia . .	Phyſodes.	
			Oniſcus.	
			Armadillo.	
			Cymothoa.	

HEXAOPODA.—Fifth Order of INSECTS.

			FAMILIES.	GENERA.	
Animal in the young ſtate	not changed in form	adhere to other animals	PARASITICA	Pediculus	*Louſe.*
				Ricinus	*Bird Louſe.*
		tail furniſhed with ſetæ or briſtles	SETICAUDATA	Podura	*Spring tail.*
				Lepiſma	*Lepiſma.*
				Forbicina.	
	metamorphoſed; extraordinary powers of leaping		TRANSFORMIA	Pulex	*Flea.*

DIPTERA.—Sixth Order of INSECTS.

				FAMILIES.	GENERA.	
A ſucker	hard, projecting from the head, long, and often bent			SCLEROSTOMATA	Empis.	
					Bombilius.	
					Myopa.	
					Conops.	
					Stomoxis.	
					Aſilus	*Hornet Fly.*
					Culex	*Gnat.*
					Hippoboſca	*Horſe Fly.*
					Chingia.	
					Chryſopſis.	
					Tabanus	*Great Horſe Fly.*
	concealed or wanting mouth	diſtinct	fleſhy, retractile, and terminated by two lips	SARCOSTOMATA	Stratyomis	*Armed Fly.*
					Ceria.	
					Nemotelus.	
					Anthrax.	
					Bibio.	
					Rhagio.	
					Sicus.	
					Hypoleon.	
					Cyrtus.	
					Syrphus.	
					Dolichopus.	
					Ceyx.	
					Tetanocerus.	
					Cerechetus.	
					Coſmius.	
					Thereva.	
					Echinomya.	
					Sargus.	
					Mulio.	
					Muſca.	
					Cenogaſter.	
					Diopſis?	
			projecting in a flat proboſcis with palpi	HYDROMIA	Tipula	*Crane Fly.*
					Ceratoplatus.	
					Scatopſus.	
					Pſychodes.	
					Hirtæa.	
		replaced by three points		ASTOMATA	Oeſtrus	*Gad Fly.*

HEMIPTERA.—Seventh Order of INSECTS.

			FAMILIES.	GENERA.	
Elytra, or ſuperior wings,	ſemi-coriaceous, creſſed, and	broad; roſtrum ariſing from the anterior part of the head	FRONTIROSTRIA	Pentatoma.	
				Scutellera.	
				Podicerus.	
				Acanthia	Houſe Bug, and ſome others.
				Cimex . .	Bug.
				Coreus.	
				Lygæus.	
				Gerris.	
				Hydrometra.	
				Reduvius.	
				Miris.	
				Ploiera.	
		very narrow; tarſi ending in veſicles	PHYSAPODA . . .	Thrips.	
	ſimilar to the inferior wings, and not creſſed	roſtrum appearing to riſe from the neck	COLLIROSTRIA	Fulgora . .	Fire Fly.
				Tettigonia	Small Graſs-hopper.
				Membracis.	
				Flata.	
				Cicadella.	
				Premecopſis.	
				Cercopes.	
				Delphax.	
		wings plain and extended	PLANIPENNIA .	Aphis . .	Plant Louſe.
				Aleirodes.	
				Chermes .	Gall Inſect.
				Coccus . .	Cochineal Inſect.
				Pſylla.	
	hard and coriaceous; antennæ ſhort; and poſterior feet fitted for ſwimming		REMITARSEA .	Ranatra . .	Frog-hopper.
				Nepa . .	Water-Scorpion.
				Naucoris.	
				Sigara.	
				Notonecta .	Boat Fly.

HYMENOPTERA.—Eighth Order of INSECTS.

FAMILIES. GENERA.

- Abdomen
  - ſeſſile; a terebra projecting from the anus of the females . . . . SERRICAUDATA .
    - Urocerus *Tailed Waſp.*
    - Tenthredo *Saw Fly.*
    - Oryſſus.
    - Sirex.
    - Cymbex.
  - pedunculated; the inferior lip
    - longer than the mandibules; abdomen on a ſhort footſtalk . . . APIFORMIA . .
      - Apis . . *Bee.*
      - Eucera.
      - Nomada.
      - Andræna.
      - Hylæus.
      - Bembex.
    - ſhort; abdomen
      - concave inferiorly; body metallic colour . . . . . . CHRYSIDA . .
        - Chryſis . . *Golden Fly, or Gilded Waſp.*
        - Panorpes.
      - not concave; ſuperior wings
        - folded, antennæ diffracted . . . . PENNIPLICATA .
          - Veſpa . . *Waſp.*
          - Maſaris.
        - not folded; antennæ
          - diffracted or filiform; abdomen round . . MYRMECEA . .
            - Dorylus.
            - Formica . . *Ant.*
            - Mutilla.
          - neither diffracted nor filiform; number of joints
            - thirteen at moſt; abdomen
              - round, conic; live upon flowers ANTHOPHILA . .
                - Philanthus.
                - Scolia.
                - Crabro.
                - Mellinus.
              - compreſſed, enlarged, larvæ concealed in vegetable excreſcences NEOTTOCRYPTA .
                - Leucopſis.
                - Chalcis.
                - Diplolepis.
                - Diapria.
                - Cynips . . *Gall Fly.*
                - Eulephus.
            - more than thirteen,
              - 17 to 30; deſtroy other inſects ENTOMOTILLA . .
                - Evania.
                - Ichneumon *Ichneumon.*
                - Fænus.
                - Ophion.
                - Banchus.
              - 14 to 17; burrow in the earth ORYCTERA . .
                - Larra.
                - Sphex . . *Savage, or Solitary Waſp.*
                - Tiphia.
                - Pompilus.

LEPIDOPTERA.—Ninth Order of INSECTS.

FAMILIES. GENERA.

- Antennæ
  - enlarged . .
    - at the extremity . . . BACULICORNIA
      - Papilio . . *Butterfly.*
      - Heſperia.
      - Heteropterus.
    - in the middle like a ſpindle FUSICORNIA . .
      - Sphinx. . . *Hawk Moth.*
      - Seſia.
      - Zygæna.
  - not enlarged
    - filiform, often pectinated FILICORNIA . .
      - Bombix.
      - Coſſus.
      - Hepialus.
    - ſetaceous . . . . . SETICORNIA . .
      - Lithoſia.
      - Crambus.
      - Noctua.
      - Phalæna . . *Moth.*
      - Pyralis.
      - Tinea.
      - Allucita.
      - Pterophorus.

NEUROPTERA.—Tenth Order of INSECTS.

			FAMILIES.	GENERA.	
The mouth	very viſible	covered by the inferior lip; wings extended in repoſe	ODONATA	Libellula	*Dragon-fly*
				Aeſhna.	
				Agrion.	
		projecting; wings covering the body when the inſect reſts	STEGOPTERA	Perla.	
				Termes	*Ticking Inſect.*
				Hemerobius	*Golden-eye.*
				Semblis.	
				Myrmeleon	*Lion-ant.*
				Aſcalaphus.	
				Panorpa	*Scorpion-fly.*
				Raphidia.	
				Pſocus.	
	hardly to be diſtinguiſhed; no mandibles		AGNATHA	Phryganea	*Cadow-fly.*
				Ephemera	*Day-fly.*

ORTHOPTERA.—Eleventh Order of INSECTS.

				FAMILIES.	GENERA.	
Poſterior legs	extremely long and ſtrong, for leaping			GRYLLIFORMIA	Locuſta	*Locuſt.*
					Acheta	*Cricket.*
					Achrydium.	
					Gryllus	*Graſshopper.*
					Truxalis.	
					Tridactylus.	
					Gryllo-talpa	*Mole-cricket.*
	proportionate to the others; number of the articulations of the tarſus	five; corcelet	longer than broad	DEFORMIA	Mantis	*Soothſayer.*
					Phyllium	*Walking-leaf.*
					Phaſma	*Spectre.*
			broad, covering the head	BLATTA	Blatta	*Cockroach.*
		three; abdomen terminated by forceps		LABIDOURA	Forficula	*Earwig.*

COLEOPTERA.—Twelfth Order of INSECTS.

				SUB-ORDERS.
Number of joints or pieces in the poſterior tarſi	five to all the feet			1. QUINQUETARSEA.
	leſs than five;	four; the anterior with	five	2. DIVERSITARSEA.
			four	3. QUADRITARSEA.
		three, and the ſame to all the other feet		4. TRITARSEA.

CLASSIFICATION.

QUINQUETARSEA—Firſt Sub-order of COLEOPTEROUS INSECTS.

FAMILIES. — GENERA.

- Wing ſheaths
  - hard
    - very ſhort, not covering the belly; antennæ moniliform . . . . **BREVIPENNIA** . .
      - Staphylinus . . *Rove Beetle.*
      - Pæderus.
      - Oxyporus.
      - Stenus.
    - long, covering the belly; antennæ
      - ſetaceous or filiform; body
        - flat; the antennæ
          - not denticulated; tarſi
            - ſimple; prey upon other animals in the larva ſtate — **CARNIVORA** . .
              - Anthia.
              - Cychrus.
              - Tachypus.
              - Carabus.
              - Caloſoma.
              - Brachinus.
              - Cicindela.
              - Colliurus.
              - Manticora.
              - Drypta.
              - Elaphrus.
              - Bembidion.
              - Olivina.
              - Scarites.
              - Nothiophilus.
              - Omophron.
            - for ſwimming . . **REMIPEDIA** . .
              - Dytiſcus.
              - Hyphydius.
              - Haliplus.
              - Gyrinus.
          - denticulated; corcelet or ſternum pointed **STERNOXIA** . .
            - Atopa.
            - Celrio.
            - Elater.
            - Threſcus.
            - Bupreſtis.
            - Trachys.
        - round and elongated; their larvæ deſtroy wood . . **TEREDILIA** . .
          - Anobium.
          - Ptelinus.
          - Ptinus.
          - Melaſis.
          - Tillus.
          - Lymexylon.
      - club-ſhaped .
        - laminated . . . . .
          - at one ſide, or ſerrated **SERRICORNIA** . .
            - Lucanus . . *Stag Beetle.*
            - Platycerus . . *Elk Beetle.*
            - Paſſalus.
            - Synodendron.
          - at the extremity . . **LAMELLICORNIA**
            - Geotrupes.
            - Copris . . *Dung Beetle.*
            - Aphodius.
            - Scarabæus . . *Bull-comber.*
            - Melolontha . *May Beetle.*
            - Cetonia.
            - Trichius . . *Hairy Beetle.*
            - Trox.
        - not laminated . . .
          - round and ſolid . . . **SOLIDICORNIA** . .
            - Hiſter.
            - Lethrus.
            - Anthrenus.
          - long, perfoliate . . . **CLAVICORNIA** . .
            - Nicrophorus *Interrer, or Corpſe Carrier.*
            - Silpha . . . *Protector.*
            - Nitidula.
            - Elophorus.
            - Hydrophilus . *Diver.*
            - Sphæridium.
            - Scaphidium.
            - Peltis.
            - Parnus.
            - Dermeſtis.
            - Byrrhus.
  - ſoft; corcelet flat; antennæ filiform, variable . . . . **MOLLIPENNIA** . .
    - Drillus.
    - Lycus.
    - Omalyſus.
    - Melyris.
    - Lampyris.
    - Malachius.
    - Telephorus.

DIVERSITARSEA.—Second Sub-order of COLEOPTEROUS INSECTS.

FAMILIES. GENERA.

- Wing ſheaths
  - ſoft, flexible; antennæ very variable; many bliſter the ſkin . . . . VESICATORIA .
    - Daſytes.
    - Sagria.
    - Anthicus.
    - Notoxus.
    - Meloe.
    - Lytta . . . *Bliſtering Fly.*
    - Cerocoma.
    - Mylabris.
    - Apalus.
    - Zenits.
  - hard antennæ
    - filiform, often denticulated; wing ſheaths
      - narrow . . . . . . ANGUSTIPENNIA
        - Sitaris.
        - Oedemera.
        - Necydalis.
        - Ripiphorus.
        - Mordella.
        - Anaſpis.
      - broad; inhabit woods . ORNEPHILA . .
        - Helops.
        - Sinopalpus.
        - Ciſtela.
        - Calepus.
        - Pyrochroa.
        - Heria.
    - moniliform; ſuperior wings or elytra
      - not conſolidated; antennæ ending in a club
        - elongated; avoid the light — LYGOPHILA . .
          - Upis.
          - Tenebrio.
          - Opatrum.
          - Pedinus.
          - Sanotrium.
        - rounded; many live on fungi — FUNGIVORA . .
          - Boletopagus.
          - Hypophlæus.
          - Aniſtoma.
          - Agathidium.
          - Diaperis.
          - Cnodulon.
          - Tetratoma.
      - ſo cloſely applied to each other as to ſeem but one; the inferior or true wings wanting — SOLIDIPENNIA .
        - Blaps.
        - Pimelia.
        - Eurychora.
        - Atris.
        - Scaurus.
        - Lepidium
        - Erodius.
        - Zaphoſis
        - Tagenia

QUADRITARSEA.—Third Sub-order of Coleopterous Insects.

				Families.	Genera.
Antennæ	borne upon the ſnout or prolongation of the front			Rostricornia	Curculio . . *Weevil.* Attelabus. Brentus. Anthribus. Brachycerus. Rhinomacer. Bruchus. Oxyſterna. Ramphus. Rhynchænus.
	not ſuſtained upon the roſtrum and	clavate in general; body	cylindric	Teretiformia	Boſtrichus. Clerus. Apate. Scolytus. Necrobia.
			flat	Planiformia	Colydium. Lyctus. Trogoſſita. Ips. Mycetophagus. Cucugus Heterocerus.
		commonly ſetaceous; larvæ live in wood		Lignivora	Prionus. Lamia. Cerambix . *Goat Chaffer.* Saperda. Callidium. Spondilis. Rhagium. Leptura . . *Wood Beetle.* Donacia. Melorchus . *Carrion Eater.*
		filform; commonly live in ſociety upon the leaves of plants		Herbivora	Donacia. Caſſida . . *Tortoiſe Beetle.* Chryſomela. Galeruca. Altica . . *Earth Flea.* Cryptocephalus. Crioceris Luperus. Hiſpa . . . *Spinous Beetle.* Helodes. Clythia. Alurnus. Erotylus.
		of two joints, of which the laſt is extremely enlarged like a ball and furniſhed with a hooked proceſs		Globulicornia	Pauſus.

TRITARSEA.—Fourth Sub-order of Coleopterous Insects.

				Genera.
Antennæ	long	clavate	villous, elongated	Daſycerus.
			naked, perfoliate	Eumorphus.
		nearly filiform		Eudomychus.
	ſhorter than the corcelet which is	applied to the wing ſheaths		Coccinella . . *Lady bird.*
		ſeparate from the wing ſheaths		Scymnus.

Supplementary Table ſhewing the Orders to which thoſe Inſects belong, which are without wings; but which are not the true Aptera.

				Orders.
Mouth	with jaws; abdomen	ſeſſile	with elytra; jaws without the *galea*	Colioptera.
			with or without elytra; jaws covered with the *galea*	Orthoptera.
		pediculated tarſi with	five articulations	Hymenoptera.
			leſs than five articulations	Neuroptera.
	without jaws	with a jointed ſnout; claws of the tarſi	turned round	Diptera.
			not turned round	Hemiptera.
		ſpiral tongue	ſcaly body	Lepidoptera.

CLASS VI. MOLLUSCA.

Head		Orders.
Head	viſible	CEPHALA.
	indiſtinct or confounded with the reſt of the body	ACEPHALA.

CEPHALA.—Firſt Order of MOLLUSCA.

Sub-orders. Genera. Sub-genera.

- Sexual organs
  - in ſeparate individuals; inſtruments of locomotion
    - long tentacula placed around the head . . CEPHALOPODA
      - NAKED . . Sepia . . *Cuttle fiſh.*
        - Sepia . . *Cuttle fiſh.*
        - Loligo . . *Calmar.*
        - Octopus . *Pulp.*
      - TESTACEOUS
        - Argonauta . *Paper Nautilus.*
        - Nautilus . *Pearl Nautilus.*
        - Spirula . . *Spirule.*
  - almoſt univerſally united in the ſame individual; inſtruments of locomotion
    - membranes ſerving for fins . . PETEROPODA
      - NAKED
        - Pterotrachea *Firole.*
        - Clio . . *Clio.*
        - Pneumoderma *Pneumoderme.*
      - TESTACEOUS . . Hyalæa . . *Hyaline.*
    - the lower part of the body conſtructed for crawling . . GASTROPODA
      - NAKED; or the ſhell concealed by the fleſh
        - Scylæa.
        - Doris
          - Doris . . *Sea lemon.*
          - Tritonia.
          - Eolia.
        - Phyllidia.
        - Thetis.
        - Limax . . *Slug.*
        - Teſtacella.
        - Sigaretus.
        - Aplyſia . . *Stinking Sea Snail.*
      - TESTACEOUS; the ſhell
        - In ſeveral pieces . . MULTIVALVES . . Chiton.
        - Conical . . CONIVALVES . . Patella . . *Limpet*
          - Fiſſurella.
          - Patella . *Limpet.*
          - Crepidula.
          - Calyptræa.
        - Spiral . . SPIRIVALVES
          - Halyotis . *Sea ear.*
          - Nerita . . *Sea Snail*
            - Nerita.
            - Nautica.
          - Turbo . . *Perriwinkle*
            - Turbo . . *Perriwinkle.*
            - Cycloſtoma.
            - Turritella *Staircaſe-ſhell.*
          - Vermetus.
          - Trochus . *Top-ſhell*
            - Pyramidella.
            - Trochus . *Top.*
            - Monodonta.
            - Solarium.
          - Bulla . . *Dipper-ſnail.*
          - Helix . . *Snail-ſhell*
            - Planorbis.
            - Helix . . *Snail.*
            - Ampullaria.
            - Melania.
            - Bulimus.
            - Achatina.
          - Voluta . . *Volute*
            - Voluta.
            - Mitra . *Mitral volute.*
            - Columbella.
            - Marginella.
            - Ancilla.
            - Oliva . . *Olive ſhell.*
          - Ovula.
          - Cypræa . . *Cowry or Porcelain Shell.*
          - Conus . . *Cone.*
          - Terebellum.
          - Murex
            - Cerithium.
            - Pleurotoma.
            - Fuſus.
            - Faſciolaria.
            - Pyrula.
            - Murex.
            - Turbinella.
          - Strombus
            - Strombus.
            - Pterocera.
            - Roſtellaria.
          - Buccinum . *Whelk*
            - Caſſidea . *Helmet-ſhell.*
            - Harpa.
            - Buccinum . *Whelk.*
            - Terebra.
            - Purpura . *Purple fiſh.*
            - Naſſa.

ACEPHALA.—Second Order of MOLLUSCA.

			SUB-ORDERS.		GENERA.		SUB-GENERA.	
Sexual organs	none; inſtruments for locomotion	none	APODA	NAKED	Aſcidia.			
					Salpa.			
					Thalia.			
				TESTACEOUS	Oſtrea	*Oyſter*	Oſtrea	*Oyſter.*
							Pedum.	
					Lazarus.			
					Spondylus	*Thorny-oyſter.*		
					Placuna.			
					Anomia.			
					Pecten	*Scallop.*		
		a proceſs of the body, called a foot, ſometimes uſed for crawling, but more commonly for ſpinning	MONOPODA	TESTACEOUS	Anodontites.			
					Unio.			
					Lima.			
					Perna.			
					Avicula		Avicula	*Swallow-tail ſhell.*
							Malleus	*Hammer-ſhell.*
					Mytilus	*Muſcle*	Mytilus.	
							Modiolus.	
					Pinna.			
					Tellina.			
					Cardium	*Cockle*	Cardium	*Cockle.*
							Iſocardia.	
					Mactra		Mactra.	
							Lutraria.	
							Craſſatella.	
					Venus		Venus.	
							Meretrix.	
							Cyclas.	
							Paphia.	
							Capſa.	
					Donax.			
					Chama		Cardita.	
							Tridacna.	
							Hippopus.	
					Arca		Arca.	
							Petunculus.	
							Nucula.	
					Solen	*Razor-ſhell*	Solen	*Razor-ſhell.*
							Sanguinolaria.	
					Mya	*Gaper*	Mya	*Gaper.*
							Glycimeris.	
							Cyrtodaria.	
					Pholas	*Piddock*	Pholas	*Piddock.*
							Giœnia.	
					Teredo	*Pipe-worm*	Teredo	*Pipe-worm.*
							Fiſtulana.	
		two ciliated arms, rolled into a ſpiral form	BRACHIOPODA	TESTACEOUS	Terebratula		Terebratula.	
							Calceola.	
					Lingula.			
					Orbicula.			
	hermaphrodite; horny articulated tentacula ranged in pairs		CIRROPODA	TESTACEOUS	Anatifa	*Barnacle-ſhell.*		
					Balanus.			

CLASS VII. VERMES.

		ORDERS.
Blood veſſels and nerves	viſible; inhabit the water or the earth	1. EXOTERICI.
	not diſcoverable; live in the interior of other animals	2. ESOTERICI.

CLASSIFICATION.

EXOTERICI.—Firſt Sub-diviſion of WORMS.

Organs of reſpiration		Sub-Orders.			Genera.	
viſible externally		DELOBRANCHIATI			Aphrodita	*Aphrodite.*
					Terebella.	
					Nereis.	
					Serpula.	
					Penicillus.	
					Siliquaria.	
					Amphitrite.	
					Dentalium	*Toothſhell.*
internal or concealed		ENDOBRANCHIATI	ſetæ upon the ſides of the body	SETEGIRI	Nais.	
					Lumbricus	*Common Worm.*
					Thalaſſema.	
			without ſetæ upon the ſides of the body	GLABRI	Hirudo	*Leech.*
					Faſciola	*Fluke.*
					Planaria.	
					Gordius	*Amminated Hair.*

ESOTERICI.—Second Sub-diviſion of WORMS.

Figure		Sub-orders.	Genera.
	round and elongated; an alimentary tube the ſhape of the body	TERETIFORMES	Echinorincus.
			Aſcaris.
			Hæruca.
			Caryophyllæus.
			Cucullanus.
			Strongylus.
			Uncinaria.
			Tricocephalus.
			Crino.
			Filaria.
			Tentacularia.
			Scolea.
			Proboſcidea.
	compreſſed; a marginal canal to contain the nutritious fluid	PLANIFORMES	Tænia.
			Faſciola.
			Ligula.
			Linguatula.
	veſicular; the young developed in the interior of the ſac	SACCIFORMES	Hydatis.

CLASS VIII. ZOOPHYTA.

		Orders.
A body	The parts of which, more eſpecially the internal organs, arranged in a radiated manner	1. ACTINOIDEA.
	of gelatinous ſubſtance, propagated by ſhoots or branches, ſo as to form compound animals	2. COMPOSITA.
	of various forms, ſometimes even in the ſame individual; generally inviſible to the naked eye; inhabit infuſions and ſtagnant waters	3. INFUSORIA.

ACTINOIDEA.—Firſt Order of ZOOPHYTES.

Body		Families.	Genera.		Sub-genera.	
	with a prickly calcareous or coriaceous integument	ECHINODERMATA	Echinus	*Urchin.*	Echinus	*Urihin.*
					Briſſus	*Flower-like Echinus.*
					Spatagus	*Sea egg.*
			Aſterias	*Star-fiſh.*		
			Holothuria	*Holothuria.*		
			Sipunculus	*Sipuncule.*		
	often reſembling in colours and form ſome flowers	ZOANTHINA	Actinia	*Sea Anemone.*		
			Zoanthus	*Animal flower.*		
	tranſparent, gelatinous, and of ſimple organization	HYALINA	Meduſa	*Sea Nettle.*		
			Beroe	*Beroe.*		
			Rhizoſtoma	*Rhizoſtome.*		

COMPOSITA.—Second Order of ZOOPHYTES.

			FAMILIES.	GENERA.	
The animals	unprotected; able to change from one place to another		POLYPINA	Hydra	*Brachiated Polyp.*
				Vorticella	*Flower Polyp.*
	furniſhed with a habitation, into which they can retreat; in almoſt every inſtance incapable of locomotion	animal ſubſtance; traverſes a horny axis, and terminates in polypes upon its branches	ZOOPHYTA (properly ſo called)	Floſcularia.	
				Tubularia	*Tubular Coralline.*
				Capſularia.	
				Sertularia	*Sea Moſs.*
		polypes contained in horny or calcareous cells, without being connected to a medullary axis	ESCARA	Cellularia.	
				Fluſtra	*Sea Mat.*
				Corallina	*Common Coralline.*
		a ſolid axis covered with ſenſible ſubſtance, containing hollows from which the polypes proceed	CERATOPHYTA	Antipathes	*Black Coral.*
				Gorgonia	*Gorgon.*
				Corallium	*Coral.*
				Iſis	*Jointed Coral.*
				Pinnatula	*Feather Coralline.*
				Veretillum.	
				Umbellula	*Umbelliferous Coralline.*
		polypes inſide in cavities formed in a ſtony axis or baſis	LYTHOPHYTA	Tubipora	*Pipe Coral.*
				Madrepora	*Madrepore.*
				Fungites.	
				Meandrites.	
				Aſtroites.	
				Porites.	
				Millepora	*Millepore.*
				Nullipora	*Nullipore.*
		The baſis ſpongy, friable, or fibrous	SPONGIA	Alcyonium.	
				Spongia	*Sponge.*

INFUSORIA.—Third Order of ZOOPHYTES.

		FAMILIES.	GENERA.	
Body	furniſhed with different external organs, or members	ORGANIFERA	Cercaria	*Cercaria.*
			Vorticella	*Wheel Animal.*
			Himantopus	*Urceolares.*
			Brachionus	*Brachionus.*
			Trichoda	*Trichoda.*
			Leucophras	*Leucophra.*
			Kerona	*Kerona.*
			Trichocerchus	*Trichocerchus.*
	without members	INORNATA	Colpoda	*Colpoda.*
			Velrio	*Velrio.*
			Velrox	*Velrox.*
			Proteus	*Proteus.*
			Monas	*Monad.*
			Baccillaria	*Baccillaria.*
			Enchelis	*Enchelis.*
			Cyclidium	*Cyclidium.*
			Parmecium	*Parmecium.*
			Burſaria	*Burſaria.*
			Gonium	*Gonium.*

Classification, in *Botany*, is that proceſs by which plants are diſtributed into claſſes, to facilitate the ſtudy of them, and to fix them more firmly in the memory. Many ſchemes have been deviſed for this purpoſe, which have generally obtained the name of methods. The framers of theſe are diſtinguiſhed by Linnæus into heterodox and orthodox. The heterodox are thoſe who have not founded their methods on any of the parts of fructification. Of theſe the *Alphabetarii* have arranged plants according to the alphabetic order of their names; the *Rhizotomi* have taken for their guide the ſtructure of the roots; the *Phylophili* have attended ſolely to the form of the leaves; the *Phyſiognomi*, to the general habit of the plant; the *Chronici*, to its time of flowering; the *Topophili*, to its native place of growth; the *Empirici*, to its real or ſuppoſed medicinal virtues; and the *Seplaſtarii*, to the ſituation which it occupies in pharmacopœias. The orthodox, in the conſtruction of their various methods, have confined themſelves to ſome of the parts of fructification. They have either formed ſyſtems profeſſedly artificial, or have attempted to make ſome approximation to a method perfectly natural. Artificial ſyſtems unavoidably unite plants ſtrikingly different from each other, if they do but poſſeſs, in common, that ſingle character which has been ſelected for the baſis of the ſyſtem. They have been founded by different authors on the fruit, the corolla, the calyx, and the ſexual, or eſſential parts of the fructification. A method which aſpires to the elevated ſtation of a natural one, admits into any particular claſs, only thoſe plants which reſemble each other in a great number of particulars, or in ſuch as are of the greateſt importance, and the leaſt liable to variation.

In the article Botany, we have given a conciſe hiſtory of the ſcience, and of the improvements which have been gradually made in its progreſs to its preſent advanced ſtate. We alſo laid before our readers a detailed account of the ſyſtem of Linnæus, which we profeſſedly follow in this department of our work, admitting only thoſe occaſional alterations which more recent obſervations, and the diſcovery of a vaſt number of plants, unknown to the great Swediſh naturaliſt, ſeem to render expedient. We ſhall now, in fulfilment of the engagement there made to the public, lay before them a ſynoptic view of the other principal methods or ſyſtems. Linnæus, in his "Philoſophia Botanica," has arranged them according to the parts of fructification, which form their diſtinguiſhing character. But it appears to us, that a chronological order will be more advantageous, as it will ſet, in a clearer point of view, the aſſiſtance which each author has derived from his predeceſſors. We will only beg leave to correct, *en paſſant*, a material error in the ſynoptic table of the Linnæan claſſes. The general character of the ſixteenth, ſeventeenth, eigthteenth, nineteenth, and twentieth claſſes, ought to ſtand thus: "Stamens united in ſome of their parts, or attached to the piſtil."

I. *Cæſalpinus's method, publiſhed in* 1583.

Trees and ſhrubs	with the corculum, or embryo	at the apex of the ſeed	1.
		at the baſe of the ſeed	2.
Under ſhrubs and herbs	with ſolitary	ſeeds	3.
		berries	4.
		capſules	5.
	with two	ſeeds	6.
		capſules	7.
	with a triple principle	not bulbous	8.
		bulbous	9.
	with four ſeeds		10.
	with numerous ſeeds	Anthemides	11.
		Cichoraceæ, ſ. Acanaceæ	12.
		with a common flower	13.
		in follicles	14.
	deſtitute of both flower and fruit		15.

Cæſalpinus is the firſt botaniſt who availed himſelf of the hints thrown out by Geſner, and attempted a truly ſcientific arrangement of plants, founded on the parts of fructification. On this account he will always be entitled to our grateful reſpect; but we may alſo add, in concurrence with La Marck, that whatever may be the defects of his method, much worſe have ſince been ſubmitted to the judgment of the public. He is ſtiled by Linnæus a Fructiſt; and would have been completely ſo, if he had formed his claſſes with a little more logical preciſion. His eighth and ninth claſſes are properly one, with the common character of a three-celled capſule, or, as he quaintly ſtiles it, a triple principle; the difference of their roots might have given riſe to a ſubdiviſion, but ſhould by no means have been elevated to a claſſical diſtinction. The ſame may be ſaid of his eleventh, twelfth, and thirteenth claſſes. In the eleventh, the compound flower is radiate, conſiſting of ligulate florets in the ray, and of tubular ones in the diſk; in the twelfth, it is without a ray, and conſiſts entirely of ligulate florets; in the thirteenth, it is alſo without a ray, but conſiſts entirely of tubular florets. Theſe varieties in the form of the compound flower, afford obvious and convenient ſubdiviſions; but in all of them the claſſical character is exactly the ſame. The grand imperfection of this method, which it has in common with many ſucceeding ones, is the ſeparation of trees from herbaceous plants. Unable to relinquiſh a diſtinction as old as the age of Theophraſtus, and become venerable from its antiquity; at the ſame time unwilling, as it ſhould ſeem, to give ſimilar claſſical characters to plants of both his primary diviſions, Cæſalpinus has paſſed over what, at the firſt view, is moſt ſtriking in the fruit of trees, and has taken his character of the two claſſes from the ſituation of the corculum, or rudiment of the future plant, as it ſprings either from the apex, or from the baſe of the ſeed; differences which are always of difficult inveſtigation; and entirely beyond the reach of the common obſerver. In this, however, he has ſtrictly adhered to his leading principle as a Fructiſt.

II.—*Moriſon's method, firſt publiſhed at Paris,* 1669, *in a ſecond edition of Breyner's Hortus Regius Bleſenſis.*

Woody Plants.	Trees	1.
	Shrubs	2.
	Under-ſhrubs	3.
Herbaceous Plants.	Scandent or climbing	4.
	Leguminous	5.
	Siliquoſe	6.
	Tricapſular	7.
	Deriving their name from the number of capſules	8.
	Corymbiferous	9.
	Lacteſcent or pappous	10.
	Culmiferous	11.
	Umbelliferous	12.
	Tricoccous	13.
	Galeatæ or helmeted	14.
	Many-capſuled	15.

Herbaceous

Herbaceous Plants.	Bacciferous	16.
	Capillary or ferns	17.
	Heteroclitæ, reducible to no claſs	18.

Moriſon's method is much inferior to that of Cæſalpinus, being farther removed from ſimplicity, without approaching at all nearer to a really natural arrangement. His three claſſes of woody plants are altogether unſcientific. His fourth claſs, which he places among the herbaceous plants, is a very heterogeneous aſſemblage of genera, without any reſemblance to each other in the flower or fruit: and many of them with truly woody ſtems. His fifth, ſixth, ſeventh, eighth, thirteenth, fifteenth, and ſixteenth are founded on the fruit; the fourteenth on the form of the corolla; the twelfth on the mode of infloreſcence; the eleventh on the general habit; the ninth and tenth ſhould be united; as they now ſtand, it is impoſſible to determine on what principles they are ſeparated; the eighteenth includes the moſſes, algæ, fungi, and corals.

III.—*Ray's firſt method, publiſhed in* 1682, *in a work entitled, "Methodus Plantarum Nova Synoptica, in Tabulis exhibita."*

Woody Plants.	Trees	1.
	Shrubs.	2.
Herbaceous Plants.	Imperfect	3.
	Without a flower	4.
	Capillary	5.
	Graſſy	6.
	With one naked ſeed	7.
	Umbellate	8.
	Verticillate	9.
	Rough-leaved	10.
	Stellate	11.
	Pome-bearing	12.
	Berry-bearing	13.
	Many-podded	14.
	With one regular petal	15.
	With one irregular petal	16.
	Tetrapetalous, ſiliquoſe	17.
	Tetrapetalous, ſiliculoſe	18.
	Papilionaceous	19.
	Pentapetalous	20.
	Frumenta, or the different kinds of corn, which afford food to men	21.
	Graſſes	22.
	Graſs-leaved plants	23.
	Bulbous	24.
	Allied to the bulbous	25.

This method, like all the other productions of its great author, has uncommon merit. Its chief excellence ariſes from its being a nearer approximation to a natural arrangement than the ſcientific world had then ſeen. For this purpoſe, though he paid particular attention to the fruit, which he thought of primary importance, he judged it expedient ſometimes to ſeek for claſſical characters from other parts of a plant. The 7th, 12th, 13th, and 14th claſſes or families are founded entirely on the fruit. Ray very illogically calls them genera; ſince he has, under each of them, ſubordinate genera, analogous to thoſe of Linnæus and all modern botaniſts. The 17th and 18th are characterized partly from the fruit, and partly from the flower. The 15th, 16th, 19th and 20th depend entirely on the flower; the 8th and 9th on the mode of infloreſcence; the 10th on the texture; and the 11th on the poſition of the leaves; the 21ſt and 22d on the general habit; the 24th and 25th on the root.

Of the defects of his ſyſtem no one was more ſenſible than himſelf. Superior to the blind partiality which ſo fondly attaches moſt authors to the offspring of their own brains, he was always ready to give up what a fuller inveſtigation of the ſubject led him to diſapprove. In fact, he never reduced this firſt method to practice in all its parts. Of this we have ſufficient proof in the alterations introduced into the "Hiſtoria Plantarum," publiſhed four years afterwards in 1686; and in the additional ones inſerted in the "Synopſis Stirpium Britannicarum," the firſt edition of which appeared in 1690. The moſt glaring impropriety, in the original ſketch, is the ſeparation of corn from the other claſſes. This the author himſelf ſoon perceived, and in his letter to Rivinus, affixed to the ſecond edition of his "Synopſis," frankly acknowledges. It is accordingly corrected in all his ſubſequent works. The 17th and 18th claſſes divide one natural family into two. This error alſo is found no where, but in the delineation of his firſt method. The third claſs contains the fungi, lichens, and ſubmarine plants; including corallines and other organized bodies, then ſuppoſed to be vegetables, but now univerſally aſſigned to the animal kingdom. The fourth claſs conſiſts of the proper moſſes; the fifth of the ferns; theſe, agreeing with each other in having no conſpicuous flower, he afterwards united; but the alteration can ſcarcely be called an improvement. Not having had the good fortune to meet with the work, in which this method was firſt offered to the public, we are not able to determine, with certainty, what he means by the vague epithet gramineæ or graſſy, of which there are no traces to be found either in the "Hiſtoria Plantarum" or the "Synopſis;" but, from its ſituation in the original arrangement, compared with what occupies its place in thoſe works, we ſuſpect that he intended by it what he afterwards called herbaceous plants, with an imperfect or ſtamineous flower, in which are included humulus-lupulus, or hop; cannabis, or hemp; urtica, or nettle; rumex, or dock; polygonum, &c. &c. Theſe have a ſingle ſeed in each flower, and leaves which, being generally entire, may, with ſome grains of allowance, be ſtiled graſſy. We are the more inclined to adopt this idea, becauſe we can ſcarcely think it poſſible, that the ſound judgment of Ray ſhould place this heterogeneous mixture in the ſame claſs with the compound flowers. On this ſuppoſition it is not proper to make a ſingle naked ſeed, the diſtinguiſhing character of the next claſs. In fact this character was ſoon dropt, and the term compound flowers ſubſtituted for it. In the "Hiſtoria Plantarum" and "Synopſis" theſe compound flowers are diſtributed among four diſtinct claſſes; but this alſo we can by no means think an improvement; they ought to have been only ſubdiviſions.

IV.—*Chriſtopher Knaut's method, publiſhed in* 1687.

Herbs with petals, and a fleſhy fruit	Berry-bearing	1.
With membranous fruit.	Monopetalous	2.
	Tetrapetalous, with a regular flower	3.
	Tetrapetalous, with an irregular flower	4.
	Pentapetalous	5.
	Hexapetalous	6.
	Polypetalous	7.
	Many-capſuled	8.

Herbs with naked fruit.	Gymnoſpermous	9.
	Solid	10.
	Pappous	11.
Herbs without petals.	Apetalous	12.
	Stamineous	13.
	Inconſpicuous	14.
	Imperfect	15.
Woody plants.	Trees	16.
Shrubs.	Shrubs	17.

This method is that of Ray, a little ſimplified, and placed in an inverted order. It has been applied only to the plants which are found in the neighbourhood of the Saxon Halle. There is an evident abſurdity in giving the epithet apetalous to one diviſion of apetalous plants in contradiſtinction to the others. But moſt theoretical botaniſts, and, indeed, naturaliſts in general, betray a lamentable ignorance of the rules of logic.

V.—*Herman's method, publiſhed in* 1687.

Herbs with petals, and a naked ſeed.	one-ſeeded,	Simple	1.
		Compound	2.
	two-ſeeded,	Stellate	3.
		Umbellate	4.
	four-ſeeded,	Rough-leaved	5.
		Verticillate	6.
	many-ſeeded		7.
With ſeeds in a pericarp,	bulbous,	three-capſular	8.
	capſule	Univaſcular	9.
		Bivaſcular	10.
		Trivaſcular	11.
		Quadrivaſcular	12.
		Quinquevaſcular	13.
		Siliquoſe	14.
		Leguminous	15.
		Many-capſuled	16.
	Fleſhy,	bearing berries	17.
		Bearing pomes	18.
Without petals,	calycled,	apetalous	19.
	glumoſe,	ſtamineous	20.
	naked,	muſcoſe	21.
Trees . .	incomplete . . .	amentaceous	22.
	fruit fleſhy,	umbilicate	23.
		not umbilicate	24.
	not fleſhy,	dry	25.

This is an elegant arrangement, founded almoſt entirely on the fruit. We are weary of pointing it out, but the diſcerning reader will at once perceive a ſimilar want of logical preciſion in the diſtribution of the apetalous plants. It would have ſtood better thus:

Apetalous, flowers with a calyx	19.
with glumes, graſſes	20.
naked, moſſes	21.

The 19th is a very multifarious claſs. The 21ſt, though only moſſes are mentioned, muſt include the whole of the Linnæan *cryptogamia*. The arrangement would have been more neat, and its author would have better ſupported his character as a Fructiſt, if he had not admitted the preſence and abſence of a corolla into his primary diviſion. The flowers, with only a calyx, would then have been diſtributed among the preceding claſſes, according to the nature of their fruit; thoſe with glumes would have been placed among the plants with a ſingle naked ſeed, and might with propriety have been made a diſtinct order; thoſe with naked flowers would have ſtood in their proper place at the foot of the ſeries. If the bulbous roots, which, as ſuch, are an embarraſſment to every method, had been equally diſregarded, Herman would have been completely a Fructiſt.

VI.—*Rivinus's method, publiſhed in* 1690.

Flowers perfect, ſimple, regular.	Monopetalous	1.
	Dipetalous	2.
	Tripetalous	3.
	Tetrapetalous	4.
	Pentapetalous	5.
	Hexapetalous	6.
	Polypetalous	7.
compound;	florets regular	8.
	florets regular and irregular	9.
	florets irregular	10.
irregular,	Monopetalous	11.
	Dipetalous	12.
	Tripetalous	13.
	Tetrapetalous	14.
	Pentapetalous	15.
	Hexapetalous	16.
	Polypetalous	17.
Flowers imperfect		18.

Rivinus has the honour of being the firſt Corolliſt. His method is very ſimple, and apparently eaſy; but as it is entirely artificial, it has the diſadvantage of diſturbing natural affinities, and will occaſion great perplexity to the botanical ſtudent who attempts to reduce it to practice. He was alſo the firſt who perceived that the diſtinction of plants into trees, ſhrubs, under-ſhrubs, and herbaceous, is not ſtrictly ſupported by nature, and that, in a botanical point of view, it is of no uſe. In our preſent advanced ſtate of knowledge, it cannot but be ſurpriſing, that Ray was not convinced by the ſtrong, and as they appear to us, unanſwerable arguments addreſſed to him by Rivinus, in a letter printed in the ſecond edition of the "Synopſis;" and that he perſevered to the laſt in keeping the trees and ſhrubs ſeparate, although he found himſelf compelled by incontrovertible facts to unite the under-ſhrubs with the herbaceous plants. In vain did Rivinus urge that the production or non-production of buds, by which Ray diſtinguiſhed the ſhrubs from the under-ſhrubs, was by no means a certain characteriſtic, and that nature does not warrant their ſeparation: our great naturaliſt perſiſted in his opinion with invincible obſtinacy. The hiſtory of ſcience ſcarcely affords a more ſtriking inſtance of the influence of preſcriptive authority and long prevailing habit, on a mind uncommonly enlightened, poſſeſſed of vigorous powers, and particularly eminent for the acuteneſs of its penetration. It is a conſolation to ſuch of us as cannot avoid feeling for the honour of our illuſtrious countryman, that Tournefort, his great antagoniſt, was equally blind. Both of them were in this reſpect ſo accuſtomed to darkneſs, that they could not endure the light of day.

VII.—*Tourne-*

VII.—*Tournefort's method, publiſhed in 1694.*

Herbaceous plants and under-ſhrubs.	Petalled.	Simple.	Monopetalous.	Regular.	Bell-ſhaped	1.
					Funnel-ſhaped	2.
				Irregular.	Perſonate	3.
					Labiate	4.
			Polypetalous.	Regular.	Cruciform	5.
					Roſaceous	6.
					Umbelliferous	7.
					Caryophylleous	8.
					Liliaceous	9.
				Irregular.	Papilionaceous	10.
					Anomalous	11.
		Compound.	-	-	Floſculous	12.
					Semifloſculous	13.
					Radiate	14.
	Apetalous.	-	-	-	Apetalous	15.
					Without flowers	16.
					Without flowers and fruit	17.
Trees and ſhrubs.	Apetalous	-	-	-	Apetalous	18.
					Amentaceous	19.
	Petalled.		Monopetalous.	-	-	20.
			Polypetalous.	Regular.	Roſaceous	21.
					Papilionaceous	22.

Tournefort was profeſſedly a Corolliſt, and ſeldom forſook his favourite principle. In the conſtruction of his 7th, 9th, and 17th claſſes he has called in the aid of the fruit; and in the 19th has had recourſe to the mode of infloreſcence ; but, in all the reſt, the corolla, as it is either preſent or abſent, is the ſole object of his attention ; conſidering alſo that his ſyſtem is truly artificial, he has broken natural families and united with them diſcordant plants much leſs than might have been expected. His 4th, 5th, 7th, 9th, 10th, 12th, 13th, and 14th claſſes are natural aſſemblages, with the exception of a few plants of a very different general character, which he has been induced to annex to ſome of them on account of the form of the corolla. Thus, for inſtance, in his fifth claſs he has inſerted chelidonium, epimedium, and potamogeton, which belong to widely different families, and in which the corolla itſelf is but imperfectly cruciform. It may be objected to the firſt claſs, that it not only makes ſad havock among natural affinities, but alſo contains plants with very differently formed corollas. No one would ſuppoſe *à priori*, that the ſhape of the flowers of campanula, convolvulus, tithymalus, (euphorbia, Linn.) glaux, ruſcus, malva, and galium can be properly expreſſed by the ſame word. It is alſo impoſſible to draw a deciſive line of diſtinction between this claſs and the next. The bell-ſhaped and funnel-ſhaped flowers approach each other ſo nearly that, independent of their interference with each other in regard to natural affinities, they cannot be ſcientifically ſeparated. The ſixth claſs is a motley collection diſtinguiſhed by very different prominent characters ; and as La Marck obſerves, is of ſo diſproportionate a magnitude, that it includes nearly one-fourth of the perfect plants. The ninth claſs does not properly fit the place aſſigned it in the ſyſtem, ſince all its genera are not polypetalous, nor have they all regular corollas. The eleventh claſs is a receptacle for vagrants, collected together from all quarters, and for whom a legal ſettlement cannot be found This, however, is an imperfection common to moſt artificial ſyſtems.

But whatever may be the defects of this celebrated method, it cannot be denied the praiſe of uncommon excellence. It is juſtly the boaſt of every ſcientific Frenchman, and, making due allowance for the time in which it was formed, can ſcarcely be too much admired. Its ſections or orders are taken from the ſituation of the germen ; when it is inferior, in Tournefort's idea, *calyx abit in fructum ;* the calyx finally becomes the fruit ; when it is ſuperior, *piſtillum abit in fructum ;* the piſtil finally becomes the fruit.

The celebrity of this ſyſtem has induced us to give a ſeries of figures to illuſtrate its general principles, as had formerly been done in the folio edition. And from the well-known excellence of the artiſts employed, we flatter ourſelves that it will be thought by our general readers as ornamental to our work as it will be inſtructive to thoſe who wiſh to ſtudy the ſubject. In all the figures, the letter *a* denotes the flower, *b* the fruit, and *c* the ſeeds. The numbers, prefixed to each, point out the plants which have been ſelected as moſt known, and beſt calculated to exhibit the particular characters of the plants contained in each claſs. Of theſe it may be neceſſary to give the following explanation. Cl. 5. Cruciform, fig. 1. Raphaniſtrum ; Tour. (Raphanus Raphaniſtrum ; Linn.) Jointed Charlock. 2. Burſa paſtoris ; Tourn. (Thlaſpi Burſa Paſtoris ; Linn.) Shepherd's purſe, &c.

VIII.—*Ray's ſecond method, publiſhed in* 1703.

Herbaceous plants and under-ſhrubs, not bearing buds.	Imperfect, or without viſible flowers.			Submarine	1.
				Funguſes	2.
				Moſſes	3.
				Capillary with an appendix of anomalous plants.	4.
	Perfect, Dicotyledonous.			Stamineous *i. e.* Apetalous, with or without a calyx	5
		Flower compound		Planipetalous, lacteſcent	6.
				Diſcoid with a pappous ſeed	7.
				Corymbiferous	8.
				Capitate	9
		Flower ſimple	with one naked ſeed.	Monoſpermous	10.
			with two naked ſeeds.	Umbelliferous	11
				Stellate	12.
			with four naked ſeeds	Rough-leaved	13.
				Verticillate	14.
			with many naked ſeeds.	Polyſpermous	15.
			ſeeds covered with a pulp.	Pomiferous	16.
				Bacciferous	17.
			in ſeveral diſtinct veſſels.	Multiſiliquous	18.
			in a ſingle veſſel.	Monopetalous and Dipetalous	19.
				Siliquoſe with an appendix of anomalous plants.	20.
				Leguminous	21.
				Pentapetalous	22.
		Graſs-leaved,	bearing flowers	Bulbous or not bulboſe	23.
			without proper flowers. . .	Stamineous graſſes	24.
				Anomalous	25.
Trees and ſhrubs bearing buds.	Monocotyledonous, with arundaceous leaves.			Palms	26.
	Dicotyledonous, flowers remote from the fruit.			Apetalous.	
				Coniferous	27.
				Not coniferous	28.
		Flowers contiguous to the fruit.	Fruit . . .	Umbilicated	29.
				Not umbilicated	30.
				Dry, not ſiliquoſe	31.
				Siliquoſe	32.
				Papilionaceous	33.
				Anomalous	34.

Linnæus tells us that Ray began with being a Fructiſt, and finally became a Corolliſt. But on a compariſon of his two methods, as they are contraſted with each other by Linnæus himſelf in his "Philoſophia Botanica," the obſervation ſcarcely appears to be well-founded. In both his methods, Ray drew the character of his primary diviſions, ſometimes from the fruit, ſometimes from the flower, and ſometimes from other parts of the plant, as each of them in its turn ſeemed to himſelf to afford the moſt ſtrongly marked diſtinctions. It is poſſible that, irritated by Tournefort's numerous criticiſms, he might feel a wiſh to outdo his rival in his own way; but this wiſh, if it ever really exiſted, does not appear to have materially affected his general views.

In the ſecond method, the ſubmarine plants and the fungi correſpond with the imperfectæ, conſtituting a ſingle claſs in the firſt. The muſci of the one, and the flore carentes of the other, are the ſame. Theſe and the capillares, which had been united in the "Hiſtoria Plantarum" and the "Synopſis," are again very properly ſeparated. We have already hazarded a conjecture that the apetalæ of the ſecond method are the gramineæ of the firſt. The planipetalæ, diſcoidæ, corymbiferæ, and capitatæ of the former are all included in the gymnomonoſpermæ of the latter. The tenth claſs of the ſecond method, conſiſting of flowers with a ſolitary ſeed, has nothing equivalent to it in the firſt. It was profeſſedly formed to accommodate a few plants which have no other common character, and for which the author could not find another convenient place. It contains valeriana, dentellaria (plumbago, Linn.), limonium (ſtatice, Linn.), mirabilis peruviana, linaria adulterina (theſium linophyllum, Linn.), paſſerina tragi (ſtellera, Linn.), agrimonia, and pimpinella ſanguiſorba (poterium, Linn.) This motley collection firſt appears as a diſtinct claſs in the "Synopſis," with the addition of thalictrum and fumaria. In the "Hiſtoria Plantarum," and probably in the firſt method, it was blended with the umbellatæ. The umbellatæ, verticillatæ, aſperifoliæ, ſtellatæ, pomiferæ, bacciferæ, multiſiliquæ, leguminoſæ, and pentapetalæ, have a place in both methods. The fifteenth claſs of the new method, or polyſpermæ, firſt appears as a diſtinct claſs in the

"Hiſtoria Plantarum." It there contains ranunculus, anemone, adonis, helleborus, malva, &c. geum and potentilla. In the new method, aliſma, ſagittaria, tormentilla, ſpirea filipendula, and clematis, are added, and the malvaceous plants removed to the 19th claſs, or monopetalæ. Linnæus has made a groſs miſtake in ſuppoſing that Ray intended the ditripetalæ to form a diſtinct claſs. In fact, the dipetalæ in the new method are an anomalous appendage to the monopetalæ. Aliſma and ſagittaria, which are tripetalous, are placed in the 19th claſs. The 21ſt of the ſecond method very properly unites the 17th and 18th of the firſt. The 23d claſs contains the bulboſæ and other liliaceous plants, with the addition of the bulboſis affines, which, with much greater propriety, had been kept ſeparate in the firſt method. Theſe conſiſt of the orchideæ and ſcitamineæ. The 23d, with equal impropriety, unites the gramina and graminifoliæ, which form ſeparate claſſes in the firſt method. The 25th claſs, or anomalæ, is peculiar to the new method; but the outlines of it firſt appeared, though with conſiderable variation, in the "Hiſtoria Plantarum." The 26th, or arundinaceæ, conſiſts of the palmæ, which here appear for the firſt time in a profeſſed method; they had already been noticed by Ray in the "Hiſtoria Plantarum," but are entirely omitted by Tournefort. The arrangement of the other trees, according to the difference of their fructification, which ſeems to have been entirely neglected in the firſt method, appears with conſiderable advantage in the ſecond; but it does not materially differ from what had already been done by Tournefort, as well as by himſelf in his intermediate publications.

The chief glory of the ſecond method ariſes from its taking the lead in diſtributing plants according to the number of their cotyledons. This, indeed, no one would ſuſpect from the tabular view of it, as it ſtands in the "Philoſophia Botanica;" nor does it appear in Ray's own table of contents, which Linnæus has very careleſsly tranſcribed, and unwarrantably abridged. But the diſtinction is clearly pointed out and explained in the work itſelf, into which, one would think, Linnæus had never looked. "Floriferas dividemus" is the perſpicuous language of Ray, "*in dicotyledones,* quarum ſemina ſata binis foliis anomalis, ſeminalibus dictis, quæ cotyledonum uſum præſtant, è terra exeunt, vel in binos ſaltem lobos dividuntur, quamvis eos ſupra terram foliorum ſpecie non efferant; & *monocotyledones,* quæ nec folia ſeminalia bina efferunt, nec lobos binos condunt. Hæc diviſio ad arbores etiam extendi poteſt; ſiquidem palmæ & congeneres hoc reſpectu eodem modo à reliquis arboribus differunt quo monocotyledones à reliquis herbis." It is with peculiar ſatisfaction that we thus do juſtice to our great Britiſh naturaliſt, and reſtore to him the honour of which he has in a great meaſure been deprived. We readily acknowledge that we are proud of being able to call him our countryman, for he was in all reſpects as good as he was great. How far we may be unduly biaſſed by natural patriotic feelings, it is not in our power to determine: but, while our preſent convictions continue, we cannot allow a decided pre-eminence to Tournefort. Both of them, indiſputably, poſſeſſed ſuper-eminent excellence, and we cannot but lament that they were not better friends. But *irritabile genus* is a character, which might have been extended by the poet much beyond his own fraternity.

IX.—*Boerhaave's method, publiſhed in* 1710.

Herbs.	Imperfect.		Submarine.	1.
			Terreſtrial.	2.
			Capillary.	3.
	Dicotyledonous,	with many naked ſeeds.	Gymnopolyſpermous.	4.
		with four naked ſeeds.	Verticillate.	12.
			Rough-leaved.	13.
			Tetrapetalous.	14.
		with two naked ſeeds.	Umbelliferous.	5.
			Stellate.	11
		with one naked ſeed.	Simple.	6.
			Planipetalous.	7.
			Radiate.	8
			Naked.	9
			Capitate.	10.
		with one capſule.	Monangiæ.	15.
		with two capſules.	Diangiæ	16.
		with three capſules.	Triangiæ.	17.
		with four capſules.	Tetrangiæ.	18.
		with five capſules.	Pentangiæ.	19.
		with many capſules.	Polyangiæ.	20.
		with many ſiliques.	Multiſiliquæ.	21.
		Siliquoſe.		22
		Tetrapetalous cruciform.		23.
		Leguminous.		24.
		Bacciferous.		25.
		Pomiferous.		26.
		Apetalous.		27.
	Monocotyledonous.	Bracteate.		28
		Apetalous.		29.
Trees.	Monocotyledonous.			30.
	Dicotyledonous.	Apetalous.		31.
		Amentaceous.		32.
		Monopetalous.		33.
		Roſaceous.		34.

Boerhaave is ſaid to have combined the ſecond method of Ray with thoſe of Herman and Tournefort. With the former he diſtinguiſhes the monocotyledones from the dicotyledones; but is more indebted to Herman than to Tournefort. His prevailing character is certainly that of a Fructiſt. His method was employed only in arranging the plants in the botanic garden at Leyden, and does not appear to have excited that attention which might have been expected from the extenſive medical fame of its excellent author. Its greateſt defect is the want of ſimplicity.

X. *Chriſtian Knaut's method, publiſhed in* 1716.

Monopetalous. - -	Uniform.	1.
	Difform.	2.
Aggregate. - -	Uniform.	3.
	Difform.	4.
	Uni-difform.	5.
Dipetalous. - -	Uniform.	6.
	Difform.	7.
Tripetalous. - -	Uniform.	8.
	Difform.	9.
Tetrapetalous - -	Uniform.	10.
	Difform.	11.
Pentapetalous. - -	Uniform.	12.
	Difform.	13.
Hexapetalous. - -	Uniform.	14.
	Difform.	15.
Polypetalous. - -	Uniform.	16.
	Difform.	17.

Chriſtian Knaut is a ſturdy Coralliſt. He poſitively denies the exiſtence of any apetalous flower, and of any naked ſeed. The former poſition is clearly contradicted by facts. The latter is nothing but a diſpute about the meaning of a term. Every one is acquainted with the integument of thoſe ſeeds uſually ſtiled naked. The only diſpute is, whether it ſhould be conſidered as part of the ſeed itſelf, or as properly its pericarp. In a ſtrictly philoſophical point of view, the latter opinion may be right; but to the practical botaniſt the former has a manifeſt uſe, and ought not to be entirely diſcarded.

XI. *Pontedera's Method, publiſhed in* 1720.

Uncertain.						1.
Certain.	Without buds	Without flowers.				2.
		With flowers.	Imperfect.			3.
			Perfect.	Monopetalous, ſimple.	Anomalous.	4.
					Labiate.	5.
					Campaniform.	6.
					Hypocrateriform.	7.
					Rotate.	8.
					Funnel-ſhaped.	9.
				Conglobate. -	Floſculous.	10.
					Ligulate.	11.
					Radiate.	12.
				Polypetalous. -	Anomalous.	13.
					Papilionaceous.	14.
					Liliaceous.	15.
					Caryophylleous	16.
					Cruciform.	17.
					Roſaceous.	18.
					Umbellate.	19.
	With buds.	Flowers imperfect.			Filamentous.	20.
					Apetalous.	21.
		Perfect.		Monopetalous. -	Anomalous.	22.
					Campaniform.	23.
					Rotate.	24.
					Funnel-ſhaped.	25.
				Polypetalous -	Papilionaceous.	26.
					Roſaceous.	27.

Pontedera was purely a Coralliſt, and profeſſed to combine the method of Tournefort with that of Rivinus. But he followed Ray in diſtinguiſhing trees and ſhrubs from underſhrubs and herbaceous plants, by their producing, or not producing buds.

XII. *Magnol's method, publiſhed in* 1720.

Herbs.	Calyx external.	Including a flower.	Unknown.	1.
			Stamineous.	2.
			Monopetalous.	3.
			Polypetalous.	4.
			Compound.	5.
		Supporting a flower.	Monopetalous.	6.
			Polypetalous.	7.
	Calyx internal only.			8.
	Calyx external and internal.		Monopetalous.	9.
			Di-tripetalous.	10.
			Tetrapetalous.	11.
			Polypetalous.	12.
Trees.	Calyx external only.			13.
	Calyx internal only.			14.
	Calyx external and internal.			15.

Magnol was a Calyciſt; but he included under the term calyx both the perianth and the pericarp. Hence he is ſaid by Linnæus to be a Calyciſt combined with the Fructiſts.

XIII. *Linnæus's ſexual method* was introduced to the world in the firſt ſketch of his “ Syſtema Naturæ,” publiſhed in 1735; and farther developed and improved in the ſubſequent editions of that work, and alſo in the “ Philoſophia Botanica,” and the “ Genera Plantarum.” For a particular account of this renowned ſyſtem, ſee BOTANY; and for a critical examination of its excellencies and defects, chiefly reſpecting its preſervation or violation of natural affinities, ſee the names of its claſſes, Monandria, &c.

XIV. *Ludwig's method, publiſhed in* 1737.

Perfect flowers.	Petalous.	Regular.	Simple.	Monopetalous.	1.
				Dipetalous.	2.
				Tripetalous.	3.
				Tetrapetalous.	4.
				Pentapetalous.	5.
				Hexapetalous.	6.
				Polypetalous.	7.
			Compound	florets regular.	8.
				Regular and irregular.	9.
				Irregular.	10.
		Irregular.		Monopetalous.	11.
				Dipetalous.	12.
				Tripetalous.	13.
				Tetrapetalous.	14.
				Pentapetalous.	15.
				Hexapetalous.	16.
	Apetalous, furniſhed with a perianth.			Dubious.	17
Imperfect flowers.				Stamineous.	18.
				Amentaceous.	19.
				Powdery.	20.

Ludwig combined the very different methods of Rivinus and Linnæus. His principal diviſions are accordingly founded on the regularity and the number of the petals; his ſubordinate ones on the number of the ſtamens and piſtils. It is obvious, at firſt ſight, that his method muſt be altogether artificial.

XV. *Royen's method, publiſhed in* 1740.

Monocotyledonous.						
Calyx ſpathaceous.					Palms.	1.
None.					Lilies.	2.
Glumoſe.					Graſſes.	3.
Polycotyledonous.						
Calyx common.	An ament.				Amentaceous.	4.
	An involucre.				Umbellate.	5.
	A perianth.	Anthers connate.			Compound.	6.
		Anthers diſtinct.			Aggregate.	7.
Calyx proper.	Fruit three-celled.	Seeds ſolitary.			Tricoccæ.	8.
	Fruit various.	Calyx and corolla, one abſent.			Incomplete.	9.
		both preſent.	Anthers	on the germen.	Fructiflorous.	10.
				on the perianth.	Calyciflorous.	11.
				two longer.	Ringent.	12.
				four longer.	Siliquoſe.	13.
				united into one.	Columniferous.	14.
				united into two.	Leguminous.	15.
				not more than the diviſions of the corolla.	Oligantherous.	16.
				twice as many.	Diploſantherous.	17.
				much more numerous.	Polyantherous.	18.
Flowers inconſpicuous.	Herbaceous				Crytantherous.	19.
	Stony.				Lithophytes.	20.

This is a happy eſſay towards a natural method founded on the cotyledons, the calyx, the corolla, the ſtamens, and the fruit. It manifeſts an attentive and deep inveſtigation of the ſubject; and is inferior to ſeveral which ſucceeded it only through its want of ſimplicity. Linnæus gave it the preference both to that of Haller and of Wachendorf, if we may form a judgment from the adverbs with which he qualifies them. Naturalem methodum in cotyledonibus, calyce, ſexu, aliiſque Royenus *pulchre*, Hallerus *erudite*, Wachendorfius *græce* quæſiverunt.

XVI. *Haller's Method, publiſhed in* 1742.

Fungi (funguſes)	1.
Muſci (moſſes)	2.
Epiphylloſpermæ (ferns)	3.
Apetalæ (without petals)	4
Gramina (graſſes)	5.
Graminibus affines (allied to the graſſes)	6.
Monocotyledones petaloides (monocotyledonous plants with petals)	7.

Polyſtemones

Polyſtemones (ſtamens much more numerous than the petals)	8.
Diploſtemones (ſtamens twice as many as the petals)	9.
Scoſtemones (ſtamens equal in number to the petals)	10.
Mejoſtemones (ſtamens fewer than the petals)	11.
Staminibus ſeſquialteris (ſtamens half as many more as the petals)	12
Staminibus ſeſquitertiis (ſtamens one-third more than the petals)	13
Quatuor ringentes (four-ringent)	14.
Congregatæ (aggregate and compound)	15.

Whatever merit this method may poſſeſs in other reſpects, and notwithſtanding the indiſputable abilities and well merited reputation of its author, we cannot but regard it as a feeble attempt towards a natural one. It unites plants which nature has decidedly ſeparated, and ſeparates others which ought to be united. The 8th claſs, for inſtance, in which the ſtamens are much more numerous than the petals, muſt include the icoſandria, and polyandria of Linnæus, plants of widely different families: while ribes, which, in a natural arrangement, clearly belongs to icoſandria, muſt here be referred to the tenth, on account of the equal number of its ſtamens and petals.

XVII. *Wachendorf's method, publiſhed in* 1747.

Gymnoſpermæ (with naked ſeeds)	1.
Homojodiperianthæ (with two equal perianths)	2.
Anomojodiperianthæ (with two unequal perianths)	3.
Pollaploſtemonopetalæ (with more ſtamens than petals)	4.
Aniſoſtemonopetalæ (ſtamens and petals unequal in length)	5.
Cylindrobaſioſtemones (filaments united into a cylinder at the baſe)	6.
Dimacroſtemones (ſtamens two long and two ſhort)	7.
Tetramacroſtemones (ſtamens four long and two ſhort)	8.
Diſtemonoplerantheræ (filaments united at the baſe into two bodies)	9.
Eleutherantheræ (anthers free, as in aggregate flowers)	10.
Cylindrantheræ (anthers united into a cylinder)	11.
Monoperianthæ (without petals)	12.
Monophythanthæ (monoicous)	13.
Diphythanthæ (dioicous)	14.
Acalyces (without a calyx)	15.
Calycinæ (with a calyx and one cotyledon)	16.
Spathaceæ (calyx a ſpathe)	17.
Glumoſæ (graſſes)	18.
Cryptanthæ (flowers concealed)	19.

We agree with Linnæus in thinking that the ſeſquipedalian Greek names, of this method, are its moſt diſtinguiſhing characteriſtic. To the honour of a natural method, it has few pretenſions. Lucidus ordo is not one of its excellencies.

XVIII. *Linnæus's fragments of a natural method, publiſhed in* 1751

1 Piperitæ. 2. Palmæ. 3. Scitamina. 4. Orchideæ. 5. Enſatæ. 6. Tripetalodeæ. 7. Denudatæ. 8. Spathaceæ. 9. Coronariæ. 10. Liliaceæ. 11. Muricatæ. 12. Coadunata. 13. Calamariæ. 14. Gramina. 15. Coniferæ. 16. Amentaceæ. 17. Nucamentaceæ. 18. Aggregatæ. 19. Dumoſæ. 20 Scabridæ. 21. Compoſiti. 22. Umbellatæ. 23. Multiſiliquæ. 24. Bicornes. 25. Sepiariæ. 26. Culmineæ. 27. Vaginales. 28. Corydales. 29. Contorti. 30. Rhæades. 31. Putaminea. 32. Campanacei. 33. Luridæ. 34. Columniferæ. 35. Senticoſæ. 36. Comoſæ: 37. Pomaceæ. 38. Drupaceæ. 39. Arbuſtiva. 40. Calycanthemæ. 41. Heſperideæ. 42. Caryophyllei. 43. Aſperifoliæ. 44. Stellatæ. 45. Cucurbitaceæ. 46. Succulentæ. 47. Tricoccæ. 48. Inundatæ. 49. Sarmentaceæ. 50. Trihilatæ. 51. Preciæ. 52. Rotaceæ. 53. Holoraceæ. 54. Vepreculæ. 55. Papilionaceæ. 56. Lomentaceæ. 57. Siliquoſæ. 58. Verticillatæ. 59. Perſonatæ. 60. Perforatæ. 61. Statuminatæ. 62. Candelares. 63. Cymoſæ. 64. Filices. 65. Muſci. 66. Algæ. 67. Fungi. 68. Vagæ, natural order not determined.

In 1764 Linnæus delivered a courſe of lectures on theſe natural orders, of which a MS. copy was taken by the celebrated entomologiſt J. C. Fabricius. In 1771, at the requeſt of his favourite pupil Giſeke, he delivered another courſe, the ſubſtance of which has been publiſhed by Giſeke ſince the death of Linnæus. In this laſt courſe, the relative ſituation of the natural orders is greatly changed, with ſeveral omiſſions and additions. They now ſtand thus: 1. Palmæ. 2. Piperitæ. 3. Calamariæ. 4. Gramina. 5. Tripetaloideæ. 6. Enſatæ. 7. Orchideæ. 8. Scitamineæ. 9. Spathaceæ. 10. Coronariæ. 11. Sarmentoſæ. 12. Holoraceæ. 13. Succulentæ. 14. Gruinales. 15. Inundatæ. 16. Calycifloræ. 17. Calycanthemæ. 18. Bicornes. 19. Heſperideæ. 20. Rotaceæ. 21. Preciæ. 22. Caryophylleæ. 23. Trihilatæ. 24. Corydales. 25. Putamineæ. 26. Multiſiliquæ. 27. Rheadeæ. 28. Luridæ. 29. Campanaceæ. 30. Contortæ. 31. Vepreculæ. 32. Papilionaceæ. 33. Lomentaceæ. 34. Cucurbitaceæ. 35. Senticoſæ. 36. Pomaceæ. 37. Columniferæ. 38. Tricoccæ. 39. Siliquoſæ. 40. Perſonatæ. 41. Aſperifoliæ. 42. Verticillatæ. 43. Dumoſæ. 44. Sepiariæ. 45. Umbellatæ. 46. Hederaceæ. 47. Stellatæ. 48. Aggregatæ. 49. Compoſitæ. 50. Amentaceæ. 51. Coniferæ. 52. Coadunatæ. 53. Scabridæ. 54. Miſcellaneæ. 55. Filices. 56. Muſci. 57. Algæ. 58. Fungi.

In this enumeration, N^os^ 7, 10, 11, 17, 26, 27, 36, 38, 39, 60, 61, 62, and 63, of the former one are omitted. N^os^ 14, 16, 46, and 54 are added. For a more particular account of theſe orders, ſee their reſpective names.

XIX. *Linnæus's calycine method, publiſhed in* 1751.

Calyx, a ſpathe	Spathaceous	1.
a glume	Graſſes	2.
an ament	Amentaceous	3.
an involucre, whether preſent or not, provided its place be there	Umbellate	4.
a perianth many-flowered	Common	5.
one-flowered, double	Double	6.
ſingle receptacle diffuſed within it, and attached to its ſides	Flowering	7.
crowning the germen		8.
encloſing the germen; differing in form from the corolla	Anomalous	9.
different in different flowers of the ſame plant	Difform	10.
uniform, with the corolla	Caducous	11.
perſiſting, circumference equal, one-petalled		12.
with more than one petal		13.
circumference unequal with one petal		14.
with more petals		15.
Perianth or corolla falling off, when the floreſcence is perfected	Incomplete	16.
when the fruit is perfected	Apetalous	17.
naked		18.

Linnæus did not profeſs to have conſtructed this method with a view to practical uſe, but only that ſtudents might become well acquainted with all the primary ſpecies, differences, and properties of the calyx. With this view he has broken the natural families without ſcruple.

XX.—*Bernard Juſſieu's method, firſt practiſed in* 175[illegible].

Acotyledonous			1.
Monocotyledonous.	Stamens inſerted under the piſtil.	Hypogynous	2.
	about the piſtil.	Perigynous.	3.
	upon the piſtil.	Epigynous.	4.
Dicotyledonous.		Hypogynous.	5.
		Perigynous.	6.
		Epigynous.	7.

This method, founded on the relative ſituation of the ſtamens with reſpect to the piſtil, was employed in arranging the plants in the royal botanic garden at Trianon, under the patronage of Louis XV. but was not formally publiſhed to the world. It contains the germ of the more elaborate method, ſince formed by his well-known nephew, the preſent Anthony Laurence Juſſieu.

XXI.—*Gleditſch's method, publiſhed in* 1764.

Stamens on the receptacle.	Thalamoſtemonis.	1.
on the corolla.	Petaloſtemonis.	2.
on the calyx.	Calycoſtemonis.	3.
on the ſtyle.	Styloſtemonis.	4.
inconſpicuous.	Cryptoſtemonis.	5.

Gleditſch had evidently acquired ſome imperfect idea of the principle on which Bernard Juſſieu arranged the plants in the garden of Trianon. Willdenow, in his "Elements of Botany," erroneouſly gives him the honour of being the firſt who attempted an arrangement, founded on the ſituation of the ſtamens. His orders are taken from the number of the ſtamens.

XXII.—*Crantz's method, publiſhed in* 1766.

Cryptanthous.	1.
Incomplete.	2.
Compound.	3.
Graſſes.	4.
Palms.	5.
Liliaceous.	6.
Ringent.	7.
Papilionaceous.	8.
Cruciform.	9.
Umbelliferous.	10.
Columniferous.	11.
Calyciflorous, *i. e.* ſtamens and corolla, when preſent, inſerted in the calyx.	12.
Fructiferous, *i. e.* fruit beneath the flower.	13.
With few ſtamens.	14.
With many ſtamens.	15.

Moſt of the claſſes in this method are natural ones.

XXIII.—*Werniſcheck's method, publiſhed in* 1766.

Monopetalous.	Simple.	Two-lipped.	1.
		Four-cleft.	2.
		Five-cleft.	3.
		Six-cleft.	4.
		Anomalous.	5.
	Compound.	Tubular.	6.
		Ligulate.	7.
		Radiate.	8.
Polypetalous.		Petals, 2, 4, and 8.	9.
		4, cruciform.	10.
		3 and 6.	11.
		5 and 10.	12.
		Umbellate.	13.
		Papilionaceous.	14.
		Stamens more than 10.	15.
		Columniferous.	16.
Apetalous.		Calyx taking the place of a corolla.	17.
		Rude, or none.	18.
		Glumous, graſſes.	19.
		Clandeſtine.	20.

Werniſcheck is a Corolliſt, and, with the exception of his 13th, 15th, and 16th claſſes, has ſtrictly adhered to his principle. His arrangement is juſtly entitled to the praiſe of perſpicuity and elegance.

XXIV.—*Laurence Juſſieu's method, firſt publiſhed in* 1774.

Acotyledononous.	Cotyledons not exiſting, or inconſpicuous.			1.
Monocotyledonous.		Stamens	Hypogynous.	2.
			Perigynous.	3.
			Epigynous.	4.
Dicotyledonous.	Without a corolla.	Stamens	Hypogynous.	5.
			Perigynous.	6.
			Epigynous.	7.
	Corolla monopetalous.		Hypogynous.	8.
			Perigynous.	9.
			Epigynous.	
		Anthers	united.	10.
			Diſtinct.	11.
	Polypetalous.	Anthers	Epigynous.	12.
			Hypogynous	13.
			Perigynous.	14.
	Apetalous.	Monoicous or Dioicous.		15.
	Undetermined.			16.

This celebrated method is a much nearer approximation to a natural one, than any which had ever been before conceived; but it can be reported only as in a ſtate of progreſs, and cannot juſtly boaſt of perfection. In ſome points of view it is ſtill artificial. Its unrivalled excellence, however, inconteſtibly entitles it to an examination in full detail. But, as its very able author has been long employed in preparing a new edition, with conſiderable alterations, we ſhall refer our readers to the article NATURAL *Orders*, hoping that, before that part of our work goes to the preſs, we ſhall be able to lay before them his gradual advances towards a truly natural arrangement, with his lateſt ideas on the ſubject.

XXV.—*La Marck's method, publiſhed in* 1786.

1. Polypetalous.	Thalamiferous.	1.
	Calyciflorous.	2.
	Fructiflorous.	3.
2. Monopetalous.	Fructiflorous.	4.
	Calyciflorous	5.
	Thalamiferous angioſpermous.	6.
	gymnoſpermous.	7.
3. Compound.	Diſtinct.	8.
	Syngeneſious tubular.	9.
	ligulate.	10.
4. Incomplete.	Thalamiflorous.	11.
	Calyciflorous.	12.
	Diclynous.	13.
	Gynandrous.	14.
5. One-lobed.	Fructiflorous.	15.
	Thalamiferous.	16.
6. Cryptogamous.		17.

The ſix claſſes of this very elegant method are founded on the preſence or abſence of the corolla, with other characters of that organ, and have the ſingular advantage of deſcending, in a regular and conſpicuous gradation, from thoſe plants to which the author of nature has given, what may be called the moſt numerous and the higheſt endowments, to thoſe which are but one degree removed from the mineral kingdom. The firſt claſs La Marck conſiders as the maximum of vegetable organization; moſt of its genera have a calyx, a polypetalous corolla, a great number of ſtamens, and often many piſtils. It contains almoſt all the plants which poſſeſs a remarkable irritability, as mimoſa pudica, &c. hedyſarum gyrans, oxalis ſenſitiva, dionæa muſcipula, the different ſpecies of droſera, &c. and may be conſidered as holding the ſame rank in the vegetable creation as the Linnæan claſs *mammalia* does among the animal tribes. The ſecond claſs is one degree lower. There is rarely found in it an indefinite number of ſtamens and piſtils in the ſame flower. Its ſtamens very ſeldom exceed ten, and in about two thirds of its genera are not more than five. Nearly all of them are attached to the corolla; whereas in the preceding claſs, they are generally inſerted into the calyx or the receptacle. The lively imagination of the French naturaliſt is pleaſed with tracing out its analogy to the animal claſs *aves*.

The third claſs betrays a ſtill greater diminution either in the number or perfection of the eſſential organs. The proper flowers are almoſt all unprovided with a ſeparate calyx, have only one naked ſeed, and are in many caſes abortive, in ſome entirely deſtitute of a piſtil. In a ſcale of comparative elevation, they are on a level with the *amphibia*.

The fourth claſs conſtantly wants ſome of the parts which conſtitute a complete flower. The plants arranged under it have generally only a calyx, or nothing but ſcales which imperfectly ſuſtain the office of a calyx. Its flowers are moſt commonly ſmall, without beauty, and difficult to inveſtigate. Its ſtamens and piſtils are, moreover, frequently ſeparate from each other in diſtinct flowers, and in ſome caſes are not found on the ſame plant. In point of relative completeneſs, it may be ſuppoſed to occupy a ſtation ſimilar to that of the *piſces*.

The fifth claſs has, in ſeveral reſpects, a ſtill inferior character. Its ſeeds have only one lobe or cotyledon, and furniſh a ſmaller quantity of nutritive matter to the riſing plumula. The full-grown plants are, in conſequence, conſtitutionally weaker, have frequently hollow ſtems, and are more eaſily cruſhed or broken.

The ſixth claſs is the minimum of vegetable excellence and dignity. Its plants have a ſimpler organization; and, in the greater number of them, neither ſtamens nor piſtils have been diſcovered. Connected with the preceding one by the affinity of the ferns to the palms, it deſcends to the loweſt degradation of organized matter. The algæ and the fungi can be compared only with the corallines, madrepores, &c. and like them can barely be ſaid to live. A more particular account of the ſubdiviſions of this method, and of its 94 natural families, will be found under the names of its claſſes.

XXIV.—*Moench's method, publiſhed in* 1794.

1.	Thalamoſtemon.	Stamens on the receptacle
2.	Petaloſtemon.	on the corolla.
3.	Parapetaloſtemon.	on leaves ſimilar to petals.
4.	Calycoſtemon.	on the calyx.
5.	Allagoſtemum.	alternately on the calyx and petals.
6.	Styloſtemum.	on the ſtyle.
7	Stigmatoſtemum.	on the ſtigma.
8.	Cryptoſtemon.	not viſible.

This method profeſſes to be an improvement of that conſtructed by Gleditſch. Its author appears to have been as much indebted to Laurence, as his predeceſſor was to Bernard Juſſieu. We rather wonder at his temerity in offering it to the world, after the "Genera Plantarum ſecundum Ordines naturales diſpoſita" had been ſo widely circulated and ſo generally admired. He has taken his orders from the difference in the fruit. But as ſome of his claſſes are very large, he has found it neceſſary to make ſubdiviſions, in which he has had recourſe to other parts of the flower.

Adanſon, in 1763, publiſhed what he calls a natural method, in which he has included all parts of a plant, without exception, from the root to the embryo of the future offſpring. It contains 58 orders; but in forming them he has eſtabliſhed no character ſufficiently ſimple or preciſe to render them at all intelligible, without labouring through his tedious verboſe details. His deſcription of the 43d or leguminous plants, for inſtance, fills eleven pages of his original work, without a poſſibility of compreſſing it into a narrower compaſs; and, after all, the moſt attentive ſtudent will be in danger of confounding the characters of one order with thoſe of another. We ſhall, therefore, diſmiſs it without further notice. It would take up more room than it is worth. A ſimilar objection, though not in quite an equal degree, may be made to the recent method of De Necker.

For an account of Gærtner's method founded on the fruit, which was drawn up without an idea of its being applied to any practical purpoſe, but merely as an illuſtration of his ſubject, ſee Fruit.

CLASSIS Procincta, in *Ancient Military Language*. This name or appellation was given by the Romans to either a fleet or an army ranged or drawn up in order of battle and ready to engage.

CLASSITÆ, in *Ancient Geography*, a people of Aſia in Aſſyria, who occupied the borders of the river Lycus, according to Pliny. Hardouin ſuppoſes that the Cilici were ſo called, by way of diſtinction, from the Cilici who inhabited the mountains.

CLASSIUS, a river of Gallia Narbonnenſis.

CLASSIDIUM, a town of Italy, in Liguria, according to Polybius, or a village placed by Livy in Gallia Ciſalpina; near which Viridomarus, king of the Gauls, was vanquiſhed in ſingle combat by M. Marcellus.

CLASTON, a town of Spain, in Bœtica, according to Strabo. Caſaubon calls it Caſtulo.

CLATERNA, a town of Italy, in Gallia Ciſalpina. Pliny gives it the title of a colony. Ptolemy annexes to it the appellation of "Togata," and the Itinerary of Antonine places it 30 miles from "Forum Cornelii," (Imola); M. D'Anville marks it S.E. of Bononia.

CLATHRI, in *Antiquity*, bars of iron, or wood, uſed in ſecuring doors and windows.

There was a goddeſs that preſided over clathri, called Clathra.

CLATHRUS, in *Botany*, (κλαθρος, *a lattice*, 129.) Linn. Gen. Mich. 93. Bulliard 10. Perſoon. 41. Mart. Lam. Claſs and order, *cryptogamia fungi*.

Gen. Ch. *Fungus* roundiſh, conſiſting of a reticulated, latticed, hollow body; the ramifications connected on every ſide. Linn. "*Volva* membranous; *pileus* roundiſh, ſeſſile, latticed with anaſtomoſing branches; *juice* flowing." Perſoon. "Seeds encloſed in the ſubſtance of the branches." Bulliard.

Sp. 1. C. *cancellatus*, Linn. Sp. Pl. 1. Lam. Pl. 887.

Bul. Pl. 441. Bolton Pl. 93. fig. 1. Sowerby 50. (C. ruber, Mich. tab. 93. Boletus purpureus & flaveſcens, Tourn. 561. Fungus rotundus cancellatus, Bauh. Pin. 375. Barrel. ic. 1263, and 1265. "Branches numerous." W. *Volva*, burſting at its ſummit into ſeveral ſegments, and affording a paſſage to the latticed pileus. *Branches* very porous, containing a gelatinous ſubſtance, which diſſolves into a very fetid fluid, and thus diſcharges the ſeeds. The plant varies in being either of a purple or yellowiſh colour. A native of England and other parts of Europe. 2. C. *carolinianus*, Boſc. Dict. d'Hiſtoire Naturelle, Pl. 26, B. "Branches four, anaſtomoſing only at the top." Boſc. A native of Carolina. Clathrus denudatus, nudus, & recutitus. Linn. See TRICHIA.

CLATHRUS is alſo the name of a ſpecies of TURBO, in the order of *teſtacea*, belonging the claſs of worms.

CLATTE', in *Heraldry*, a term borrowed from the French to expreſs irregular lines, found in old paintings and engravings of arms not reducible to any other proper lines of heraldry, as the ingrailed, the indented, or the like.

CLAVA HERCULIS, in *Botany*, ſee ZANTHOXYLUM.

CLAVARIA, from *clava*, a club.) Linn. gen. 1332. Juſſ. 15. Vent. vol. ii. 18. Claſs and order, *cryptogamia fungi*.

Gen. Ch. "*Fungus*, with an even ſurface, oblong." "Uniform; upright, club-ſhaped; ſeeds emitted from every part of its ſurface." Withering.

* *Stem with a head.*

Sp. 1. C. *gyrans*, With. Bolt. 112. 1. Batſch. 164. Willd. 7. 18. "Stem hair-like; head club-ſhaped, terminating, longiſh, tapering at each end." *Stem* about half an inch long, riſing from a ſmall bulb, very ſlender, pellucid, crooked at the bottom, twiſting and untwiſting as the air is moiſt or dry. *Head* whitiſh. On rotten ſtraw and leaves in woods and moiſt places. Sep. Oct. 2. C. *phacorhiza*, With. A ſlender, ſimple, undulating thread, terminating rather bluntly at the apex. The ſubſtance at the baſe ſomewhat reſembles a bean or ſeed, ſplitting to protrude a young plant. Sometimes the head is larger, and reſembles a bodkin or knitting needle. 3. C. *gracilis*, Bolt. tab. iii. fig. 1. Sowerb. 232. *Stem* half an inch long, ſmooth, ſlender, pellucid. *Head* enlarging, almoſt imperceptibly from the ſtem, more than an inch long, duſky white, of a wax-like appearance, terminating more or leſs acutely, differing in colour and texture from the ſtem. Found in ſhady places in garden ground that has been lately dug. 4. C. *acuta*, Sowerb. 333. (C. piſtillaris, Bolt. 110. fig. 2, 3, 4.) Generally growing ſolitary, and varying much in ſize. *Root* compoſed of a few ſhort fibres. *Stem* cylindrical, partly tranſparent, about the length of the head. *Head* always ſharply conical, ſomewhat opaque and mealy. 5. C. *phoſphorea*, Sowerb. 100. (Rhizomorpha fragilis, Roth. Crypt. minus nota. 7-Himantia umbrina, Perſoon Meth. Fung. 73. Agaricum nigrum reticulatum compreſſum, Mich. Gen. 125. tab. 66. fig. 3. Fungus niger compreſſus, varie divaricatus et implexus inter lignum & corticem. Rai. Syn. 15 Sometimes paraſitic between the wood and bark of trees. The plant figured by Mr. Sowerby was found in a wine-cellar in little St. Helens, London, creeping among ſaw-duſt and bottles, and communicated to him by Mr. B. M. Forſter. When freſh it was remarkably luminous in the dark at the ends of the ſhoots, where a very ſlender head is formed: but Mr. Forſter doubted whether this phoſphoric appearance was natural to the plant, or owing to ſome vinous moiſture imbibed by it. 6. C. *filiformis*, Sowerb. 387. fig. 4. *Stem* branched, hairy. *Heads* terminating the branches, very ſlender, reſembling thoſe of the preceding ſpecies but ſmaller. Not uncommon among dead leaves, when thickly ſtrewed on the ground. It is compoſed of fibrillæ not unlike Byſſus barbata Eng. Bot. tab. 701; but in drying ſhrivels up almoſt to nothing. 7. C. *tenuis*, Sowerb. 386. fig. 5. Reſembling a little black hair, thickening upwards. Found on bits of rotting wood in a coal cellar in damp weather. 8. C. *herbarum*, Sowerb. 353. Perſoon Comment. de Fung. Clavæf. tab. iii. fig. 4? Like C. ophiogloſſoides in miniature, but ſmoother and of a more uniform colour, very ſmall, with a diſtinct head, which finally becomes ſhrivelled and twiſted. Growing on dead ſtalks. 9. C. *obtuſa*. Very ſmall. Paraſitic on fern-ſtalks in autumn, either on the upright growing plant, or its decaying remains. *Head* larger in proportion to the ſtem than in moſt of the preceding ſpecies; either ſmooth or granulated like a ſphæria; in the latter caſe, the ſtem, when magnified, is a little hairy. In both varieties the head is ſolid, of a ſomewhat friable texture, becoming a little horny in drying. 10. C. *minuta*, Sowerby, 391. Very minute. Head orange-coloured. Found on the bractes of dipſacus piloſus. 10. C. *coccinea*, Sowerb. 294. (Tremella purpurea; Hudſ.? Sphæria tremelloides, With.). Seldom without a ſtem, though apparently ſeſſile, as may eaſily be perceived by a perpendicular ſection. *Head* ſcarlet. Extremely common on rotten ſticks in damp weather in autumn. 12. C. *polymorpha*, Sower. 276. Baſe ſomewhat brown, and harder than the reſt of the plant, which is of a waxy texture, differing much in ſhape, and generally hollow. Often to be ſeen on decaying elm leaves in Kenſington gardens. 13. C. *paraſitica*, With. Willd. Berol. 7. 17. (Sphæria paraſitica, Woodw.) "Paraſitic, club-ſhaped, black, quite ſimple; ſtem cylindrical; head oblong-cylindrical, obtuſe, coated with minute papillæ." Willd. This ſingular fungus is always fixed to a lycoperdon. It reſembles C. ophiogloſſoides, but has a ſofter ſubſtance, and ſooner decays. *Root* conſiſting of many long, wiry, brown fibres, with which it entwines and covers the ſurface of the tuber, but never penetrates its ſubſtance. *Stem* ſlender, about an inch long. *Head* about half an inch long, oval, covered with minute ſphæriæ. Found on a heath near Norwich and ſent to Mr. Woodward by Mr. Pitchford. 14. C. *cylindrica*, Bull. tab. 463. fig. 1. Sowerb. 90. Whole plant of a wax-like friable texture. *Stem* cylindrical. *Head* elongated, in ſome plants pear-ſhaped. Found by Mr. Sowerby, in autumn, in a field between Stoke Newington and Hornſey. 15. C. *ephiphylla*, With. Dickſ. Faſc. 3. tab. 9. fig. 10. Sowerb. 293. (C. phalloides, Bull. 463. "Club-ſhaped, quite entire; head blunt, hollow, red, orange or ſaffron-coloured," two or three inches high. *Stem* cylindrical, whitiſh or pale yellow. *Head* roundiſh, or oblong-egg-ſhaped, ſometimes reſembling that of an agaric. In bogs and on half rotten dead leaves; in peat holes on Rombalds Moor, Yorkſhire, and in a deep running ſtream near Tunbridge Wells. 16. C. *capitata*, With. (Sphæria agaricifolia, Bolt. tab. 130: Flor. Dan. tab. 540.) "Stem yellow, cylindrical; head egg-ſhaped, cheſtnut-coloured, dotted." *Root* black, ſpongy, ſurrounded with a thick volva which is of the ſame ſubſtance with the ſtem. This volva is encloſed in another, which is dry, huſky, of a browniſh green colour, attached to the inner one by a few radical fibres. *Stem*, while young, ſolid and ſmooth, when old, fiſtular, furrowed, a little twiſted; in both ſtates, ſoft, pliable, and eaſily ſplitting into yellow ſhining filaments. After being ſhut up in a tin box all night, a ſmall gelatinous drop was obſerved, by Bolton, in every pore on the ſurface of the head; after an expoſure to the warm ſunſhine for about an hour, the gelatinous particles dried up, and a white powder was copiouſly diſcharged.

Found in Ramſden Wood, near Halifax, in Yorkſhire. 17. C. *ſpatulata*, With. Schmid. tab. 50. Flor. Dan. 658. (Helvella ſpatulata; Sower. 35. H. clavata, Schæf. tab. 149. Dickſ. 1. faſc. p. 19. H. feritoria, Bolt. tab. 97.) Battledore clavaria. *Root* a hard fibrous knob, a little thicker than the bottom of the ſtem. *Stem*, while young, cylindrical, ſolid, ſoft, pliable, ſilvery white. As it advances in age, it becomes a little wrinkled on the ſurface, twiſted, and ſometimes torn, eſpecially near the root. *Head* like the large end of a battledore for ſtriking a ſhuttlecock; at firſt conſiſting of two equal membranes of a pale yellow colour, plain, united by their whole inner ſurface, reſembling a ſmall bladder with the two ſides preſſed together; as it advances in growth, the two ſides become wrinkled, and branching veins begin to originate in that part of the ſtem which runs into the head; at laſt the ſides ſeparate, and the head becomes inflated; when opened, nothing is found in it but a few downy, capillary filaments. In a ſtate of perfect maturity, the head, on being touched, throws up its ſeeds in form of a ſmoke, which riſe with an elaſtic force, and glitter in the ſunſhine like particles of ſilver. A very diſtinct ſpecies, but its genus not eaſily determined; it being almoſt equally allied to peziza helvella, lycoperdon, and clavaria. Firſt diſcovered, by the late excellent Mr. Crowe, in the plantations of Coſteſy, near Norwich; found, by Bolton, in the plantations about Fixby-Hall, near Halifax. 18. C. *ferruginea*. Sowerb. 84. *Stem* a little rough on the upper part. *Head* reſembling that of a ſmall agaric, inſide ſomewhat pithy. Found under the ſhade of firs in plantations, near Norwich. 19. C. *militaris*, Linn. Sp. 2. Lam. 2. Lam. Ill. tab. 888. fig. 1. "Club-ſhaped, very entire; head either ſcaly or granulated. *Var.* 1 Schæff. 290. (Sphæria militans, Bolt. 128.). Head ſcaly, about four inches high, near two in diameter at the thicker part, ſolid, orange-brown. In ſhady woods. *Var.* 2. Schmid. 5. fig. 2, 3. Vaill. Paris, tab. 7. fig. 4. Flor. Dan. tab. 657. fig. 1. (Sphæria militaris, Sowerb. 60.) *Head* granulated, orange brown or chocolate-coloured, much more ſlender than in the preceding ſpecies, ſolid, yellow within, ſometimes bifid at the apex. *Var.* 3. Bull. 496. 1. Buxb. 4. 66. 2. "Head granulated, yellow." *Stem* about an inch high, ſlender, tapering upwards, gradually thickening to form the head. *Head* an inch or an inch and half long, two or three tenths of an inch in diameter, thickeſt in the middle, blunt at the end; in moiſt woods and bogs in autumn. La Marck ſuppoſes this ſpecies to be only a variety of C, piſtillaris; but he ſeems to be acquainted only with the firſt variety. 20. C. *ardenia*, Sowerb. 215. Woolly at the baſe. *Stem* tomentous at the bottom, cylindrical, hollow. *Head* dilating upwards. In the younger plants the head is ſomewhat pointed and covered with a lightiſh mealy powder. In a more advanced ſtate it becomes truncated, and covered with a browner powder; ſplitting longitudinally in decay. Found by lady Arden, Nov. 29, 1798, in Nook-Park, near Epſom. It grows on rotten hazel ſticks, ſpringing from the under ſide, half an inch or more under the earth, among decaying foliage. Its whole duration ſeems to be about a week.

** * Stem without a head, nearly undivided.*

21. C. *herculanea*, With. Var. 1. Bull. 244. Sowerb. 277. (C. piſtillaris, β. Linn. δ. Hudſ.) "Undivided, club-ſhaped, ſolid, not granulated." The largeſt of the genus; about three inches high, one or two in diameter towards the top, in the larger ſpecimens much reſembling the ſhape of a pear, dull orange-coloured, beautifully white, and ſoft within. Found in Windſor foreſt. 22. C. *vermiculata*, Lightf. 1057. Sowerb. 253. (C. piſtillaris, Hudſ. 638.) "Worm-ſhaped, ochroleucous." Lightf. About two inches high, generally thickeſt in the middl, often longitudinally wrinkled, varying from a ſtraw-colour to an orange. 23. C. *tuberoſa*, Sowerb. 199. *Root* tuberous. *Stem* tubular, pointed, growing on ſticks, forcing its way through the bark. 24. C. *fuſiformis*, Sowerb. 234. (C. piſtillaris, Bolt. 110?) Spindle-ſhaped, tapering to a point. Subſtance friable when freſh, pithy, moſt firm in the external part. 25. C. *rugoſa*, Lam. Ill. 888. fig. 2. Sowerb. 235. (C. piſtilaris, Lightf.?) Subſtance more tender than in the preceding, and moſtly hollow, yellow, tipped with orange; young ſpecimens ſimple, blunt at the end; old ones laciniated in the upper part.

Obſ. The laſt five ſpecies are all included under C. *piſtillaris* of Linnæus and Hudſon. Withering has divided them into two, with ſeveral varieties under each, making a ſolid ſtem the principal character of his herculanea; and a hollow one of his piſtilaris; but, as the ſame plant appears to vary in this reſpect, in different ſtages of its growth, it can ſcarcely be thought a proper ſpecific diſtinction. We have followed Sowerby in making five ſpecies, which appear to be ſufficiently diſtinct, and which may include the numerous varieties of different authors.

26. C. *tuberculata*, With. Schæff. 289. "Stemleſs, nearly of equal thickneſs, pale orange, whole ſurface ſtudded with tubercles" About an inch and a quarter high, a quarter of an inch in diameter, rather flatted, ſometimes ſlightly cloven at the top; tubercles deep orange, broadeſt at the baſe, pointed, and tranſparent at the tip; interſtices filled with a whitiſh, cobweb-like ſubſtance. Grows on the ground, but rare, Aug. 27. C. *elveloides*, With. Dickſ. Faſc. i. p 21. Wulfen in Jacq. Miſc. Auſt. tab. xii. fig. 3. (Elvela carnea, Schæff. tab. 164.) "Growing in tufts, quite ſimple, very thick, united at the baſe, inverſely pyramidal, ſtriated." Two inches high, one in diameter; when young fleſhy; when older woody, branched, compreſſed, ſomewhat funnel-ſhaped, truncated; margin plaited, curled, brown, with a tinge of purple without, whitiſh, or yellowiſh within. Woods on the ground, about the trunks of trees, Aug. and Sept. 28. C. *ophioglоſſoides*, Linn. Sp. Pl. 3. Lam. 3. Vaill. Paris, tab. 7. fig. 3. Mich. Gen. tab. 87. fig. 4. Schæff. tab. 237. Flor. Dan. tab. 1076. fig. 2. Schmid. 25 Bull. 372. Bolt. 111. fig. 2. Sowerb. 83. (Muſcus clavatus, Pluk. tab. 47. fig. 3.) "Club-ſhaped, quite entire, compreſſed, blunt." About two inches high, near half an inch in diameter in the broadeſt part; always wholly black on the outſide, white within; when young, ſolid and ſmooth; when older, hollow, ſhrunk, depreſſed, furrowed or wrinkled. In moiſt paſtures, Sept. Oct. 29. C. *lutea*, Lam. 4. Mich. Gen. tab. 87. fig. 5. Hall. Helv. n. 2207. "Horn-ſhaped, quite ſimple, ſmooth." From ſix to nine lines long, gold-coloured, ſlender, hollow, a little pointed at the top, curved, tender. Found by La Marck in the neighbourhood of Rouen. There is a variety a little larger, growing in tufts, figured by Mich. tab. 87. fig. 11. (C. ceſpitoſa, Jacq. Miſc. ii. tab. 12. fig. 2?) 30. C. *fimbriata*, With. "Undivided, hollow, cloſed, and pointed, or open and fringed at the end." Whole plant covered with a greyiſh powder. Near half an inch high, about the thickneſs of a pin, greeniſh at the bottom, white above, tapering. Found by Dr. Withering among moſs, Oct. 31. C. *cornea*, Withering. Batſch 28. 161. Sowerb. 40. (C. aculeiformis, Bull. 463-4. Sibth.) "Red orange; ſimple or cloven, nearly cylindrical, obtuſe, gelatinous, ſolid." Scarcely a quarter of an inch high, often ſticking together

from their glutinous ſubſtance, though horny and brittle when dry. With. from Batſch. Sowerby's figure does not perfectly accord with Withering's deſcription, though both make the ſame reference to Bulliard. In Sowerby's figure, the ſtem appears flatter, deeply laciniated, and ſometimes cloven almoſt to the baſe into three or more ſegments.

*** *Stem branched.*

32. C. *elegans*, With. —— Bolt. tab. 115. (C. coralloides, Var. Bull. 496.—Sowerb. 278.) "White, ſometimes branched, upright." Four or five inches high. *Root* hard, brown, fibrous. *Stem* ſometimes ſimple, club-ſhaped, wrinkled, longitudinally furrowed; ſometimes a little branched; all the diviſions obtuſe. In both ſtates, while freſh and growing, of a pure ſilvery white, and, if viewed between the eye and the light, reſembling the fineſt virgin wax. In decay it changes to a pale brown colour, and ſoon diſappears. Sept. Withering thinks Bolton right in keeping it diſtinct from C. coralloides, as it connects the unbranched with the branched ſpecies. 33. C. *coralloides*, Linn. Sp. Pl. 6. Lam. 7. With. Tourn.. 332-6. Barr. 1259, 1260, 1261, 1262. Schœff. 170, 172, 174, 175, 176, 177. 285, 286, 287. Bull. 222, 354, 358, 496. Lam. Il. 888. fig. 3. Bolt. tab. 113. Sowerb. 278. (Fungoides ramoſum maximum, braſſicæ caulifloræ facie et magnitudine, Dill. in Rai. Syn. ed. iii. p. 16, communicated by Dr. Richardſon, who, in 1703, found plants which weighed two or three pounds. They grew in a meadow at Bierly-hall near Bradford, Yorkſhire.) "Branches crowded, much divided and ſubdivided, unequal." It varies much in colour, being either white, grey, purple, yellow, or olive-coloured; but may always be diſtinguiſhed from C. piſtillaris, by growing from one baſe, and being much branched. It is ſometimes as large as a cauliflower. The whole ſpecies is eſteemed on the continent one of the beſt of the fungous tribe for the table, and is eaten by the Germans under the name of *Ziegenbart*. Dr. Withering aſſures us, from his own experience, that the white and grey varieties may be eaten with ſafety. 34. C. *faſtigiata*, Linn. Sp. Pl. 7. Lam. 6., Bull. 358, D. E. Bolt. tab. 112. fig. 2. and tab. 113. fig. 6. (Fungoides coralliforme luteum fætidum et minus ramoſum, Dill. in Rai. Syn. ed. 3. p. 479. tab. 24. fig. 5.) "Yellow; branches crowded, of equal height." Bulliard is inclined to think it only a variety of coralloides. But, according to Mr. Woodward, it differs from that ſpecies in having ſeveral ſtems very ſlightly connected at the baſe, which are either ſimple, or little branched, approaching very near to C. piſtillaris, but ſpecifically diſtinct from both. In the young plants figured by Bolton in tab. 112. fig. 2, the tops of the branches are entire, and truncated; in the older ones, tab. 113, C. pointed teeth ſhoot out, which gradually become larger, and ſometimes branched. Woods and paſtures, Aug. Oct. 35. C. *coriacea*, Willd. Bull. tab. 452. fig. 2. "Branches flattiſh, grooved, fringed at the end, grey, changing to black brown;" about two inches high, of a ſoft but elaſtic ſubſtance. It differs from C. coralloides, and C. faſtigiata, in the longitudinal grooves. Found by Dr. Sibthorpe in Shotover plantations, Oxfordſhire, Oct. 36. C. *muſcoides*, Linn. Sp. Pl. 8. Lam. 5. With. Bolt. tab. 114. Sowerb. 157. (C. corniculata, Schœff. tab. 173. Fungus parvus luteus ramoſus, Rai. Syn. tab. 24. fig. 7.) "Pale yellow, repeatedly branched, taper-pointed, unequal." From two to five inches high. It agrees with C. faſtigiata, in being nearly diſtinct at the baſe, and with C. coralloides, in being always much branched, but differs from both in having the extremities of the branches ſharp-pointed. Branches ſeveral times dichotomous; terminating forks ſometimes of unequal length; ſometimes diverging at their origin, and converging near the point. Luxuriant ſpecimens are the ſize of a man's fiſt; the branches much ſwelled at the divarications, and much entangled together, but all united at the baſe, Bolt. Heaths and dry woods, Oct. 37. C. *laciniata*, With. Bull. 415. 1. Jacq. Miſc. 14. 1. Schœff. 291. Sowerb. 158. (C. deformis, Var. β. γ. Lam. Encyc. Vaill. tab. 8. fig. 2, 3. La Marck's Var. α of his deformis is C. *cornutus*, Schœff. tab. 289.) "Flat, thin, membranous, jagged, and fringed at the top." From one to two inches high, irregular in ſhape, much rooted in the earth, ſpreading elegantly in all directions, and ſeeming to depend on the contiguous herbage for ſupport. *Stems* uniting at the bottom, purpliſh brown, covered with a fine mealy white, which eaſily rubs off; branches often like an expanded hand, whitiſh, or yellowiſh-brown; the ends jagged, ſet with ſeveral pointed projections, and tipped with reddiſh brown, Aug. 38. C. *anthocephala*, With. Sibth. Bull. 452. 1. Sowerb. 156. "Fan-ſhaped, lobed, ruſty red; ſtem ſhort, cylindrical, hairy." Of a tough woody texture, nearly two inches high. *Stem* expanding upwards into ſeveral ſegments, which are ſcolloped at the end, and paler than the reſt of the plant. Oct. 39. C. *hypoxylon*, Linn. Sp. Pl. 5. Lam. 10. With. (C. cornuta Bull. 180. Sphæria hypoxylon, Sowerb. 55. Sphæria digitata, &c. Bolt. tab. 129. *a, b, c, d.* Coralloides ramoſa, nigra, compreſſa, apicibus albis, Tourn. 565. Lichen agaricus nigricans, Mich. gen. tab. 55. fig. 1.) "Branches reſembling horns, compreſſed." Very woolly when young, and very black, rather woody, white, and fibrous within, ſometimes ſingle, or occaſionally forked, with the extremities more or leſs acute; ſometimes with the ſummits compreſſed, palmated, or digitated, and covered with a white farinaceous powder, which continues on them from October to March. 40. C. *digitata*, Linn. Sp. Pl. 4. Lam. 11. With. Schœff. tab. 328. Sowerby. 69. (Sphæria digitata, Woodv. Bolt. tab. 129. fig. 2. *f.* Bull. tab. 220. Agaricus digitatus niger, Tourn. 562. Lichen agaricus terreſtris, digitatus niger, Mich, gen. tab. 54. fig. 4.) "Branched, woody, black." Linn. "Thick, ſolid, conical, rough," With. Subſtance like cork, tending to a cylindrical figure, from one to two inches high, from a quarter to three quarters of an inch in diameter, ſometimes rather branched, white at the top while young. *Seeds* lodged in little cells near the ſurface, which cells are not viſible till the hairs fall off. Bull. Dr. Waller, in ſome curious obſervations communicated to Dr. Withering by the Rev. Mr. Dickenſon, has given it as his opinion, that the plants deſcribed by Linnæus under the names of C hypoxylon, C. digitata, and C. ophiogloſſoides, are but one ſpecies, which he propoſes to call C. villoſa. According to him, C. hypoxylon is the moſt common appearance of the *male* plant; C. digitata of the *female;* and C. ophiogloſſoides is a variety of the *female.* The female plant begins to ſpring at the ſame time and in the ſame place with the male, *i. e.* about the end of September, and generally in ſhady woods, but riſes only to half its height. They grow always in cluſters together, but never proceed from the ſame root. After the male plant has ſhed its pollen in November, it begins to decay, and in the ſpring entirely diſappears: whereas the female plant continues to grow vigorouſly till about the middle of April, when the ſeeds being ripe, the head burſts in ſeveral places and falls off. Theſe facts, if ſufficiently aſcertained, ſatisfactorily ſhew the diſtinction of the ſexes. With regard to C. digitata, Dr. Waller obſerves, that Linnæus has miſunderſtood the term digitatus,

digitatus, as applied by Tournefort, Vaillant, and others, to two varieties of the plant, not becauſe they are fingered like the human hand, but becauſe their ſingle head, in figure and ſize, has ſome reſemblance to a human finger. In oppoſition to this ſtatement, it is, however, neceſſary to add, that Mr. Sowerby has obſerved, that C. digitata commences its growth very early in the ſpring, and ripens its ſeed-veſſels annually in autumn. It is alſo worthy of notice, that Mr. Woodward, a very diligent and accurate obſerver, could never perceive any appearance of ſpherules on C. ophiogloſſoides. 41. C. *cupreſſiforme*, With. (Sphæria digitata, Bolt. tab. 129. fig. *g.*) " But little branched; head conical, ſupported on a ſtem." Mr. Woodward thinks this plant eſſentially different from the preceding one. *Stem* about half an inch high, ſimple, or only once divided. *Head* about the ſame length, reſembling a cypreſs tree in miniature. On decayed wood. 42. C. *tomentoſa*, Lam. 10. " Branched, coriaceous, cloathed with a reddiſh brown pubeſcence; little branches ſomewhat palmated at the top." Growing in expanded tufts; not more than an inch high. Pubeſcence ſhort, cottony, with the appearance of velvet. Eaſily diſtinguiſhed from every other known ſpecies. In habit reſembling coralloides ramoſum ex rufo carneum platyceron of Micheli, (tab. 88. fig. 3.) which is, perhaps, a variety. Found by La Marck in a mine at Schemnitz, in Hungary, on the wood which ſupported the roofs of the galleries. 43. C. *farinoſa*, With. Dickſ. Faſc. 2. p. 25. Sowerb. 308. (Ramaria farinoſa, Holm in nov. act. dan. 1. fig. 6.) " White, mealy; branches ſhort, truncated, crenulate." Solitary. *Stem* upright, ſomewhat angular, a little compreſſed; branches unequal, thicker towards the end. When the white meal is rubbed off, the plant appears yellow. Woods, on the chryſalis of inſects. 44. C. *byſſoides*, Sowerb. 335. " Small, delicately white." *Stems* branched, forming irregular intricate tufts, reſembling a byſſus, or rather a minute coral. Found on old ſtumps of trees.

Mr. Woodward and other recent botaniſts have removed ſome of theſe ſpecies to ſphæria, in conſequence of their agreement with that genus in the ſtructure of their ſeed-veſſels. But Schmidel has demonſtrated a ſimilar ſtructure in ſtill other ſpecies of clavaria, and on a more accurate examination of the plants in a ſtate of compleat maturity, it may probably be found in all; ſo that the two genera muſt on this ground be united into one. But the difference in their general habit is ſo great, that Withering has thought it beſt to keep them diſtinct. For a ſimilar reaſon we have retained C. hypoxylon, &c. in the preſent genus where Linnæus placed them; convinced that, though a new arrangement will hereafter be neceſſary, we are not as yet in poſſeſſion of ſufficient knowledge to eſtabliſh one on a ſolid foundation. La Marck has retained all the Linnæan ſpecies of clavaria, with the addition of three others; but Poiret, his ſucceſſor in the botanical part of the Encyclopedie Methodique, has removed militaris, hypoxylon, and digitata to ſphæria.

Juſſieu has given the following character of his clavaria: " Somewhat fleſhy, growing either on the ground, or on other plants; either club-ſhaped, ſimple, oblong, or branched like corals; the little branches ſwelling at the tip, with projections reſembling nipples." By this definition he has excluded the firſt five ſpecies of Linnæus, *viz.* piſtillaris, militaris, ophiogloſſoides, digitata, and hypoxylon. Theſe, under the generic name of hypoxylon, he has removed to the order of algæ, and aſſociated with the lichens. Ventenat has not adopted this new genus.

CLAVARIUM, in *Ancient Military Language*, an allowance to common Roman ſoldiers for purchaſing ſhoes and boots, or harneſs for the legs (called caligæ), and which were ſet full of nails. They raiſed frequent mutinies, demanding largeſſes of the emperors under this pretence.

CLAVATA VESTIMENTA, in *Antiquity*, habits adorned with purple clavi, which were either broad or narrow. See CLAVUS.

CLAUDE, JOHN, in *Biography*, a highly celebrated French Proteſtant divine, was born at Suavetat, in the Agenois, in the year 1618 or 1619. His early education was conducted by his father, who was alſo a miniſter, and a man of learning; he was afterwards ſent to finiſh his ſtudies in philoſophy and theology at Montauban, where he was ordained in 1645. After having ſucceſſively ſerved two churches of inferior conſequence in the country, each for a ſhort period, he accepted an invitation from the church of Niſmes, which was eſteemed one of the firſt in the Proteſtant intereſt in France. There was a Proteſtant college at this city, and Mr. Claude employed his leiſure time in delivering a private courſe of theological lectures to the ſtudents, who gladly availed themſelves of the aſſiſtance of his great learning and abilities. He had paſſed eight years in this ſituation, agreeably and uſefully employed, and univerſally reſpected by all who had the happineſs of his acquaintance, when a circumſtance occurred which obliged him to remove. He had the misfortune to oppoſe the efforts of a man who had been gained over by the court, or catholic party, to bring back the Proteſtants to the Roman communion; and an order of council was in conſequence iſſued to forbid him to officiate any longer in Languedoc. On receiving this prohibition he went to Paris, in hopes of being able to get it reſcinded; he remained there ſix months, but could not ſucceed in the object of his journey. During his ſtay at Paris, he was prevailed upon by madam De Turenne to write an anſwer to a work which had juſt been publiſhed by Meſſrs. De Port-Royal, " On the Perpetuity of the Roman Catholic Faith reſpecting the Euchariſt," which was principally deſigned to convert her huſband, marſhal Turenne, to the court tenets. Mr. Claude's anſwer led to a controverſy of ſome length, in which he appeared with great advantage; but it was not probable he could ſucceed in the firſt object of his undertaking, the preſervation of marſhal Turenne to the Proteſtant intereſt, when other inducements, more powerful in the eſtimation of a courtier than religious ſcruples, weighed on the other ſide. From Paris, Mr. Claude went to Montauban, the place of his education, where he accepted the charge of a church. After he had reſided here four years, the Port-royaliſts diſcovered, by the baſeſt artifices, that he was preparing an anſwer to their elaborate vindication of the original publication on the " Perpetuity," and made intereſt to obtain another order of council to forbid him the exerciſe of his profeſſion at Montauban. This occaſioned him another journey to Paris, where he remained nine months, with as little ſucceſs as had attended his firſt application on a ſimilar errand. At this time, 1666, he received a moſt flattering invitation from the reformed church of Paris, which aſſembled at Charenton, and accepted the charge of being one of its paſtors. Charenton being the metropolitan church of the French Proteſtants, Mr. Claude had an opportunity of exerciſing his talents with the greateſt advantage to their cauſe, and on many occaſions rendered them eſſential ſervices by his publications, and by his excellent conduct at ſynods and conſiſtories. His firſt publication in his new ſituation compriſed two additional tracts againſt the work of the Port-royaliſts on the Euchariſt. After this, Dr. Nicole publiſhed an attack upon the Proteſtants, in a work entitled, " Well-grounded Prejudices againſt the Calviniſts;" which drew from Mr. Claude an anſwer in two volumes quarto, entitled, "A Defence of the Reformation," which has been regarded as the ableſt work ever publiſhed on the ſubject. He printed alſo ſome ſermons, under the title of "The Parable of the Wedding Feaſt." At the requeſt of mademoiſelle de Duras, who was a member of his church, he had, in 1678, a long private conference with Boſſuet, the biſhop of Condom, afterwards of Meaux, which was conducted on both ſides with all the talents theſe able adverſaries could call forth. Of this diſputation Boſſuet firſt publiſhed an account, in which he conſidered himſelf as the victor; but Claude afterwards publiſhed his replies, claiming, with equal confidence, the honour of the day as his own. In 1682 he publiſhed anonymouſly a ſmall work, entitled, "Conſiderations on the Circular Letters of the Aſſembly of the Clergy of France of the Year 1682." The letters to which it was a reply had been written and circulated by the Catholic clergy with the view of bringing back the Proteſtants to their communion. Shortly after this, Claude publiſhed another ſmall piece of a more practical kind, "On Preparation for the Lord's Supper." Thus did he actively employ himſelf in the cauſe of the Reformation, until the clergy ſucceeded in the great meaſure which they had long laboured to effect, the revocation of the edict of Nantz. This fatal decree was regiſtered in parliament, and received the ſanction of law, on the 22d of December 1685. The longeſt period which was granted to the Proteſtant clergy to quit France was fifteen days; but ſo eager were the exulting biſhops to get fairly rid of their old adverſary, that an exception was made to the caſe of Claude, who received ſpecial orders to depart the kingdom in twenty-four hours! On the 23d of December, therefore, in compliance with this injunction, he ſet out for the Hague, where his ſon was miniſter of the Walloon church. He was received on his arrival with the greateſt kindneſs by perſons of the higheſt diſtinction; particularly by the prince of Orange, who granted him a penſion for his maintenance. He enjoyed the bounty of his benefactor, however, only for a ſhort period; as he died, after a ſhort illneſs, in January 1687. During his reſidence at the Hague, he publiſhed a work, entitled, "The Complaints of the Proteſtants of France;" which was deſigned to expoſe the conduct of the biſhops of France in their perſecution of his party. It was well received by the friends of the reformation on the continent; but was, of courſe, execrated in France, and in England was ordered by James II. to be burnt by the common hangman. After his death, his ſon, Mr. Iſaac Claude, publiſhed his poſthumous works in five volumes 8vo.

Mr. Claude did not poſſeſs many requiſites for a public ſpeaker. His perſon was bad, and his voice deficient in thoſe qualities which are calculated to impart the charms of melody and perſuaſive faſcination to the eloquence of public diſcourſe. His ſtyle and language, although not diſtinguiſhed by elegance, were, nevertheleſs, correct, vigorous, and animated; and if they were not adapted to amuſe the fancy and captivate the feelings, ſeldom failed to convince the underſtanding and improve the heart. His writings prove him to have poſſeſſed a large ſhare of learning, and juſtly claim for him the higheſt reputation as a controverſialiſt. To this it muſt be added, that his private life was truly excellent; he had imbibed the genuine ſpirit of the religion he taught; and manifeſted, in the whole of his conduct, a piety and devotion, a charity and benevolence, an integrity and uprightneſs of character, which reflect the higheſt luſtre on his name and memory. Bayle. Nouveau Dict. Hiſtorique, Paris 1804. Robinſon's Life of Claude.

CLAUDE, Le Jeune, or Claudin, in *Biography*, the moſt renowned French muſician of his time, was a native of Valenciennes. He was an early follower of Calvin; but flouriſhed ſomewhat later than Goudimel, with whom he is often confounded; both having the name of Claude, both being Hugonots, both great muſicians, and both in high favour with the Calviniſts for ſetting Clement Marot's muſical tranſlation of the Pſalms to muſic for their temple worſhip, which rendered both ſo obnoxious to the Catholics that one of them was maſſacred on St. Bartholomew's day, 1572, and the other narrowly eſcaped.

Concerning the miſtaken identity of theſe muſicians, Bayle has cleared up that point with his uſual accuracy; and proved from indiſputable authority, that Le Jeune was living and in the higheſt public favour, even at court, though a Hugonot, many years after the fatal feaſt of St. Bartholomew, particularly in 1581, when the wonders which he is ſaid to have performed by his muſical art at the wedding of the duke de Joyeuſe are recorded. The works of Claude le Jeune conſiſted chiefly of miſcellaneous ſongs, and pſalms; *de melanges*, *des chanſons*, *des pſeaumes*, of which he publiſhed many books. His "Mélanges" conſiſt of ſongs and motets, in French, Italian, and Latin. His ſongs are chiefly French, and in many parts like the madrigals of Italy. Of his pſalms in ſimple counterparts of three and four parts, we have examined three ſeveral editions, printed in different forms and in different countries; and as far as counterpart is concerned we find them admirable. Few of the melodies, we believe, were of his invention, but were the productions of the firſt German reformers; they however went through more editions perhaps than any muſical work ſince the invention of printing.

Claude, Clauda, or Claudius, in *Ancient Geography*, an iſland of the Cretan ſea, mentioned by Ptolemy, and in the Acts of the Apoſtles, (ch. xxvii. 16.) and lying S. of Crete. In Pliny's time it had a city called Gaulos. This iſland is ſuppoſed to be the modern iſle of Gozo

Claude, St., in *Geography*, a town of France, and principal place of a diſtrict in the department of Jura; the place contains 3579, and the canton 14,722 inhabitants; the territory comprehends 382½ kiliometres and 32 communes.

Claude, St., a town of France in the department of Charente, and chief place of a canton in the diſtrict of Confolens; the place contains 2008 and the canton 12,289 inhabitants; the territory includes 295 kiliometres and 17 communes.

CLAUDENDA *curia*. See Curia.

CLAUDENS *palpebras*, in *Anatomy*, a name given by Spigelius, and ſome others, to one of the muſcles of the face, called by Albinus and Winſlow, *muſculus orbicularis palpebrarum*, and by others *ſphincter palpebrarum*.

CLAUDER, Gabriel, in *Biography*, phyſician to the elector of Saxony and member of the Imperial Academy at Vienna, was born at Altenbourg, in the year 1633. After being inſtructed in the Greek and Latin languages, in which he is ſaid to have made great proficiency, he was ſent, at the age of eighteen, to Jena, to be initiated in the different branches of medicine, which he ſtudied under the profeſſors Rolfinck, Moebius, and Schenck. He then went to Leipſic, Holland, and England, converſing, in each place, with the moſt eminent of the profeſſors. Returning by Leipſic, he took his degree of doctor in medicine in 1662. He was a frequent correſpondent of the Acad. Nat. Curioſ. and furniſhed them with a great variety of obſervations, which appear in their collections. In a man who died after almoſt inceſſant vomiting, the ſtomach, omentum, and part of the duodenum, were found in the cavity of the thorax. One patient took thirty, and at length fifty grains of ſolid opium each day, and continued the practice eighteen months, without ſuffering any inconvenience. He gave the hyoſcyamus in dyſentery with ſucceſs. For the titles and accounts of the remaining diſſertations, ſee Haller's Bib. Med. His ſeparate publications are "Diſſertatio de Tinctura Univerſali, vulgo Lapis Philoſophorum dicta," Altemb. 1678, 4to. "Methodus balſamandi Corpora humana, aliaque majora, ſine Eviſceratione et Sectione, hucuſque ſolita." Altem. 1679, 4to. The preparation uſed by him was ſuppoſed to be ſimilar to that employed by De Bils, of which he had heard (ſee the article Bils, De, in Vol. iv. of the Cyclopædia,); it proved equally inefficient. "Diſſertatio de Cinnabari nativa Hungarica, in majorem efficaciam fixata et exaltata." Jena, 1684, 4to. The cinnabar was expoſed to the flame of a lamp for the ſpace of eight or nine months; it was then expoſed to other degrees of heat for about four months longer; at the end of this proceſs it was ſuppoſed to have acquired a ſpecific power over the lues venerea. In this alſo he was unſucceſsful, and we only learn from it that he had an active mind, and was deſirous of doing ſomething beneficial to humanity, and which might tranſmit his name, with credit, to poſterity. He alſo left "Praxeos Medicæ Monumenta generalia," which was publiſhed at Chemnitz, 1729, 8vo. He died Jan. 9, 1691. His nephew, Frederic William Clauder, ſucceeded him in his poſt of phyſician to the elector of Saxony. He was alſo elected member of the Imperial Academy, and, like his uncle, ſent ſome obſervations which were publiſhed in the "Collectanea." Haller, Bib. Eloy. Dict. Hiſt.

CLAUDIA, in *Ancient Geography*, a town of Norica, according to Pliny; named Claudivium by Ptolemy. Cluverius ſuppoſes it to be Clauſen in Bavaria, and Hardouin refers it to Clagenfurt in Carinthia.

Claudia *Regio*, a country of Aſia Minor, in the vicinity of the town of Miletus. Diod. Sic.

Claudia *Via*, a Roman road, in Italy; commencing at the bridge Milvius and joining the Flaminian high-way.

Claudiæ *Aquæ*, two fountains of Italy, in the neighbourhood of Rome. Suetonius.

CLAUDIAN, Claudius Claudianus, in *Biography*, an eminent Latin poet, flouriſhed in the fourth century under the emperors Theodoſius, and his ſons Arcadius and Honorius. Like the epic bard of Greece, various cities have contended for the honour of having given him birth. It has been maintained by ſome that he was a native of Florence, by others, of Gaul, while a third party have ſuppoſed him to have been a Spaniard; but the moſt probable and beſt authenticated accounts, among which may perhaps be placed his own teſtimony, aſſert that he was born at or near Alexandria in Egypt. He was greatly in favour with the celebrated general Stilicho; and enjoyed all the benefit of the extenſive patronage of that commander while he retained his influence and authority in the government of the empire. He was made a tribune and notary, and had, at one time, ſo highly ingratiated himſelf into public eſteem, that the ſenate ordered a ſtatue to be erected in honour of him, in the forum of Trajan, with an inſcription expreſſive of their high opinion of his accompliſhments and practical merit. Serena, the wife of Stilicho, procured for him, by her extenſive intereſt, a moſt advantageous marriage with a wealthy lady of Africa. When his patron was put to death, Claudian conſidering that the favourites of a diſgraced miniſter are generally objects of enmity or ſuſpicion to his ſucceſsful and triumphant adverſaries, haſtily quitted the court. Little is known of his ſubſequent hiſtory; but it has been ſuppoſed that he paſſed the remainder of his days in retirement; it does not appear, however, that he was deprived of any of his dignities. From ſome pieces which have been inſerted by ignorant editors among his poems, it has been thought by ſome that he was a convert to Chriſtianity; but there are the ſtrongeſt reaſons to prove that he was a polytheiſt and idolater to the laſt. Oroſius, particularly, calls him "an obſtinate pagan;" and his own works abound with paſſages which imply that he was a votary of the popular ſuperſtitions of Pagan Rome. Lardner, neverthelefs, quotes him as bearing a remarkable teſtimony to the victory of the Chriſtian emperor Theodoſius in Gaul, and which was decided in his favour by a ſtorm ſo extraordinary in its effects upon the army of his adverſaries as to have been regarded even by Claudian himſelf as a proof of divine interpoſition.

Claudian juſtly holds a diſtinguiſhed rank as a poet. During the decline of Roman literature, he alone has left to poſterity, ſpecimens of compoſition which may be regarded as worthy of the Auguſtan age, for the purity and claſſic elegance of their ſtyle and language. He is by many eſteemed the poet who approached neareſt to Virgil in the dignity and harmonious flow of his verſification. Fabricius ſtyles him "poeta floridus et amoeniſſimi ingenii." His poems, however, diſplay great inequalities of genius; for although he ſometimes aſtoniſhes by the boldeſt flights of imagination, and bears away his readers by the fire and animation of his language, he often flags in the midſt of his fineſt paſſages, and, in his longer poems eſpecially, generally falls off before he reaches the concluſion. His writings are numerous; the principal of his pieces are, a ſevere ſatire which he wrote againſt Ruffinus and Eutropius, who were the rivals of his patron Stilicho; his poems in honour of Honorius and of Stilicho; his "Rape of Proſerpine," the commencement of an epic poem which he never finiſhed; his "Idylliums and Epigrams." The moſt valuable editions of his works are thoſe of Barthius and Heinſius; Delphin, Geſner, 1759; and Burman, 1760. Suidas, Fabricius, Tiraboſchi, Tillemont.

CLAUDIANA, in *Ancient Geography*, a town of Aſia, in Syria, near the Euphrates.

CLAUDIAS, a town of Aſia, in Armenia Minor; ſuppoſed to be the ſame with Claudias, *Ara-Cloudich*, in Comagene, on the right bank of the Euphrates, N.E. of Juliopolis, and S.S.E. of the place where the Euphrates croſſes the Taurus.

CLAUDICATION, in *Surgery*. See Lameness.

CLAUDIO, Lorrenese, or Claude Lorraine, in *Biography*. See Gallie.

CLAUDIOMERIUM, in *Ancient Geography*, a town of Spain, placed by Ptolemy in the country of the Artabri.

CLAUDIOPOLIS, a town of Aſia Minor in Bithynia, called alſo Bithynium by Dion Caſſius and Ptolemy; it is placed on the river Sangar and named Bithynia by Pauſanias.—Alſo, a town of Aſia in Iſauria, according to Ammianus Marcellinus, who ſays that the emperor Claudius ſent thither a colony. It had been epiſcopal.—Alſo, an ancient town of Aſia in the Honoriade, according to the book of the Authentics. It had been epiſcopal according to Hierocles, who diſtinguiſhes it from that of Iſauria.—Alſo, an ancient town of Aſia, in Cataonia, a country of Armenia Minor, according to Ptolemy. Pliny places it in Cappadocia. It was probably the ſame with the Claudiopolis of Iſauria. Theſe towns derived their names from Claudius Cæſar, ſon of Druſus, who eſtabliſhed colonies in various parts of the empire.—Alſo, a town of Galatia, at a ſmall diſtance from the river Halys. It was formerly called Adrapta. Ptolemy calls it the new Clodiopolis, or Neo-

Clodiopolis.—Alſo, a town of Armenia Minor, near the Euphrates, ſuppoſed to be the ſame with *Claudias*.

CLAUDIUS, Tiberius Claudius Drusus Cæsar, in *Biography*, the fifth of the emperors of Rome, was born at Lyons in Gaul, about ten years before the birth of Chriſt. He was the ſon of Nero Claudius Druſus, and Antonia; deſcended on his father's ſide from Livia, the wife of Auguſtus, and on that of his mother, from M. Antony and Octavia, the ſiſter of Auguſtus: he was alſo the nephew of Tiberius, the brother of Germanicus, and the uncle of his predeceſſor in the empire, Caligula. Having loſt his father while he was in his infancy, the care of his education was committed to a preceptor, of whoſe cruel treatment he afterwards loudly complained. Under the tuition of this pedagogue he made conſiderable proficiency in ſeveral branches of learning, and acquired a competent knowledge of the Greek language ſo as to be able to write and ſpeak it with facility; but being all his life time ſubjected to a great variety of bodily diſorders, his judgment and mental powers were ſo greatly impaired and enfeebled, that he was not deemed capable of undertaking any public truſt in the government of the empire. His relations in general rated his abilities very low; even his mother and ſiſter, from whom ſome tenderneſs at leaſt was due to his weakneſſes; and they were not ſparing of their ridicule and declarations of contempt whenever his name happened to become the ſubject of converſation. During the reigns of Auguſtus and Tiberius he was ſuffered to remain in the condition of a private citizen; but when his nephew Caligula obtained the imperial purple, he was dignified with the rank of ſenator, and made the colleague of the emperor in his firſt conſulſhip. During this period he occaſionally preſided inſtead of Caligula at the public games, and was frequently greeted by the acclamations of the aſſembly as the brother of their favourite Germanicus. He was, however, much more commonly the object of contempt than of public eſteem; the domeſtics whoſe duty it was to attend upon him as their maſter, treating him at their pleaſure with the groſſeſt indignities. After ſuffering ſuch various mortifications, in which his life was not unfrequently expoſed to imminent danger, a circumſtance, which to the thoughtleſs mind may bear the appearance of accident, diverted the courſe of events, and raiſed him to the throne of the Cæſars. At the time Caligula was aſſaſſinated, Claudius was in the palace, but was ſo terrified and alarmed at the event, that he retreated to an adjoining balcony, and concealed himſelf in the hangings of a doorway. A ſoldier, who was roaming for ſpoil, obſerving his feet, dragged him from his retreat, but had no ſooner recognized his perſon, than he fell on his knees, ſolicited his pardon, and addreſſed him under the title of emperor. This man, whoſe name was Gratus, was ſoon joined by other ſoldiers, equally diſpoſed, from their attachment to the memory of Germanicus, to ſerve his brother; they placed the terrified emperor in a chair, conveyed him to the camp full of conſternation and fears for his life, and lodged him within the ramparts for the night. On the following morning (January 25th, A.D. 41. A.U. 794.), the ſoldiers formally eſtabliſhed him at the head of the empire, by ſwearing allegiance to him as their lawful ſovereign; for which, it is ſaid, he promiſed to reward them liberally at a future period. The ſenate, when they found themſelves delivered from the ſanguinary deſpotiſm of Caligula, made ſome attempts to reſtore the ancient conſtitution of the commonwealth; but not being ſufficiently prompt in their deciſions, nor cordial in their co-operation, they were obliged to abandon their ſcheme, and ſubmit to the governor whom the military had been pleaſed to inveſt with the inſignia of power. Claudius began his reign with ſeveral acts of lenity, moderation, and juſtice. He publiſhed a proclamation of pardon to all who had in any manner oppoſed his elevation to the throne, or who had been concerned in the late conſpiracy againſt Caligula, ſuch perſons only excepted as had been actually engaged in his aſſaſſination; and it has been thought that he was urged to the condemnation and puniſhment even of thoſe by apprehenſions that his own life was not ſecure againſt their daggers. The laws which were at that time in force concerning treaſon, he aboliſhed, as too tyrannical and ſevere, and releaſed ſuch perſons as had been impriſoned on account of them by Caligula and Tiberius; he aboliſhed ſeveral oppreſſive impoſts which had been extorted by thoſe emperors from the people; and whatever property they had unlawfully taken from their ſubjects, he reſtored to the parties themſelves, if alive, or elſe to their deſcendants. In all theſe proceedings he conducted himſelf with ſingular modeſty and propriety. He did not appear at all elated by the popularity which they acquired him, nor would he conſent to accept the honours which the ſenate had decreed him as a teſtimony of their attachment and gratitude. Theſe were, however, but the tranſient efforts of a character radically feeble and debaſed, too deficient in firmneſs and energy to preſerve an uniformity of virtue, or maintain a ſolid popularity, in a turbulent and licentious age. His natural imbecility of intellect, while it rendered his perſonal conduct in the government feeble and contradictory, made him an eaſy dupe and obſequious ſlave to the bolder ſpirit of his wife, Meſſalina, of infamous notoriety, and of his ambitious and daring freed-men and favourites, Pallas, Caliſtus, and Narciſſus. Their policy was to keep his mind in a ſtate of conſtant alarm, to inſpire him with diſtruſt and ſuſpicion of all who were obnoxious to themſelves, and whoſe rank or influence in the ſtate might render them formidable opponents to their ſchemes of aggrandiſement and blood; and, under feigned pretences of diſaffection and treaſonable deſigns, to obtain from him the imperial ſanction for their unbluſhing enormities of proſcription, baniſhment, and murder. It may be ſaid, that while he wore the purple, the ſceptre was in other hands; and of the many acts of his reign, ſmall indeed is the proportion of thoſe which can with hiſtorical propriety be attributed to the uncontrouled dictates of his own mind. At the inſtigation of the licentious and ſanguinary Meſſalina, Julia, the niece of the emperor, and other women of diſtinction, who were falſely accuſed, were put to death; and Seneca, among other of her victims, baniſhed to Corſica. To the ſame influence, ſupported by the power of her willing miniſters, Narciſſus and his fellow freed-men, we may alſo ſafely refer the frequent execution of Roman ſenators, and of Roman knights, to the almoſt incredible number of three hundred and upwards, who became the unfortunate objects of her ſuſpicion and vengeance. At length, however, ſhe fell a ſacrifice to the unreſtrained impulſes of her licentious paſſions. She became enamoured of Caius Silius, a young Roman of noble birth and remarkable beauty. In order the more ſecurely to carry on her adulterous connections, ſhe cauſed him to be divorced from his wife, whom Tacitus calls "a lady of elevated rank," and inveigled him into her toils by the flattering promiſes of royal favour, and by holding out no very equivocal hopes of future elevation to imperial honours.

It is, perhaps, ſcarcely poſſible to find, even in the annals of declining Rome, a greater monſter of depravity than this woman, or one whoſe character is blackened with darker ſhades of criminality. Inflamed by her guilty paſſion, ſhe broke through every reſtraint of decency; frequented the houſe of her paramour in the moſt open and undiſguiſed manner, loaded ed him with the richeſt preſents, and publicly treated him in every reſpect as if he had been her huſband and the emperor of Rome. The hiſtorical ſtudent almoſt doubts the evidence of facts, when it is added reſpecting her, that, daring beyond all example in iniquity, ſhe had the ſhameleſs effrontery to marry this object of her brutal luſt. She availed herſelf of the abſence of Claudius at Oſtia, to put this final ſeal to her wickedneſs, and to ſtamp her character with indelible infamy. Claudius remained long a ſtranger to her practices and to his own diſgrace, and would probably have become the victim of the adulterous parties, had not Narciſſus, rather fearing their power than abhorring their guilt, taken meaſures to apprize him of his danger, and eventually to effect their downfall and puniſhment. So inſenſible was the diſhonoured emperor of the ſtain which had been inflicted upon his character, that it is doubtful whether he would have puniſhed the defilers of his bed, had he not been urged, and repeatedly impelled to it by Narciſſus, who, availing himſelf of an involuntary conſent extorted from him with great difficulty, diſpatched a tribune to the gardens of Lucullus, where Meſſalina had retired in deſpair, to put her to death. Nothing can give a more degrading idea of the character of Claudius than the account which Tacitus gives of this tranſaction. He was enjoying the luxuries of his table when the intelligence was communicated to him of the death of the empreſs; he received it without emotion, and did not ſuffer her fate, intereſting as it was in many important points of view, to interrupt his pleaſures. He was alike inſenſible to the feelings which ſuch an event might naturally have been ſuppoſed to awake in the breaſt of a huſband, and to the lamentations of his children at the loſs of their mother. After the downfall and death of Meſſalina, Agrippina, the niece of Claudius, artfully availed herſelf of the advantages of acceſs to his perſon which her near relationſhip gave her, to ingratiate herſelf into favour with him, and ultimately ſo completely ſucceeded in her plan, as to induce him to take her for his wife. A vote to recommend, to legalize and juſtify this inceſtuous union, ſo contrary to the Roman cuſtoms, as well as revolting to human nature, was previouſly obtained from the ſenate, who pleaded for the marriage as an event which promiſed to be of the greateſt benefit to the ſtate. As Meſſalina had rendered herſelf unpopular by her various acts of tyranny, Agrippina thought it adviſeable to reverſe, as the firſt act of her power, one of the proceedings which had given moſt offence to reflecting men, by recalling Seneca, whom her predeceſſor had cauſed to be baniſhed; but perhaps her real motive in this affair was to give Domitius, her ſon by a former marriage, the advantage of his inſtruction, in order to raiſe him to the empire, as ſhe afterwards did, to the prejudice of Britannicus, the ſon and legitimate heir of Claudius. From the proceedings of the government, it ſoon appeared that Claudius had only exchanged one miſtreſs for another. As he had formerly been the dupe and the ſlave of Meſſalina, ſo was he now the tool and the vaſſal of Agrippina. Her whole ambition was to obtain the future ſovereignty for her own ſon, and to this all the efforts of her craft and power were directed. Whoever was conſidered as hoſtile to her views, was ſoon removed from the ſituation where he might have the means to embarraſs her proceedings, and none were admitted to offices of truſt and honour but ſuch as were ſubſervient to her will and devoted to her cauſe. As ſome of her meaſures, reſulting from extreme anxiety, were proſecuted with too little diſguiſe and precaution, Claudius was privately appriſed of their dangerous and threatening nature. In the paroxyſm of terror, which never failed to alarm him, when he had reaſon to ſuſpect treaſonable deſigns againſt his life, he gave vent to his feelings in expreſſions of threatening import, which ſoon reached the ears of Agrippina. She no ſooner learned his ſentiments than ſhe fully apprehended her danger. She ſaw that ſtrong meaſures muſt be purſued before her object could be ſecured, and that the utmoſt promptneſs was neceſſary in the execution of them. To rid herſelf therefore of every cauſe of alarm, and of every chance of oppoſition, ſhe took an early opportunity of adminiſtering poiſon to him in a favourite luxury of his taſte. This had the intended effect, and proved fatal to him, A. D. 54, in the 64th year of his age, after having worn the imperial purple 14 years.

When the imbecility of his character is conſidered, no perſonal military achievements of importance can be expected to have added glory to his reign. But though the throne of the Cæſars was occupied by a being ſcarcely human in reſpect to mental capacity, the empire was not without military commanders to ſupport the dignity of the Roman name. In Germany, Corbulo and Galba led the Roman legions to victory and conqueſt; while Plautius carried the Roman eagle triumphantly through many of the fertile provinces of Britain. At the time this general was purſuing his conqueſts, Claudius himſelf, deſirous of obtaing the nominal honours of a triumph, paſſed over into Britain, and after witneſſing ſome of the ſucceſſes of his troops returned to Rome, to decorate his brow with the honours which had been hardly earned by the valour of his generals and their brave followers. Plautius was ſucceeded by Oſtorius, who proſecuted the ſucceſſes of his predeceſſor, and vanquiſhed the brave and noble Caractacus. Claudius, however, though he could hardly flatter himſelf with the hope of high diſtinctions as a military man, was ambitious of literary reputation. Several compoſitions of his in the Greek and Latin languages are mentioned by Roman writers; but he ſignalized himſelf principally by his attempt to improve the Roman alphabet. He added three letters to thoſe already in uſe, which were adopted pretty generally during his reign; but his ſucceſſors do not appear to have been convinced of their utility, as they were not uſed after his death. His reign did not, however, paſs without ſome public works of national importance. The better to provide the city of Rome with grain from foreign markets in years of ſcarcity, he formed a port at Oſtia, at the mouth of the Tiber. He cut a grand canal with the view of draining the water of the Fucine lake, and recovering the land which it inundated for the purpoſes of agriculture. This was an undertaking of aſtoniſhing difficulty, which employed for eleven years nearly thirty thouſand labourers; it did not, however, fully ſucceed, nor produce a benefit at all adequate to the immenſe expence beſtowed upon it. But perhaps Rome was moſt indebted to this emperor for completing an aqueduct of ſtupendous magnitude, which had been begun by Caius, by which the city was ſupplied with the delightful waters which iſſued from the ſprings of the neighbouring hills. The character of Claudius was a ſtrange mixture of good and bad qualities. The former, however, loſt their effect in his conduct from the want of energy and firmneſs of mind to act in conformity to their dictates; and the latter, operating with equal blindneſs and indiſcrimination, led him, in the adminiſtration of the empire, to the moſt wanton acts of cruelty, and the moſt barbarous meaſures of tyranny and oppreſſion. His puerile attempts to adminiſter juſtice in perſon, ſeemed only to defeat the very end he aimed to ſecure, and to render him ridiculous in the eyes of an indignant public; and his impotent endeavours to cruſh the immediate objects of his ſuſpicion and hatred, inſtead of effecting their deſtruction, moſt commonly recoiled with accumulated force againſt himſelf, and rendered him the object of vengeance rather than the diſpenſer of deſtruction and death. But it is uſeleſs to dwell upon a character which has nothing in it worthy of the notice of poſterity. He died lamented by none,—deſpiſed by all; and was ſucceeded by Domitius, the ſon of Agrippina, who is better known under the name of Nero. Suetonius. Tacitus. Tillemont.

CLAUDIUS, M. AURELIUS, (ſometimes called CLAUDIUS II.) was a native of Illyricum, and moſt probably a perſon of mean and obſcure parentage. He was early diſtinguiſhed for his military talents, and, after having gained the approbation and confidence of the emperor, the ſenate and the people of Rome, was promoted by Decius to the chief command of the Illyrian frontier, and of the troops which were ſtationed in Thrace and the neighbouring provinces. At this period the barbarians of the north were frequent in their incurſions into the Roman territories, and afforded the Roman legions full employment to repel their attacks. On the ſide of Illyricum Claudius had to contend with the Goths; and by his ſkill and bravery obtained a victory over them, for which the ſenate decreed him the honour of a ſtatue. The emperor Gallienus viewed his ſucceſs and popularity with a different eye; but, dreading a rupture with a man who, by his great ſervices in ſupporting the tottering fabric of the ſtate againſt thoſe powerful enemies who were aſſailing its foundations, and who ultimately effected its ruin, was regarded with juſt eſteem by all ranks of citizens, he thought it beſt to temporize, and to diſguiſe his real feelings by rich and munificent preſents, which were intended to lure the mind of Claudius to a belief that it was the ſincere wiſh of the emperor to cultivate his friendſhip. Gallienus, during the ſiege of Milan, where Aureolus, an impoſtor, and his deſperate followers, had ſhut themſelves up, was treacherouſly killed by ſome of his own officers; and Claudius, though at the time abſent on duty at another poſt, has not eſcaped ſuſpicion of being privy to the conſpiracy. Perhaps, however, his ſubſequent elevation is the only circumſtance which can be ſaid to give a colour of probability to ſo foul an imputation. It is ſaid, that when Gallienus found that his wound was likely to prove mortal, he nominated Claudius his ſucceſſor, and ſtrongly recommended him to the choice of the ſoldiers and the ſenate. The conſent of the latter was eaſily obtained, for he was already their favourite; and the concurrence of the former was ſecured without much difficulty by large promiſes of reward. Claudius was, therefore, inveſted with the imperial purple, A. D. 268, and as nearly as can be judged in the fifty-fourth year of his age. He proſecuted the ſiege of Milan with redoubled vigour, and ſoon compelled Aureolus to ſurrender at diſcretion, and ſubmit to the fatal doom which the army adjudged to be his due. His unfortunate adverſary was, however, executed contrary to his wiſhes. Claudius, on coming to the throne, found himſelf placed in a ſituation crowded with difficulties, and with dangers of the moſt threatening kind. The emperors whom he was called to ſucceed, abandoned to the debilitating luxuries and pleaſures of the age, had neglected the diſcipline of the troops, and relaxed in the maintenance of that regular ſubordination which had in former times trained them up to be the conquerors and the maſters of the world; and had by this means weakened the barriers of the empire, which were now every where aſſailed by the moſt formidable and determined enemies. The firſt care of Claudius was to correct, as far as circumſtances would admit, the error of his predeceſſors; to controul the licentiouſneſs of the military, and to impart to them the energy and bravery as well as the name of Roman ſoldiers. Having, in ſome meaſure, ſucceeded in his undertaking by the judicious uſe of his influence over them, he prepared to put their valour to the ſevereſt teſt. The Gothic nations on the ſhores of the Euxine had aſſembled a formidable armament near the Nieſter, where, from two to four thouſand tranſports were prepared to convey them towards the Grecian provinces. After various viciſſitudes, in which, from want of nautical ſkill, and from the unpropitiouſneſs of the weather, they ſuffered very extenſive loſſes, a body of them, ſaid to amount to the almoſt incredible number of three hundred and twenty thouſand, landed near mount Athos, and laid ſiege to the city of Theſſalonica. Claudius, on the firſt intelligence of their invaſion, marched with all poſſible expedition to check their progreſs, and avert the deſolation with which they threatened the empire. While on his way, he addreſſed a letter to the ſenate, which is ſtill extant, expreſſive of the great diſadvantages under which he would have to combat his formidable adverſaries, from his want of arms of almoſt every deſcription, and, more than all, from the imbecile and puſillanimous ſpirit with which the depravity of the times had infected the legions which attended him. It diſplays, however, a brave, determined, and dignified courage in himſelf, by which he appeared prepared to contend for victory with unbending reſolution, and to enjoy the honour of conqueſt, or to ſubmit to defeat without deſpondency. He firſt engaged the Goths at Naiſſus, in Dardania. His troops, overpowered by numbers, began to give way; but a detachment, which had been purpoſely ſtationed in ſome of the defiles of the mountains, iſſued forth in the critical moment, attacked the enemy in the rear, inſpired their countrymen with new courage, and ultimately cauſed the barbarian hordes to fly in diſorder, and to leave behind them fifty thouſand of their number dead upon the field of battle.

Claudius delayed not to proſecute the advantages he had almoſt unexpectedly obtained; but his progreſs was, nevertheleſs, an arduous ſtruggle againſt the deſperate efforts of a determined foe. The Goths rallied their troops; and, while they retreated towards Macedonia, reſolutely contended for every inch of ground over which they had to paſs. Their army was, however, at length deſtroyed, through the ſuperior ſkill of Claudius, and his intimate acquaintance with the country; and his ſoldiers obtained a rich booty of cattle and ſlaves as the reward of their toils. The few that eſcaped the ſword of the vaſt multitude which, but a ſhort time before, had ſpread like locuſts over the ſhores of Greece, took refuge in the precipitous retreats of mount Hæmus, where want, and the inclemency of winter, ſoon leſſened their number, and completed their wretchedneſs. By this ſignal and ſplendid victory Claudius merited the higheſt reward from his countrymen. It was, indeed, ſcarcely poſſible to over-rate his ſervices, ſince he contributed moſt eſſentially to ſupport the falling greatneſs of the empire, and to ſave it from ſinking at once beneath the power of enemies, who, like a mighty torrent, were rolling towards it, and threatening it with inſtant and complete deſolation and ruin. He did not live, however, to enjoy the glories of the triumph, nor to receive the plaudit he had ſo well deſerved. He fell a victim at Sirmium to the peſtilence which had broken out among the Gothic fugitives, after a reign of two years, which, for its length, may vie in ſplendour with any that are recorded in the page of hiſtory. He was ſucceeded by Aurelian, one of his generals, who afterwards proved himſelf worthy of the partiality to which he owed his elevation. Crevier. Gibbon.

CLAUDIUS, APPIUS, a Sabine by birth, whoſe original name was Atta, or Aetius Clauſus. He was a man of ſome conſequence in his own country, but conceiving himſelf to be ill uſed by a factious party who were endeavouring to ſtir up a war againſt the Romans, he removed (about A.U. 254, B.C. 500.) with a large body of his partizans to Rome, where he was well received, and admitted into the patrician order. On this occaſion he changed his name to Appius Claudius, and became the founder of one of the moſt illuſtrious of the Roman families. He was elected conſul with Publius Servilius A.U. 259. B.C. 495., and became the reſolute opponent of the common people in their turbulent demands to be relieved from the operation of the laws then in force againſt debtors. He withſtood them with firmneſs and with ſome ſeverity, and by that means gained the eſteem and confidence of the ſenate; while his colleague, who wanted his energy and deciſion of character, by purſuing half meaſures with them, forfeited the reſpect of both parties. He afterwards ſhewed the ſame ſpirit of hoſtility to the plebeians, in his oppoſition to the Agrarian law; and on all public occaſions ſtood forward the moſt determined ſupporter of the power and authority of the patricians. The imperfection of the hiſtorical documents of this early age prevent our being able to ſtate the time of his death. Livii Hiſt. lib. ii.

Claudius, Appius, was the ſon of the preceding, and equally diſtinguiſhed for his ſupercilious contempt of the plebeians, and his reſolute hoſtility to all the public meaſures which originated with them. Volero, one of the tribunes of the people, propoſed a new law for determining the election of their magiſtrates, which went very much to reſtrict the power which the patricians had before poſſeſſed on ſuch occaſions. The ſenate, therefore, to maintain their former influence, obtained the conſulſhip for Claudius (A.U. 283. B C. 471), who they knew would not be wanting in exertions to ſupport their cauſe; and gave him for a colleague, Titus Quintius, a man of milder temper and more conciliatory diſpoſitions. Notwithſtanding, however, all that Claudius could do, the law of Volero paſſed, and he had the mortification to find himſelf defeated by men whom he deſpiſed. He vented his ſpleen in invectives againſt the ſenate, and attributed his failure to their cowardice in withholding from him the aſſiſtance and ſupport it was in their power to have rendered him. While theſe diſſentions were embroiling the citizens of Rome in ſevere conteſts againſt each other, their attention was called to the hoſtile menaces of external foes. The Æquans and Volſcians had availed themſelves of theſe diviſions to take the field, and had invaded the Roman territories. Quintius was diſpatched againſt the Æquans, and Claudius againſt the Volſcians. He was no ſooner inveſted with the command, than he gave full vent to the ill-will and hatred which burned in his breaſt, by treating the ſoldiers with the moſt unjuſtifiable harſhneſs and ſeverity; and his conduct had the natural effect of rendering more inveterate the averſion in which he was before held by them. This he ſoon had a painful opportunity of knowing; for when his troops had drawn near the enemy, and it became neceſſary for him to lead them to battle, they threw down their arms in diſguſt, and fled with the utmoſt precipitation towards the city, diſgracefully abandoning their ſtandards to an enemy whom they might eaſily have vanquiſhed. For this deſertion of duty, and flagrant violation of diſcipline and ſubordination, they were however afterwards puniſhed by their incenſed general; ſome he beheaded, others he cauſed to be beaten with rods, and the remainder he puniſhed by decimating them, and inflicting the penalty on every tenth man, who was ſelected by lot. In the year following freſh conteſts aroſe between Claudius and the people. Having been particularly active in his oppoſition to the Agrarian law, a proſecution was inſtituted againſt him by the tribunes, and he was compelled to appear before the tribunal of his determined foes. He held their perſecution of him however in ſovereign contempt. He refuſed to put on the humiliating dreſs which it was uſual for an accuſed perſon to wear during his trial, and unawed by the dangers which threatened him, he pleaded his cauſe with the ſame boldneſs of demeanour, the ſame unbending ſtubbornneſs of ſpirit, and the ſame bitterneſs and violence of expreſſion, which characterized his proceedings and harangues when he was armed with the conſular authority; and it is ſaid by his hiſtorian, Livy, "that the people confeſſed themſelves more awed by the culprit than they had been by the conſul." The impreſſion which his firmneſs made on his accuſers and judges cauſed the trial to be adjourned to a future day; but before that day arrived, he was ſeized by a diſorder which ſoon terminated in his death. He was buried with honours ſuitable to his rank and character; and in liſtening to the encomiums pronounced over his grave, the multitudes who attended, and who but a ſhort time before were bent upon his deſtruction, convinced of their juſtneſs, forgot their enmity in the admiration of his virtues. Livii Hiſt. lib. ii.

Claudius, Appius, the *Decemvir*, has been thought to be the ſon of the laſt-mentioned of the ſame name, and was the firſt perſon elected to that office (A.U. 303. B.C. 451.) on the change of the conſtitution of the commonwealth. He inherited from his anceſtors all that averſion to the common people, for which they had been remarkable; but being ambitious of popular honours, he changed his tone, and became, before his election to the decemvirate, their warm advocate and friend. His favour with the common people enabled him to procure the office a ſecond time, and to chooſe, as his colleagues, men of the moſt worthleſs characters, who were not likely to thwart him in any of his ſchemes, whatever might be their iniquity. With the concurrence of this faction, he ruled the commonwealth with a rod of iron, and contrived, under various pretences, to extend the period of his office beyond the year, the regular term of its duration; and from the numerous partizans which he had acquired among the plebeians, and the young and diſſipated part of the nobility, would probably have reſiſted with ſucceſs every attempt to effect his downfall, or to control his power, had not a circumſtance happened which at once laid bare the baſe iniquity of his character, and rouſed the generous indignation of an inſulted people. During the abſence of the other decemvirs in the army, and when, according to the laws, he poſſeſſed ſupreme power, he became enamoured of a young and beautiful woman, of the name of Virginia, whoſe father, Virginius, was a centurion in the army. Having in vain practiſed every inſidious art, and tried every vile expedient to ſubdue her virtue, he determined upon a device as daring as it was abominable to gratify his luſt. He inſtructed one of his creatures, Marcus Claudius, to claim her as his ſlave, who had been clandeſtinely taken from him, and at all events to obtain poſſeſſion of her perſon, and detain her in cuſtody until he, as ſupreme judge, ſhould think proper to decide the ſuit. The abſence of her father on duty with the army, left him no room to doubt but by this means his purpoſe might be ſecured. According to this ſcheme, Marcus embraced an early opportunity, and ſeized the devoted girl in the public forum; but his conduct exciting the indignation of the populace, who were not inclined to credit his tale, or acknowledge his claim, he found it moſt prudent not to uſe violence, but to ſummon her before the tribunal of Claudius, where he well knew what ſentence to anticipate. Claudius, that his deſigns might be in ſome meaſure diſguiſed, conſented to put off his deciſion on the caſe till the morrow, to give time for her father to attend in her behalf; but, at the ſame time, to accompliſh his purpoſe, he ordered that ſhe ſhould in the interim remain under the care of Marcus. On paſſing this decree, Icilius, a young man to whom ſhe had been betrothed, alarmed at the danger which threatened the object of his affection, addreſſed Claudius in the bittereſt terms of reproach, expoſed his evil intentions, and ſo wrought upon the feelings of the populace, that the decemvir found himſelf reluctantly obliged to put off the execution of his deſign one day longer. To this, however, he ſubmitted the more readily, becauſe he did not think Virginius would be able to reach the city time enough to prevent the decree he meant to paſs. But Icilius was too deeply intereſted in the event, to loſe his cauſe through procraſtination. He diſpatched meſſengers to the camp even before Appius had quitted the judgment ſeat, and early on the morrow the anxious father was in the city. He proceeded to the forum, attended by his daughter, and ſeveral matrons, all clothed in mourning, to denote their diſtreſs; and on his way intereſted all men in his behalf, by the greatneſs of his affliction, and the danger which threatened his child. Claudius was already in waiting, and the claimant no ſooner began to plead, than he interrupted him, and peremptorily decreed, that Virginia ſhould be held in ſlavery, until he ſhould finally decide her caſe. At this dreadful ſentence every heart was petrified with horror; but Claudius, who alone beheld unmoved the agonizing ſpectacle, commanded the armed men with whom he had crowded the forum, to diſperſe the populace, who had cloſed round Virginius to ſupport him. They retired, however, of their own accord; and the diſtreſſed father beheld himſelf deſerted and forſaken, hopeleſs of aſſiſtance to protect his daughter from violence and from ſhame. Suppreſſing for a moment the tumultuous feelings of indignation which burned within him, he addreſſed Claudius in ſupplicating tones, praying permiſſion to withdraw a little to make ſome inquiries of Virginia's nurſe on the ſubject in diſpute. He accordingly retired a ſhort way towards the butchers' ſheds, and, burſting with grief and deſpair, ſeized a knife and plunged it into his daughter's heart. "Thus, my Virginia," ſaid he, "the only way in my power, do I ſecure thy freedom!" Then, turning to Claudius, "Appius," he exclaimed, "with this blood I devote thine head to deſtruction!" He then ruſhed from the crowd in deſperation, clearing his way with the knife, which he ſtill held in his hand. Icilius caught up the body of his eſpouſed bride, and held it up to the view of the aſtoniſhed multitude, and, by his pathetic expoſtulation, fired them with honeſt indignation and abhorrence of the monſter who had been the real cauſe of the dreadful deed. Virginius had now reached the camp, and intereſted the great body of his brethren in arms in his diſtreſs. They unanimouſly agreed to avenge his wrongs, and inſtantly marched in a body to Rome. They demanded that the power of the decemviri, which they had ſo groſsly abuſed, ſhould be aboliſhed; and the ſenate, dreading farther miſchief, thought proper to comply. The old conſtitution being eſtabliſhed, Virginius inſtituted a proſecution againſt Claudius for malverſation, and cauſed him to be committed to priſon, where, unable to bear the mortifications of his ſituation, and the diſgrace which had overtaken him, he put a period to his exiſtence. Livii Hiſt. lib. iii.

Claudius, Appius, commonly called *Cæcus*, or the Blind, was a deſcendant of the preceding, and much eſteemed for his abilities, and for the public works completed under his care and direction. He is mentioned as being cenſor, A.U. 442. B.C. 312. with Caius Plautius for his colleague. Caius, diſguſted with ſome proceedings regarding the choice of ſenators, reſigned his office, and Claudius undertook its duties alone. He has perpetuated his memory by the great road which he cauſed to be made from Rome to Capua, a diſtance of 140 miles; and alſo by an aqueduct which was finiſhed in his cenſorſhip, and which brought a plentiful ſupply of water 7 miles to Rome. (See Appian Aqueduct, and Appian Way.) He introduced an innovation into the order of the prieſts employed at the altar of Hercules, which gave great offence, by taking it from the Potitian family, who claimed it as their hereditary right, and conſigning it to perſons of meaner birth, and even to emancipated ſlaves. The abhorrence in which this tranſaction was viewed by the Romans, may be eſtimated by the language in which it is ſpoken of by Livy, who gravely ſtates, that it was followed by very fatal conſequences to the deſcendants of the Potitian family, and attributes to the wrath of the gods on the occaſion the blindneſs with which Claudius was afflicted in his old age. In the year of Rome 446, B.C. 308, he was created conſul, with Lucius Volumnius for his colleague, and was elected to that office a ſecond time, with the ſame aſſiſtant, A.U. 456, B.C. 298. Soon after this election he was ſent towards Etruria, to meet the combined armies of the Samnites and Etruſcans, who threatened the Roman frontier. His engagements with them were a ſeries of ſucceſſive diſaſters, in which he loſt his credit with his troops for military ſkill. Claudius was ſo greatly mortified at his defeats, that it was with the greateſt reluctance he would ſeem to admit his inadequacy to combat the enemy, by admitting his colleague to bring in his forces to his aſſiſtance. When, however, he had ſubmitted to this, and the armies were again engaged, he is ſaid to have diſplayed the higheſt degree of perſonal bravery, and to have contributed very greatly to the ſucceſsful iſſue of the engagement. The time of his death is not mentioned. Livii Hiſt. lib. ix. x.

Claudius is a name common to ſeveral other perſons who are occaſionally mentioned in the Roman hiſtory; but none of them are of ſufficient importance to demand particular biographical notice in a work of this nature.

Claudius, in *Ancient Geography*. See Claude.

Claudius *Mons*, a range of mountains in Pannonia, which ſeparated the territory of the Tauriſci from that of the Scordiſii. Pliny.

CLAVE, in *Block-Making*, a ſtool 14 inches high, made of elm, and ſupported by 4 legs; the top 6 feet long, 2 or 3 feet wide, and 8 inches thick at each end, and only 4 inches thick in the middle, in which the ſhells are ſet up with wedges for making the ſheave-holes.

CLAVECIN, Fr. in *Muſic*, a harpſichord.

Clavecin *oculaire*, an ocular harpſichord. Father Caſtel, an ingenious and whimſical Jeſuit, who was a geometrician and a great mechanic, paſſionately fond of muſic, finding in ſir Iſaac Newton's "Optics," that he compared the ſeven priſmatic colours to the ſeptenary or ſeven notes that lead to the octave in muſic, imagined it poſſible to excite the ſame ſenſations of pleaſure to the eye by the melody and harmony of colours, as the common harpſichord produces to the ear by a ſeries or combination of ſounds.

He ſuppoſed that there was in nature a primitive and fundamental ſound, and called that ſound C; and that there was likewiſe in nature a principal and original colour, or key-note, among colours, which was the baſe and fundamental of all other colours, and that this was the primitive colour *blue*. And further, as there are in muſic three tones or eſſential ſounds dependent on the primitive ſound C, which compoſe the perfect or common chord C E G, or 8th, 10th, and 12th of the fundamental C; there are likewiſe three original colours dependent on *blue*, that are not compounded of any other colours, but are diſtinct and original: theſe are *blue*, *yellow*, and *red*. Blue is the key-note, red the 5th, and yellow the 3d or 10th.

There are in muſic five tones, and two ſemi-tones, C D E G A, and F B. There are likewiſe five primitive whole colours, *blue*, *green*, *yellow*, *red*, and *violet*, and two ſemitonic colours, *orange* and *purple*. The ſcale of muſic is therefore C D E F G A B, and the ſcale of colours, *blue*, *green*, *yellow*, *orange*, *red*, *indigo*, and *violet*; and as the whole tones in muſic are divided into half notes by flats and ſharps, ſo the colours may be ſhaded off by the neighbouring colours, and rendered *demi blue*, *demi-yellow*, &c. going through the whole muſical ſyſtem, and compoſing colours upon the original ſeptenary to ſuit all kinds of modulation.

It was ſo early as the year 1725, that Pere Caſtel announced his idea of an ocular harpſichord, and wrote an ingenious paper or memoire on the ſubject, in the "Journal des Savans," to which he long contributed; Diderot likewiſe drew up a deſcription of the new inſtrument, and the celebrated German muſician, Tilemaun of Hamburgh, undertook to compoſe for it. A pamphlet on the ſubject was publiſhed in London about the year 1750, preparatory to an exhibition, and great expectations were raiſed in the credulous all over Europe.

Pere Caſtel in his youth chiefly attached himſelf to geometry, and publiſhed many tracts that were eſteemed for their originality. His ſtyle was lively, free, natural, ſimple, and ſentimentally energetic; but without method, and ſo viſionary and whimſical, that he often touched and affected his readers at the ſame time that he made them laugh; and it was by this means that he amuſed and perſuaded. His project of a *clavecin oculaire*, upon trial, was found ridiculous and impracticable, and was ſoon forgotten. He died in the year 1757, at the age of 68; and in 1763 there was publiſhed a collection of the bons mots, ſallies, and ſingularities of Pere Caſtel.

CLAVELLATI CINERES. See CINERES.

CLAVENNA, in *Ancient Geography*, a town which belonged to the Helvetians, placed by the Itinerary of Antonine 10 miles from Larius lacus, or the lake of Como.

CLAVERACK, in *Geography*, a poſt town of America, in the ſtate of New York and county of Columbia, pleaſantly ſituated on a large plain, about 2½ miles eaſt of Hudſon city, near a creek of the ſame name. It contains about 60 houſes, a Dutch church, a court-houſe, and a gaol. By the cenſus of 1791, the townſhip contained 3262 inhabitants, including 320 ſlaves. By the ſtate cenſus of 1796, it had 412 electors. It is diſtant 231 miles from Philadelphia.

CLAVES *inſulæ*, a term uſed in the Iſle of Man, where all ambiguous and weighty caſes are referred to twelve perſons, whom they call *claves inſulæ*, i. e. *the keys of the iſland*.

CLAVICHORD, in *Muſic*, a keyed inſtrument, long known, and ſtill much uſed in Germany. Its form is that of a ſmall piano forte; it has no quills, jacks, or hammers. The ſtrings are all muffled with ſlips of red cloth, and the tone is produced by little braſs wedges, placed at the ends of the keys, which, when put down, preſs againſt the middle of the ſtrings, acting as a bridge to each. When this inſtrument is touched by a great maſter, it is capable of great expreſſion, though of a melancholy kind, ſomething like the effect of the old cloſe-ſhake on the violin. We had in 1772, the extreme pleaſure of hearing the incomparable Emanuel Bach touch his favourite clavichord at Hamburgh; when he threw away ſuch thoughts and execution in his *toccate* or preludes, as alone would have ſet up a young profeſſor, and have eſtabliſhed the character of a great muſician.

In pathetic and ſlow paſſages on this inſtrument, whenever he had a long note to colour, he abſolutely produced the effect of a cry of ſorrow and complaint, ſuch as could only be effected on the clavichord, and perhaps by himſelf.

The antiquity of this keyed inſtrument in Germany is very great among modern muſical inventions; as there is a deſcription and a repreſentation of it cut in wood, in the Latin "Muſurgia" of Ottomarus Luſcinius, printed at Straſburg in 1536. But we find mention made of it, as a common inſtrument, in England, under the name of *clarichord*, by Taverner, ſtill more early.

CLAVICITHERIUM. See CITOLE.

CLAVICLE, *Clavicula*, in *Anatomy*, one of the bones of the ſhoulder, connecting the acromion proceſs of the ſcapula with the firſt bone of the ſternum. See SKELETON.

CLAVICLE, *Fracture and Diſlocation of*. See FRACTURE and DISLOCATION.

CLAVICULUS, in *Botany*, an old term for a tendril. See CIRRUS. Linnæus has ſtill retained it in the name of *fumaria claviculata*, a plant whoſe leaf-ſtalks end in branched cirri; while he has called a neighbouring ſpecies, *capreolata*, the leaf-ſtalks of which themſelves perform the ſame office, without any ſuch branching terminations. This is an eſſential difference between the two ſpecies, which their names do not indicate.

CLAVICYMBALUM, in *Antiquity*, a muſical inſtrument with thirty ſtrings, in a perpendicular ſituation.

Modern writers apply the name to our harpſichords.

CLAVIER, *French*, implies, in *Muſic*, what we mean by the complete ſet of keys on the organ, harpſichord, pianoforte, virginal, clavichord, and ſpinet. When it is ſaid of a performer on any of theſe inſtruments, *qu'il ſait bien ſon clavier*, it implies that he has a good method of fingering, underſtands modulation, and has a neat and clean execution: as we ſay in England of a great player on the violin, that he knows the finger-board well.

CLAVIJA, in *Botany*, Boſc. Nouv. Dict. Flor. Peruv. Pl. 30. Claſs and order, *polygamia diœcia*.

Gen. Ch. *Cal.* five-leaved; leaves nearly round. *Cor.* wheel-ſhaped; mouth cloſed with five oblong projections; border five-cleft; ſegments almoſt round. In the male flower, tube membranous, ten-toothed, covering the abortive germ. *Stam.* five. In the female, tube none. *Stam.* five, barren. *Piſt.* Germ ſuperior, egg-ſhaped; ſtigma ſeſſile, umbilicated. *Peric.* Berry globular, one-celled. *Seed* ſolitary, uniform, very hard, enveloped in the pulp, and ſeated on a fleſhy receptacle. The hermaphrodite and male flowers are on different plants. Four ſpecies, all ſhrubs, are found in Peru. Boſc.

CLAVIOL, a muſical inſtrument, ſaid in the *True Briton*, Auguſt 9 1802, to be conſtructed by a Mr. Hawkins of New York. By the deſcription in this paper, it ſeems much to reſemble the lyrichord of Plinius, that was exhibited for two or three years in the middle of the laſt century; the tones of which were produced by wheels refined, which in their revolution acted as ſo many fiddle bows; the ſtrings being brought into contact with the wheel by the preſſure of the fingers on the key. One peculiarity in the lyrichord was, that the ſtrings were tuned by weights. The baſes were very fine, but the treble ſcreamed intolerably. Plinius was a German, and the firſt who attempted to make large pianofortes in England.

The inſtrument called a *claviol* by Mr. Hawkins, "produces its effects from bowel ſtrings, by a refined horſe-hair bow, and is played with finger keys, like the harpſichord. The tones of this inſtrument are ſtated to poſſeſs the ſweetneſs of the armonica, the richneſs of the violin, and the grandeur of the organ." We have never heard or ſeen this inſtrument, and have not diſcovered that any one has been ſent to England; and only give this account of it as an advertiſement. If its perfections are not exaggerated its invention would be a valuable diſcovery.

CLAVIS, a Latin word, ſometimes uſed in Engliſh writers for a key.

CLAVIUS, Christopher, in *Biography*, a German Jeſuit, was born at Bamberg, in Germany, in 1537, and became a very ſtudious mathematician, and a voluminous writer. His works containing a complete courſe of mathematics, and conſiſting chiefly of elementary treatiſes and commentaries on Euclid and others, without any original inventions, amount to five large folio volumes. Pope Gregory ſent for him to Rome for the purpoſe of aſſiſting other learned perſons in the reformation of the calendar; and he afterwards engaged in the defence of it againſt Scaliger, Vieta, and others, by whom it was attacked. He died at Rome, Feb. 6th, 1612, at the age of 75 years.

CLAVO, in *Geography*, a town of Corſica; 8 miles E.S.E. of Ajaccio.

CLAUS, a town of Germany, in the county of Bregentz; one mile N.N.E. of Bregentz.

CLAUSE, an article, or particular ſtipulation in a contract; a charge or condition in a teſtament, &c.

We ſay, a *derogatory clauſe*, *penal clauſe*, *ſaving clauſe*, *codicillary clauſe*, &c.

CLAUSEN, in *Geography*, a town of Germany, in the Tyroleſe; 6 miles S.W. of Brixen.—Alſo, a town of Germany, in the circle of the Lower Rhine, and electorate of Treves; 5 miles S. of Wittick.

CLAUSENA, in *Botany*, Lam. Encyc. Juſſ. 430. Burm. Fl. Ind. 87. Claſs and order, *octandria monogynia*. Nat. ord. *Uncertain*, Juſſ.

Gen. Ch. *Cal.* one-leafed, ſhort, rather flat, four-toothed. *Cor.* Petals four, round, ſeſſile. *Stam.* Filaments eight, ſhorter than the corolla, awl-ſhaped, thickened, and hollow at the baſe; anthers round, verſatile. *Piſt.* Germ ſuperior, roundiſh; ſtyle cylindrical, ſhorter than the ſtamens; ſtigma ſimple.

Sp. C. *excavata*, Lam. Ill. Pl. 310. A ſhrub. Leaves alternate, winged; leaflets numerous, petioled, oval-oblong, ſlightly crenulate, pubeſcent. *Flowers* in a panicled raceme. *Fruit* unknown. A native of the iſland of Java.

CLAUSENBURG. See Colosoar.

CLAUSENTUM, in *Ancient Geography*, a town of Albion or England, marked in the Itinerary of Antonine, on the route from Regnum to Londinium, between Regnum and Venta Belgarum, 20 miles from the former, and 10 from the latter. It is ſuppoſed to have been Old Southampton. Dion Caſſius ſays, that this town had been celebrated before the reign of Claudius, and that it had been the reſidence of Dunobelin.

CLAUSIT *extremum diem*. See Diem.

CLAUSTHAL, in *Geography*, a town of Germany, in the circle of Lower Saxony, and principality of Grubenhagen, containing 800 houſes, 2 churches, an houſe of orphans, a public ſchool, a ſmall garriſon, and a mint for coining money, and having near it ſilver mines; 15 miles S. of Goſlar.

CLAUSTRAL *Prior*. See Prior.

CLAUSULA, in *Ancient Geography*, a river of Illyria, according to Livy, who ſays that it watered the town of Scodra, on the eaſtern ſide.

CLAUSUM *fregit*, in *Law*, an action of treſpaſs; thus called, becauſe the writ demands the perſon ſummoned to anſwer to *quare clauſum fregit*, of the plaintiff, why he committed ſuch a treſpaſs? See Capias.

CLAUSZ, in *Geography*, a town of Germany, in the archduchy of Auſtria, 177 miles S.S.W. of Steyr.

CLAUSZNITZ, a town of Germany, in the circle of Upper Saxony, and territory of Erzgebirg; 14 miles S.S.E. of Freyberg.

CLAUTINATII, in *Ancient Geography*, one of the moſt turbulent people of Vindelicia, according to Strabo. They are ſuppoſed to have occupied both banks of the Inn, near its junction with the Danube.

CLAVUM *Veneris*, in *Botany*, a name given by ſome authors to the *water-lily*, or *nymphæa*.

CLAVUS, in *Antiquity*, a band, or fillet of purple, worn on the breaſt by the Roman ſenators and knights, more or leſs broad, according to the dignity of the perſon; from the proportions of which aroſe the difference of *tunica anguſticlavia*, and *laticlavia*. See Tunica. This ornament, according to ſome, was called *clavus*, *nail*, as being ſtudded with little round plates of gold, or ſilver, like the heads of nails. Cantelius maintains, that the clavus conſiſted of a kind of purple flowers, ſewed upon the ſtuff; or interwoven with it. Others will have them to be the buttons or claſps by which the tunic was held together. Some again ſuppoſe that the latus clavus was nothing but a tunic bordered with purple. Scaliger is of opinion, that the clavi did not belong to the veſt, but hung down from the neck, like chains and ornaments of that nature. Rubenius maintains, that the clavi were merely purple lines or ſtreaks in the middle of the garment; and that they did not receive the name of clavi in alluſion to the heads of nails, to which, as he thinks, they bore no reſemblance, but that they were ſo called from their being of a different colour from the reſt of the garment; for the Romans, he ſays, uſed to inlay their cups, and other precious utenſils, with ſtuds of gold, or other ornamental materials. Theſe, from their likeneſs to nail-heads, they called in general clavi. Hence it was natural to uſe the ſame word for denoting theſe lines of purple, or other colours, which were different from the reſt of the garment, as thoſe clavi were of a different colour and figure from the veſſels which they adorned. M. Dacier (in Horat. l. ii. ſat. 5) ſays, that the clavi were purple galoons, with which they bordered the fore-part of the tunic, on both ſides, in a place where it came together. The broad galoons, he ſays, made the laticlavium, and the narrow the anguſticlavium. As to the name of clavi, he thinks the ancients gave it to any thing that was made with a deſign to be put upon another.

Clavus *annalis*. So rude and illiterate were the Romans towards the riſe of their ſtate, that the driving or fixing of a nail was the only method they had of keeping a regiſter of time; for which reaſon it was called *clavus annalis*. There was an ancient law, ordaining the chief prætor to fix a nail every year on the ides of September; it was driven into the right ſide of the temple of Jupiter Opt. Max. towards Minerva's temple.

This cuſtom of keeping an account of time, by means of fixing nails, was not peculiar to the Romans, for the Etrurians likewiſe uſed to drive nails into the temple of their goddeſs Nortia, with the ſame view; and from them it is ſaid to have paſſed to Rome. Liv. lib. vii. cap. 3. We learn alſo from Livy (l. viii. c. 18.) that the Romans recurred to the ceremony of driving a nail into the temple in order to ſtop the progreſs of a plague that raged at Rome A.U.C. 389. B.C. 365. The ſame ceremony was again employed about thirty years after, by way of remedy againſt a ſtrange alienation of mind, which was conſidered as the cauſe of the multiplication of crimes in the city.

Clavus, in *Medicine*, See Cephalalgia.

Clavus *hyſtericus*, a term introduced by Sydenham to denote a ſevere pain of the head, which is peculiar to *hyſterical* women. The pain is circumſcribed, and is ſaid to reſemble the ſenſation, which a nail driven into the head might be ſuppoſed to occaſion; hence the term *clavus*, a *nail*, was adopted. The cure of this ſpecies of head-ache, muſt depend upon the removal or palliation of the original diſeaſe, *hyſteria*, of which it is a ſymptom. See HYSTERIA. See alſo CEPHALALGIA.

CLAVUS, in *Surgery*, See CORN.

CLAWEDOK, in *Geography*, a river of North Wales in the county of Denbigh, which runs into the Clwyd, four miles N. of Ruthyn.

CLAWING, or CLAWING *off*, in *Sea language*, ſignifies the act of *beating* or turning to windward from a lee-ſhore, ſo as to eſcape the danger of ſhipwreck.

CLAWS, among *Zoologiſts*, denote the ſharp pointed nails, with which the feet of certain quadrupeds and birds are furniſhed.

CLAWS, *Elks'*. See ELK.

CLAWS is alſo uſed for a cloſe or ſmall meaſure of land.

CLAY. In common language, any earth which poſſeſſes ſufficient ductility when kneaded up with water to be faſhioned like paſte by the hand, or the potter's lathe, is called a *clay*. In *Mineralogy*, however, the term has a ſomewhat more extended application, comprehending not only the proper ductile clays, but certain other mineral ſubſtances which bear a ſtrong analogy to them. They may be conveniently arranged under the five following ſub-ſpecies.

1. Subſp. *Pure clay*.—*Reinethon Erde*, Germ.—*Lac Lunæ* of ſome authors.

Its colour is ſnow-white or yellowiſh-white. It occurs in ſmall kidney-ſhaped pieces. It is without luſtre; its fracture is fine earthy; it is opake; ſtains the fingers ſlightly; adheres feebly to the tongue; is fine but meagre to the touch; is very light, ſoft, and eaſily frangible. Its component parts, according to a recent analyſis by Fourcroy, are,

45	alumine
24	ſulphated lime
27	water
4	lime and ſilex.
100	

It has hitherto been found only at Halle in Saxony, where it occurs very near the ſurface, and accompanied by gypſum.

2. Subſp. *Porcelain clay*.—*Porzellauerde*, Germ.

Its colour is reddiſh-white, paſſing to yellowiſh and greyiſh-white. It occurs in maſs and diſſeminated. It ſtains the fingers; is for the moſt part ſlightly coherent, paſſing into duſty; is fine but meagre to the touch; ſlightly adheres to the tongue, and is but of little ſpecific gravity.

A ſpecimen, analyſed by Vauquelin, afforded the following reſult:

55	ſilex
27	alumine
0.5	oxyd of iron
2	lime
14	water
98.5	

When perfectly pure, it is nearly, if not entirely, fuſible in the greateſt heat of a porcelain furnace.

It forms beds in geiſs, and not unfrequently occurs in granite, occupying the place of the felſpar: indeed, it may readily be traced through various ſtates of induration into true felſpar; hence it has been conſidered by ſome as decompoſed felſpar, and by others as unformed or imperfect felſpar.

The clay employed in the manufacture of the Berlin porcelain, is procured from the diſtrict of Magdeburg: the beſt French porcelain clay (the ſubject of the above analyſis) is dug near Limoges; and the beſt Engliſh porcelain clay is procured from Cornwall: this latter is naturally mixed with quartz and mica, forming a granite, from both of which it is ſeparated by waſhing.

3. Subſp. *Common clay*.—*Potter's clay*.—*Pipe clay*.

Its colour is very various; when greyiſh-white it is called *pipe clay*; it alſo occurs greeniſh-grey, paſſing into verdegris-green; ſmoke-grey, paſſing into yellowiſh-brown; reddiſh-brown and browniſh-red; or, laſtly, bluiſh-grey, paſſing into blackiſh-blue. It occurs maſſive, or fine ſlaty, forming veins or beds; theſe latter, often of great extent and thickneſs. Its fracture is earthy, paſſing into uneven or imperfectly conchoidal. It is generally ſmooth, and ſomewhat unctuous to the touch; adheres pretty ſtrongly to the tongue, is ſoft and eaſily frangible.

When in veins, it generally occurs in primitive mountains, accompanying metallic ores; when in beds, it is uſually found in alluvial land, covered by or reſting on gravel.

It conſiſts eſſentially of alumine and ſilex, but generally contains, beſides, a variable proportion of oxyd of iron. Carbonated lime, too, is by no means an unfrequent ingredient, and when this abounds, the clay paſſes into marl. See MARL.

4. Subſp. *Indurated clay*.—*Clay-ſtone*.

Its colours are greeniſh-grey, bluiſh, aſh, ſmoke, and pearl-grey, or browniſh-red. It occurs in maſs; is opake and without luſtre. Its fracture is fine grained earthy, paſſing into ſlaty, ſplintering, and imperfectly conchoidal. It adheres but ſlightly to the tongue; is ſoft and eaſily frangible.

When put into water, it falls to pieces by degrees, but even then poſſeſſes very little ductility. It occurs in rock maſſes, in veins and beds, and forms the baſis of clay porphyry. It paſſes, on the one hand, into potter's clay, and, on the other, into jaſper.

5. Subſp. *Shale*.

Its colour is ſmoke-grey, yellowiſh, aſh, or bluiſh-grey, or greyiſh-black. It occurs in maſs. It is dull, but when mixed with mica is glimmering. Its fracture is ſlaty, approaching ſometimes to earthy. It is opake, ſoft, and eaſily frangible; it is meagre to the touch, adheres ſlightly to the tongue. Sp. gr. about 2.6.

It occurs in the independent coal formation, alſo in the moſt recent floetz trap and alluvial formations.

It generally breaks down when put into water, and by expoſure to the weather it decompoſes into a very unctuous and tenacious clay.

Of the above ſub-ſpecies, the firſt, on account of its rarity, is made no uſe of. The ſecond is the baſis of the European porcelains, for which it is well adapted, on account of its difficult fuſibility, and its hardneſs and compactneſs of texture when baked; it is even leſs fuſible than felſpar, from the decompoſition of which, in particular caſes, it certainly originates: but felſpar contains a very notable proportion of pot-aſh, which diſappears during its decompoſition, being probably waſhed away; and to this, no doubt, is owing the greater infuſibility of the clay.

The method of aſcertaining the goodneſs of porcelain clay is to knead it into a maſs with water, and after having dried it very gradually and thoroughly, to expoſe it to a full white heat in a muffle; if, after being thus baked, its colour is a pure white, if its texture is compact and porcellanous, and it exhibits no ſigns of fuſion, it may be conſidered as of the very beſt quality: but as it generally contains a variable proportion of iron, ſo its colour will exhibit more or leſs of a reddiſh-yellow tinge; and as this prevails, ſo the value of the clay will be materially impaired. A ſlight aſhery tinge may be got rid of in the manufacture, by the addition of a little ſmalt; but the ware thus acquires a bluiſh tinge, which, though not very perceptible alone, is ſufficiently obvious when compared with porcelain made of pure unſophiſticated clay.

The common clays, or thoſe that belong to the third ſubſpecies, may be divided, with regard to their utility, into the three claſſes of unctuous, meagre, and calcareous.

The unctuous contains, in general, more alumine than the meagre, and the ſiliceous ingredient is in finer grains: when burnt, it adheres ſtrongly to the tongue, but its texture is not viſibly porous. When containing little or no oxyd of iron, it burns to a very good white colour, and is very infuſible; pipes are made of it, and it forms the baſis of the white Staffordſhire ware. If it contains oxyd of iron, or pyrites, ſufficient to colour it red when baked (as is uſually the caſe), it becomes much more fuſible, and can only be employed in manufacturing the coarſer kinds of pottery.

Meagre clay is ſuch as when dry does not take a poliſh from rubbing it with the nail: it feels gritty between the teeth, and the ſand which it contains is in viſible grains. When burnt without addition, it has a coarſe granular texture, and is employed in the manufacture of bricks and tiles.

Calcareous clay efferveſces with acids, is unctuous to the touch, and always contains iron enough to give it a red colour when baked. It is much more fuſible than any of the preceding, and is only employed in brick-making: by judicious burning it may be made to aſſume a ſemi-vitreous texture, and bricks thus made are very durable.

Any of the unctuous or meagre clays, that are very infuſible and contain but little iron, may be employed in making crucibles, and other ſimilar chemical veſſels, that are required to ſtand a powerful heat.

Clay, in *Agriculture*, a ſoft, earthy ſubſtance, of an unctuous and tenacious quality, and which is found in a native ſtate in different ſituations. It has been remarked by Dr. Fordyce, to form a tenacious maſs when mixed with water, which hardens upon drying, and does not diffuſe ſo readily in water again as ſand; and that if a maſs of it be heated red hot, it becomes hard, and burns to a brick, reſembling cryſtalline earth in its properties. It is alſo found that ſoap-earth agrees in its properties with clay, of which it is a ſpecies, only it is much more diffuſible in water, ſeparates from it with greater difficulty, is of a ſmoother texture, and has finer particles. It is a ſubſtance that by culture becomes more diffuſible in water. The earth or ſoil conſiſts chiefly of ſtrata of ſubſtances, in which the clay and cryſtalline earth are ſometimes found pure, but more commonly there is a mixture of the two; and it is ſeldomer that pure clay is found than pure ſand. It has been remarked by Lord Dundonald, that this kind of matter forms not only a large portion of the ſurface-ſoil of moſt countries, but it is alſo found in the mineral ſtrata to an immenſe depth; that argillaceous matter, or clay, is no where found pure, but is more or leſs adulterated with other earths, and with different materials, ſuch as mineral, vegetable, and animal ſubſtances. And that the pureſt clay contains upwards of ſixty per cent. of ſiliceous matter, or ſand.

It is the earth moſt retentive of moiſture, by which it becomes ductile and tenacious, and loſes theſe properties by the action of fire, or by being burnt. According to Mr. Kirwan, it is of various colours, as white, grey, browniſh red, browniſh black, yellow, or bluiſh; it feels ſmooth, and ſomewhat unctuous; if moiſt, it adheres to the fingers, and if ſufficiently ſo, it becomes tough and ductile. If dry, it adheres more or leſs to the tongue; if thrown into water, it gradually diffuſes itſelf through it, and ſlowly ſeparates from it. It does not uſually efferveſce with acids, unleſs a ſtrong heat be applied, or that it contains a few calcareous particles, or magneſia. It conſiſts of argill and fine ſand uſually of the ſiliceous kind, in various proportions, and more or leſs ferruginous matter. The argill, according to him, forms generally from 20 to 75 per cent. of the whole maſs; the ſand and calx of iron the remainder. Theſe are perfectly ſeparable by boiling in ſtrong vitriolic acid.

It is remarked by Dr. Darwin, in his "Philoſophy of Agriculture and Gardening," that the too great adheſion of the particles of argillaceous earth, or clay, renders it, in its pure ſtate, unfit for vegetation; as the tender fibrils of roots can with difficulty penetrate it; whence it becomes much improved for the purpoſes of agriculture, when it is mixed with calcareous earth and with ſiliceous ſand, as in marl. It is commonly believed, he alſo ſays, that lumps of clay become meliorated by being expoſed to froſt in its moiſt ſtate, which, by expanding the water which it contains, by converting it into ice, is ſuppoſed to leave the particles of the clay further from each other. This, however, he ſays, ſeems in general to be a miſtaken idea, ſince, if the act of freezing ſeems to occur, as noticed by Mr. Kirwan in his "Mineralogy," vol. i. p. 9, who obſerves, that clay, in its uſual ſtate of dryneſs, can abſorb two and a half times its weight of water without ſuffering any to drop out, and retains it in the open air more pertinaciouſly than other earths, ſqueezing out its water, and thus parting with more of it than other earths. This curious circumſtance, that water as it cryſtallizes detrudes the clay which is diffuſed in it, correſponds, he remarks, with other facts of congelation. Thus when wine, or vinegar, or common ſalt and water are thus expoſed to froſty air, the alcohol, the acetous acid, the marine ſalt, and the calx of copper, are all of them detruded from the aqueous cryſtals, and retreat to the central part of the fluid, or to that laſt frozen, or into numerous cells ſurrounded with partitions of ice, as he has frequently obſerved; whence it appears, that wet clay is in general rendered more ſolid and tenacious by being frozen, as well as when it is dried, and its moiſture exhaled by too warm a ſun, and by both thoſe circumſtances becomes leſs adapted to the purpoſes of agriculture. In moſt clays a kind of efferveſcence occurs, after they are turned over and thrown on heaps, and thus acquire air into their interſtices, which renders them much fitter for the purpoſes of vitrification, and thus forwards the proceſſes of the brick-kiln and pottery. This greater facility to vitrify, is probably effected by the union of oxygen with the iron, which moſt clays contain; as oxydes of lead and manganeſe are uſed in the more perfect vitrifications. When the clay abounds with vitriolic acid, ſo as to be converted into alum, it becomes very unfriendly to vegetation.

It has been found in practice, that vaſt improvement in many of the lighter ſorts of ſoil may be effected by the uſe or application of clay upon them. And Mr. Rodwell has experienced great improvement from it on the poorer ſorts of ſandy ſoils, which are very looſe, and even on black ſands. See Claying *of Land*.

It has alſo been remarked by Mr. Young, in ſpeaking of marl, that when that ſubſtance "is not to be had, clay in many places is to be found at a moderate depth. This manure has," he ſays, "few of the properties by which marl is to be known, but yet it works wonderful improvements on many ſoils. In ſome light lands it has been preferred by many good farmers to indifferent ſorts of marl; and this preference has been the reſult of attentive experience. But," continues he, "the great point concerning clay, is not ſo much the compariſon with marl, as the uſe of it where no marl is to be had. On all light ſandy ſoils it ſhould be uſed with a confidence of ſucceſs; for the precedents of its good effects are ſo numerous, that we cannot have a doubt of its excellence. About ſixty or ſeventy loads an acre, at the ſame expence as of marl, will work an improvement great enough to ſhew how much miſtaken thoſe men are who think nothing but the fineſt marls worthy of attention; and upon heavier ſoils, as wet loams, brick earths, upon clay, and looſe hollow ſoils, that want a firmer texture, clay is an excellent manure; but there are vaſt tracts of ſuch land that cover very fine veins of clay, and yet farmers know nothing of the uſe of it. It is much to be regretted," he thinks, "that their landlords do not give them a juſter idea, by being at the expence of claying ſome ſmall fields until the benefit of the improvement becomes conſpicuous."

Clay-*Balls*, in *Mineralogy*, are the name by which, in ſome places, the ſtony nodulous foſſils called *Ludus Helmontii* are known. Theſe are uſually reckoned among the extraneous foſſils, and are found of various ſizes from four or five inches to almoſt as many feet in diameter; they are uſually flattened irregularly, and appear externally, like maſſes of ſoft matter kneaded or moulded imperfectly together; their internal ſubſtance is cracked, apparently by the ſhrinking of their ſubſtance in drying or hardening, and the joints or ſepta are more or leſs coated or filled with ſpar, often of a waxen colour, whence this foſſil is ſometimes called *Septariæ*, or *Waxen vein*. Clay-balls are found in many of the Britiſh clay ſtrata, and are uſually lodged therein with the utmoſt regularity, like pavement, often touching each other, as is the caſe with two remarkable layers of this foſſil near the top of the clay on which London ſtands. In the cutting of the Grand Junction canal from Paddington towards Uxbridge, and the Croydon canal from Deptford towards Croydon, theſe layers were cut through and expoſed in a very complete manner for examination, for great diſtances together; they are ſunk through in all the wells near London, where the clay ſtratum is complete, or where none of its upper part is abraded or waſhed away. Sometimes a ſmall ſpring of water ouzes out of theſe layers of clay-balls, and the ſame is found to poſſeſs mineral qualities, and they are, we believe, the ſource of moſt or all of the mineral ſprings in the immediate vicinity of the metropolis. When expoſed to the air, rain, &c. clay-balls ſoon ſplit, and fall into an ochry powder, and at length mix with the ſoil; but the ſpar occupying the ſepta is ſometimes very durable, and remains entire after the ſubſtance of the ball is mouldered away. An important uſe was a few years ago diſcovered for theſe curious nodules, in the manufacture of a cement for water-works and ſtuccoing of buildings, for which Meſſrs. Parker and Co. of Bankſide, London, have a patent; they call it Roman cement, and the ſame is now largely uſed in the conſtruction of the walls of docks, reſervoirs, &c. and for imitating ſtone-work in buildings; the new door caſes to the Treaſury-Chambers, in Whitehall, are a ſpecimen of the valuable qualities of this cement, the ſame having been applied, in very thick layers at once, during an intenſe froſt a few winters ago, and yet it ſet immediately, and ſtands the weather as perfectly as the beſt ſtone. The front of the Houſe of Lords, and many other buildings in Weſtminſter, are now covering with this cement, under the direction of Mr. James Wyatt, who has applied it with effect on the new palace at Kew, and in ſome additions and repairs at Windſor Caſtle. It is not certain that all the clay-balls, lodged in the different clay ſtrata, are exactly ſimilar in their compoſition, or adapted to the manufacture of cement; where, however, they can be had in plenty, it may be worth the while of the owners of the ſoil to procure their analyſis and trial. See Ludus Helmontii.

Clay *Caſtle*, in *Geography*, is ſituate about a mile S.W. from Youghal, in the county of Cork, Ireland, where the pieces of the bank that break off and are waſhed down by the ſea, are by degrees petrified into a hard firm grit. This is compoſed of a mixture of fine ſand, and a yellow clay tempered by the ſea water which beats againſt the hill. Wood and ſeveral other things daubed over with this clay are petrified on the ſpot. Smith ſays, there is a ſimilar petrification at Harwich in England. Smith's Cork.

Clay-*Farms*, in *Agriculture*, ſuch as have the lands either wholly or in a great part of a clayey quality. There are many extenſive tracts in different parts of the kingdom where this ſort of land prevails, and which have been often cultivated to much diſadvantage from the want of a due mode of cropping, and their not having of courſe a ſufficient proportion of green winter food for the ſupport of the requiſite number of live ſtock, and the raiſing of the neceſſary quantity of manure. It has been ſuggeſted that theſe inconveniences may be fully obviated by having recourſe to the cabbage huſbandry. See Cabbage and Farm.

Clay *Hill*, or Copt Heap, in *Geography*, a remarkable eminence on the ſouth weſt branch of the grand ridge of England, about two miles W. of Warminſter, and near the edge of the Chalk ſtrata. The ſituation of the barrow or tumulus on the top of this hill was determined in the government trigonometrical ſurvey in 1794, by an obſervation from Beacon-Hill ſtation, diſtant 117,216 feet, and bearing 85° 54″ 8″ S.E. from the parallel to the meridian of Dunnoſe; and another from Wingreen ſtation diſtant 84.554 feet; whence is deduced its latitude 51° 12′ 13″, and its longitude from Greenwich 2° 13′ 25″.8 W. or 8^{m} $53^{s}.7$ in time.

Clay-*Mill*, a machine uſed by the brick-makers near London for tempering their clay. In *Plate* XII. *Mechanics*, are repreſented two of theſe machines. In *fig.* 10, which is the moſt common, A B is an upright ſhaft turning on a pivot at the lower end, which works in a braſs ſocket let into a piece of wood lying on the ground; the upper end has a ſimilar pivot, the braſs is fixed in the interſection of two beams, C D, of the frame; theſe beams are ſupported by four uprights at their ends, which are firmly fixed in the ground; the whole is braced together ſo as to form a very ſteady frame for the ſhaft A B to turn round in. E, F, G, H, are four arms mortiſed in the ſhaft ſomewhat below the middle, ſupported by braces from the upper part of the ſhaft, and connected together by four braces in the form of a ſquare; the two arms, E, F, are longer than the other two, and have hooks, by which the horſes draw, faſtened to them. They have alſo each two irons, *ab*, *ab*, attached to them, whoſe lower ends work at the ſides of a circular trough or ditch, KK, which is concentric with the ſhaft A B, and walled with bricks. The ends of the levers, G, H, carry harrows, L, M, (*fig.* 11.) working in the ſame trough; theſe harrows are ſometimes fixed to the arms, as at G, by three ſtruts, and ſometimes they are connected with the levers by four chains, and loaded with heavy weights, as at H, and better explained in the following figure.

When the machine is in uſe, a quantity of clay is thrown into the circular trough, KK, which is about one-fourth filled with water by a pump, the trough from which is laid under the horſe-walk. The horſes are then put to the ends of the levers, E, F, and ſet in motion; as they turn the machine round, the harrows, L, M, drag the clay round, in the trough, and by agitating it in the water, ſoon diſſolve part of the clay, forming it into the conſiſtence of thick mud; as the horſes continue to work and more water is added, the whole maſs is thoroughly incorporated; a ſluice, N, is then opened which allows the clay to run out into ſhallow pits, which are dug in the ground at ſome diſtance round the mill, and a little below its level; in theſe pits the clay is ſuffered to remain until the greater part of the water is evaporated; it is then dug out and carried to the brick-maker. The pump for ſupplying the mill, is in general worked by a man, but in the machine before us, it is worked by the mill; at the upper end of the ſhaft, AB, *fig.* 10. a wheel, P, is fixed, which has wooden projections nailed to it; theſe take the end of a lever, Q, moving on an iron bar, *d*, as a center; the weight of the lever is ſupported by a friction-wheel running on an horizontal bar R, fixed to the frame-work above; the lever, Q, has a rod, S, jointed to it near its end, which is ſupported by a frame, T, faſtened to one of the upright poſts, the end of this rod is jointed to one arm of a bent lever, the other arm of which has the pump-rod of the pump, O, hooked to it. As the horſes turn the wheel its teeth move the end of the lever Q with it and raiſe the pump-rod; when the tooth quits the end of the lever the weight of the pump-rod pulls back the lever to its original poſition, ready for the next ſtroke; by this contrivance a conſtant ſupply of water is eaſily procured, and, by preventing the deſcent of the pump-rod, the pump-work is ſtopped when there is water enough. The iron bars, *a b*, *a b*, are intended to remove the clay which may get to the ſides of the trough KK, and by that means eſcape the harrows.

The machine repreſented by *fig.* 11, though not ſo common, is much more ſimple in its conſtruction. A is a ſtout poſt firmly fixed in the ground; it is hooped at top, and has a braſs ſocket in the centre to receive the point of an iron pin, *a*, which goes through the interſection of two levers, EF, GH; this pin has a caſt-iron plate, *b*, faſtened to it, that is bolted to the lever, ſo as to connect them together. I, I, I, I, are four braces to ſtrengthen the croſs. O, O, O, O, are four other braces which carry a circular ring, R, and the whole is ſtrengthened by four long ſcrew bolts *d, d, d, d;* this ring fits the poſt looſely, and when the horſe turns the machine it moves as ſteadily as the former machine; the harrows and the circular trough are the ſame. The two preceding machines are uſed, in thoſe places where the clay uſed by the brick-makers is not very clean, but has many ſtones and other extraneous matter among it, as they ſink to the bottom of the circular trough, and remain there when the clay is drawn off. Where the clay is naturally ſufficiently pure, and requires only to be tempered, a different machine is uſed; it conſiſts of a cylindric tub about three feet diameter and four feet high, in the centre of which is a vertical ſpindle, the lower end working in a braſs ſocket at the bottom of the tub, the upper end turns in a collar ſupported by two iron bars nailed to the ſides of the tub; at the top of the ſpindle, above this collar, a long lever is fixed for the horſe to turn the ſpindle by; the upright ſpindle has ſix or eight arms fixed perpendicularly to it in different planes, working within the tub; theſe arms have ſpikes projecting from their upper and under ſides, the tub has a ſmall trap door in the ſide, near the bottom, which can be kept cloſed by a haſp; the clay is thrown in at the top of the tub, and the horſe made to turn the ſpindle, the arms and the ſpikes fixed to it, cut the clay in every direction and mix it thoroughly, water being added in the proper quantity. When it is ſufficiently ground the door at the bottom of the tub is opened, and, as the horſe turns, the clay is thrown out, and carried to the brick-maker.

CLAY-*Stone.* See CLAY *indurated.*

CLAY *Strata,* in *Mineralogy.* The recurrence of clayey ſtrata, in the ſinking of deep wells, and ſhafts for mines, in England, is more common than thoſe of any other matter; and ſince the diſcoveries, and meritorious labour of Mr. William Smith, on the ſtratification of theſe iſlands, have been known among the circle of his friends, opportunities have offered, of aſcertaining the peculiarities of the organic remains moſt commonly lodged in theſe ſtrata. In the ſouth-eaſtern part of England, or uppermoſt parts of the ſeries of Britiſh ſtrata, theſe are, cornua ammonii, belemnites, corallines, or coralloids, entrochi, gryphites, bituminous wood, &c.; at the ſame time that ludus helmontii, iron-ore, or ochre, pyrites, ſelenite, or gypſum, mica, &c. are not unfrequently found lodged in theſe clay ſtrata.

The uppermoſt, or firſt clay ſtratum (or rather aſſemblage of clay ſtrata) in the Britiſh ſeries, is that on which the metropolis of the Britiſh empire and its environs ſtand; its upper part is red, and very tenacious when wet, forming perhaps one of the worſt ſtrata for cultivation, in England; which, but for the great population thereon, and conſequent opportunities of obtaining manure, for a ſeries of ages back, would probably, to the preſent day, have been in a ſimilar ſtate to the waſtes or commons, with which the vicinity of London has been ſo often reproached. Near the top of this ſtratum, there are two remarkable layers of clay-balls, or ludus helmontii, as obſerved under the article CLAY-*Ball*, and lower down, pyrites, and other foſſils; a layer or ſtratum of ſand, containing black particles, occurs near the bottom of the London clay ſtrata, which, in the ſinking of wells, is ſometimes found nearly dry, and at others produces a ſpring of unpalatable water. Beneath the London clay ſtrata, a thick ſand ſtratum is found, reſting upon the chalk ſtrata, and, by means of the numerous and large cracks and fiſſures in the *chalk*, the ſand is ſupplied with a moſt powerfully pent or confined ſpring, which often riſes near 250 feet, on the ſinking of a well, through the clay ſtrata above mentioned, and runs over the ſurface, as in Mr. Vulliaumy's well, near Kenſington Gravel-pits, deſcribed in the "Philoſophical Tranſactions" for 1797, and many others in and near London, which have been ſunk within a few years paſt. Near the bottom of the London clay ſtrata, there are layers, or ſtrata, of ſmooth, flat, and round chert pebbles, of uniform ſizes, which do not appear to be worn or rounded fragments of a chert rock, but nodules, many of them conſiſting of concentric layers, originally formed, of the particular ſizes in which we now find them.

The next clayey ſtratum in the Britiſh ſeries, is found beneath the chalk ſtrata; from its white colour, it is denominated chalk-marl in many places; when overflowed, and kept wet, by ſprings from the edge of the chalk ſtrata, as at the foot of the chalk hills N. of Dunſtable, this chalk-marl is very tenacious and barren; but where its out-crop is dry, as on the ſouth ſide of the North Downs, near Ryegate, Godſtone, &c. or the north ſide of the South Downs, as at Clayton, Plumpton, &c. its ſurface forms very good land, particularly for wheat; while the inner parts of it are, in ſuch ſituations, diſpoſed to harden into a ſubſtance almoſt like ſtone, in thin laminæ. Cornua-ammonii, ſhark's teeth, and a curious variety of extraneous foſſils, are found in this chalk marl, of which we hope that the publication of Mr. Smith's intended work, will enable us to give a more detailed account, under the head of each foſſil, as we arrive at the ſame in the progreſs of our work.

The next conſiderable aſſemblage of clay ſtrata which we meet with in the Britiſh ſeries, has a remarkable ſtratum of red potter's-clay on its ſurface, on which there is a variety of tile and pottery kilns in Suſſex, beneath which a whitiſh tenacious clay is found, and therein a thin ſtratum of limeſtone, called Suſſex marble, in many places where it is uſed, particularly in the ſlender grouped pillars of Gothic buildings, like Weſtminſter Abbey; this thin and curious ſtratum of lime-ſtone, conſiſts almoſt entirely of a congeries of turbinated, or perriwinkle-like ſhells, of very uniform ſizes; in ſome ſpecimens theſe are all ſmaller than peaſe, and in others they are of the ordinary ſize of perriwinkles; whether theſe are the produce of different beds in the ſame ſtratum, or whether a thickneſs of clay ſeparates them, we have not yet been able to aſcertain. This ſubject we muſt, for the reaſon above ſtated, reſume on future occaſions.

The moſt uſual vegetable productions found upon clay ſtrata, are of the following genera ; *viz.* in wet ſituations, carex, juncus, ſchœnus, aira, orchis, carduus, poterium, ſalix, &c. while, in dry ſituations, the following prevail, *viz.* primula, arum, rhinanthus, orchis, poa, roſa, rubus, prunus, acer, quercus, &c.

CLAYE, in *Geography*, a town of France, in the department of the Seine and Marne, and chief place of a canton in the diſtrict of Meaux, 2½ leagues W. of it. The place contains 1007, and the canton 10,725 inhabitants ; the territory includes 195 kiliometres, and 25 communes

CLAYES, in *Fortification*, are wattles made with ſtakes, interwoven with oziers, &c. to cover lodgments.

CLAYETTE, LA, in *Geography*, a town of France, in the department of the Saone and Loire, and chief place of a canton, in the diſtrict of Charolles, 3½ leagues E.N.E. of Marcigny. The place contains 1089, and the canton 10,887 inhabitants ; the territory comprehends 202½ kiliometres and 17 communes.

CLAYEY LAND, in *Agriculture*, that ſort of lands in which the clayey ingredient is more or leſs abundant, and which differs very materially in proportion to the nature and qualities of the clay, as well as the quantity in which it enters into their compoſition ; ſome being extremely ſterile and unproductive, while others are capable of affording an abundant produce of different kinds of vegetable crops.

According to the obſervations of the very intelligent and able author of the "Treatiſe on the Connection of Agriculture with Chemiſtry," there is no clayey land or ſoil that is pure and free from ſand ; and there are but few clays that are free from a mixture of calcareous matter, magneſia, vegetable and animal matters, mineral oil, and other mineral or metallic ſubſtances ; ſome clays are of a much more unctuous, and, as it were, greaſy nature than others. They do not differ more in this reſpect, than they do in the appearance they aſſume, when ſubmitted to a moderate degree of heat Thoſe clays which are the moſt unctuous and greaſy to the touch, are, by calcination, changed to a black colour. This muſt be owing, either to their containing animal or vegetable matter, although, previous to calcination, it eſcapes obſervation ; or, the inflammable matter in the clay may exiſt in the ſtate of a colourleſs mineral oil, adhering obſtinately to the clay, and not capable of being ſeparated from it by water, with which oil can hold no union ; yet capable of being changed into a black carbonaceous matter by the action of fire. A due mixture of clay, ſerves the important purpoſes of retaining in the ſoil the attenuated vegetable and animal ſubſtances, as alſo the mineral oil. Of this deſcription are thoſe clays, or clayey loams, which have been depoſited by the ſea, or muddy ſtreams, containing a conſiderable proportion of the exuviæ, or remains of animal and vegetable bodies, in an extreme degree of attenuation. Such lands as theſe are the moſt permanently fertile, and, where the climate is favourable, produce the heavieſt and beſt filled grain. He further ſtates, that ſoils, formed by depoſiture, for the moſt part contain a ſufficient quantity of calcareous matter. Adding lime to ſuch lands may prove injurious, by its expending, taking up, or otherwiſe altering the arrangement and combination of the animal and vegetable matters, which ſhould carefully be preſerved for ſucceeding crops. Under any circumſtances, lime ſhould, he thinks, be given to ſuch ſoils but ſparingly. But there are clayey ſoils containing little or no animal, vegetable, or bituminous matter, and which are equally deficient of calcareous matter, conſiſting only of clay, ſand, and the earth of iron. To improve and render fertile a ſoil of this deſcription, is truly an Herculean taſk, and will ſeldom repay the induſtry of the cultivator, unleſs ſituated in the neighbourhood of a town, where more dung may be procured than can be ſpared from the farm in its contiguity. A ſoil of this nature can receive little or no benefit by the application of lime, as it contains nothing for the lime to act upon or combine with. When under ſuch circumſtances, that dung, or ſuch like manure, cannot be procured, a preparation of peat, with a very moderate proportion of lime, ſeems to be the next beſt application. A ſoil of poor lean clay, ſuch as above deſcribed, will, he ſays, require 8 tons of lime, and 48 tons of peat, for one dreſſing. Doing things partially can never anſwer ; this quantity is the leaſt that ought to be applied ; a much greater may be given, if the articles can be cheaply and eaſily procured. In this the farmer muſt be regulated, in a great meaſure, by his ability in doing, or extent of his capital. His primary object, in this caſe, ſhould be to promote the growth of paſture graſſes, becauſe the land or ſoil at firſt will be in no heart to produce crops of grain ; and, ſecondly, becauſe the promoting of the growth of ſuch graſſes, and judiciouſly depaſturing and folding, is the ſureſt way of improving ſuch lands. After the graſs has taken hold of the ground, and is beginning to carry a tolerably thick ſward, its thickneſs and quality may be greatly improved, by ſome one or more of the top-dreſſings, or preparations, recommended under that head. See TOP-DRESSINGS.

It is evident that clayey lands are therefore as different in their natures as in their colours. Some of them are ſo obſtinate that it is ſcarcely poſſible to ſubdue them. Others are ſo ſoft and unctuous, as to be eaſily reduced to a proper ſtate for nouriſhing plants ; while others, again, are ſo hungry, as to abſorb in a ſhort time whatever kind of manure is applied, without either materially altering the nature of the land or ſoil, or improving the crops. Clay being, as has been ſeen, a ſolid compact body, and its particles adhering firmly together, it does not eaſily admit water, although capable of receiving a large quantity, nor does it part with it but by ſlow degrees. When dry it is hard and denſe ; and the more rapidly water is drained off or exhaled, the harder it becomes, frequently opening into ſmall chaſms or rents, when ſuddenly dried. As clay, from its tenacious quality, retains water longer than any other ſoil, the roots of the plants, in a rainy ſeaſon, are frequently ſoaked in water for a conſiderable time, and the plants themſelves, if not entirely deſtroyed, are ſo chilled and weakened as to produce very indifferent crops. On the other hand, from the natural cloſeneſs of its texture, added to the circumſtance of its hardening very quickly and to a great degree when the moiſture is ſuddenly extracted, the plants in a dry ſeaſon are prevented from extending their roots in ſearch of nutriment ; while the dews and light ſummer ſhowers, ſo eſſential to the growth of all vegetables, and which eaſily penetrate the more friable ſoils, are repelled by the clay, and again exhaled by the influence of the ſun. From this account of the nature and properties of all clayey lands or ſoils, it is ſcarcely neceſſary to mention the great importance of keeping them as dry as poſſible at all ſeaſons, eſpecially during winter. When that is properly attended to, the farmer has it in his power to plough and ſow on the firſt return of favourable weather in the ſpring, as thereby, in a great meaſure, he avoids the riſk of his crops ſuffering either from heavy falls of rain, or a long continued ſeaſon of dry weather, particularly the latter, for when a clayey ſoil is reduced to a proper ſtate by the harrows and rollers, after the ſeed is ſown, it very ſeldom happens that the crop ſuſtains any material injury from the want of rain during the remainder of the ſeaſon. But although the nature and properties of clayey lands be ſuch as above deſcribed, yet, by induſtry, and the application of ſuch manures as are beſt calculated for correcting their bad qualities, and for bringing thoſe moſt favourable to vegetation into action, this ſort of land is often made to produce abundant crops, of many different kinds.

But clayey lands, of whatever kind they may be, the author of the "Synopſis of Huſbandry" thinks "require a more laborious exertion to reduce them to a fineneſs neceſſary for the purpoſe of huſbandry than any other ſoils, and are diſtinguiſhed under various names, ariſing from the colour; but the intrinſic good or ill quality of this ſoil depends not on thoſe vague diſtinctions, but on the proportion of ſand intermixed with it; and where this ingredient is happily blended with the clay, and where the ſoil is of a reaſonable depth, and the ſprings do not riſe too near the ſurface; when theſe ſeveral good qualities are united, there are few ſoils more kindly for the ſeveral purpoſes of huſbandry; and though in their cultivation the clays may require a greater ſtrength both of horſes and tackle than any other, yet, on many accounts, they deſervedly claim the preference either to a chalk, gravel, or ſand." Of this kind, he obſerves, are the lands in the wealds of Kent and Suſſex; and he knows of no part of the kingdom where the ſeveral purpoſes of huſbandry are more effectually anſwered than in theſe counties: the ſize and fatneſs of the beaſts evince the fertility of their paſture, whilſt the luxuriancy of its ſeveral growths of hops and corn proclaim the ſuperior goodneſs of the arable land; and the large ſpreading oaks are a demonſtrable proof that it is kindly to the growth of timber. But there are other kinds of clayey ſoils which, being by nature ſo ſtiff and tenacious as not to be meliorated either by tillage or manure, bid defiance to the moſt ſkilful plan of huſbandry, and can never be brought to yield a ſufficient quantity of earth to heat the ſeed, unleſs in a ſeaſon the moſt propitious; and even with every advantage that can attend it, this ground will fail to produce a crop by any means adequate to the pains and expence required in working it; ſo that it demands ſome judgment to diſcriminate the various kinds of clays, which, though they all rank under the ſame general denomination, do yet differ moſt eſſentially in their properties. Thoſe of the more ſterile kind are rarely of any conſiderable depth, having a bed of gravel for the under ſtratum, and are generally within a near proximity to the ſprings; for this kind of land being always overcharged with wet, or parched with drought, and therefore ſubject to accidents which it is ſeldom in the power of the huſbandman to foreſee or prevent, is, on theſe accounts, inferior to moſt others: whilſt clays of the firſt denomination are deſervedly ranked, as has been obſerved, among the moſt fertile ſoils. To determine the goodneſs of a clayey ſoil, one ſhould have recourſe, he ſays, to the appearance of the trees, corn, and other vegetables: the proſperous growth of the trees and hedges, the flouriſhing ſtate of the corn, and the verdure of the meadow-land, are favourable omens; whilſt the ſtunted appearance of the trees, thin crops of corn, and ſhort graſs, are plain indications of the poverty of the ſoil.

"In the buſineſs of tilling this kind of land, the renter will act wiſely," he ſays, "in providing himſelf with ſtout and able horſes, ſtrong ploughs, and other inſtruments of huſbandry; and his hinds, likewiſe, ought to be thoſe of the moſt ſturdy breeds. Of the many different kinds of ploughs now in uſe, there are none better adapted for working theſe ſtubborn grounds than thoſe commonly diſtinguiſhed by the name of ſwing-ploughs: theſe are conſtructed without wheels, and the horſes draw ſingly, following each other in the furrow, in both which reſpects this plough claims the preference to wheel-ploughs, where the horſes, by going a-breaſt, tread the ground much more than in the former inſtance; though in Kent the farmers uſually work their ſtiff land with the common turn-reſt, or, as it is vulgarly called, turn-riſe plough, which is made far more weighty than the Hertfordſhire or any other wheel-plough; and, from the circumſtance of turning the reſt at the end of every furrow, is not chargeable with the defect before mentioned, of ſubjecting the freſh ploughed ground to be trodden by the horſes. In ſome counties they till their ſtiff lands with a foot-plough, which, by means of the iron that is let into the beam, and reſts in the furrow, works with more ſteadineſs than the ſwing-plough, but in the other parts of its conſtruction nearly reſembles the laſt-mentioned inſtrument. As moſt of the ill qualities attending the ſoil originate in its adheſive nature, every art ſhould be made uſe of to meliorate and pulveriſe the ſtubborn clods, ſo as to reduce them to that degree of fineneſs neceſſary for the purpoſe of vegetation."

"And in the practice of winter-fallowing a clayey ſoil, let," ſays he, "the ground that is propoſed to be ſown with oats or beans in the ſpring, be fallowed up as ſoon as poſſible after the wheat ſeaſon is finiſhed, and be careful that the lands may not be made over-large; perhaps five bouts or wents may be a proper ſize, ſo that each land may meaſure about half a rod over; but this is to be determined by the nature of the ſoil and the locality of the ſituation. It has been ſhewn already, that clays differ eſſentially from each other, and hence it ſeems of conſequence, at the fallowing of thoſe which are of the wet, ſpewy kind, to lay the ridges in ſuch manner that they may be leaſt incommoded by the winter rains; whereas, in thoſe of a moderate texture, and which are leſs inclined to moiſture, this caution is not neceſſary, but to guard againſt the contingency of moiſture during the winter, by laying the land as dry as poſſible, is a point to be attempted by all poſſible means on every different deſcription of this ſoil. The ground having been thus fallowed at an early ſeaſon, and having partaken of the benefit of the winter froſts, will generally work kindly towards the middle of February, which is the proper time for planting beans on clays. For oats, perhaps, three ploughings may be required, provided the ſeaſon be favourable for performing them; for, in a very wet ſpring, it may be more prudent to diſpenſe with one ploughing, and to ſow after the firſt ſtirring in April; but if the weather be kindly, it will be adviſable, when the bean ſeaſon is finiſhed, to ſtir ſuch ground as is intended for oats; and this fallow, having enjoyed the benefit of the March winds, will work well at the ſecond ſtirring in April, the proper time for ſowing oats on ſtiff lands. The ground having been thus managed, will come in for beans the next year, or be in a ſtate of tillage proper to ſow with clover, which generally ſuceeds well when cultivated on theſe ſoils; and fields which were put in with beans, if the ground be in good heart, will come in for a wheat ſeaſon at the following autumn. And this ſhews how neceſſary it is for a farmer to look forward, in order that his land may not only be well prepared for the growth of the preſent crop, but be in readineſs for the reception of a different grain in the following years."

In fallowing for wheat in clayey lands, it has been already obſerved, he adds, that "wheat might very properly ſucceed a crop of beans on theſe ſoils, a method which is generally purſued in Kent and Suſſex; but where the land is of a very ſtiff nature, it is abſolutely neceſſary to give it a ſummer fallow once in four or five years or oftner, according to its goodneſs, by which method its adheſion is deſtroyed and the pores are opened for the admiſſion of the ſun, air, rains and dew, all of which abound with ſuch principles as may contribute, in a high degree, towards the melioration and fertility of the ſoil. The proper time to fallow for wheat, on a clay, is in the month of April, as ſoon as the lent ſeaſon is finiſhed; and if the weather will permit, the ſtirring ſhould be effected in May, and this is ſometimes all that can be done to the field till after the rains in Auguſt; for, ſhould a dry time happen in June, it will be impracticable to work the land, it having been rendered ſo hard as to preclude the entrance of the plough, or if this can be effected, the ſurface will, in this caſe, break up in ſuch large clods, and withal ſo ſhallow, as to render the tillage of little worth; but ſhould the weather permit, it will be proper to give the ground a ſecond ſtirring in June, and to lay the fields in ridges; for in ſuch form the ſoil will more conveniently imbibe the various influences of the atmoſphere, than in broader lands. The number of ploughings throughout the ſummer depends ſo much upon contingencies, that no ſtated rule can be laid down upon that head; for if the weather be either too wet, or tending to the contrary extreme, this work of the more obſtinate kind of clays will be wholly impracticable, and on this account, the farmer is frequently diſappointed of a wheat ſeaſon; but on clays which are leſs adheſive, and where the land has been conducted in a huſbandlike manner for a ſeries of years, there is not ſo much hazard of being thrown out at the wheat ſeaſon; and a time generally offers for ſowing the corn between the latter end of Auguſt and the beginning of October, which is the lateſt term to which the ſowing of this grain ought to be protracted on theſe heavy lands. If the weather ſhall have been kindly throughout the ſummer, the land will have been ſtirred at leaſt twice during that period: and thus with the fallowing, and the laſt ploughing at ſeed time, the ground will have been four times ploughed, which will moſt probably have reduced it to a degree of fineneſs proper for the reception of the wheat, after which the field ſhould be ſufficiently harrowed, ſo as to cover the corn to a proper depth."

And it is obſerved, by the practical author of the "Preſent State of Huſbandry," that "the manures moſt proper to be applied to theſe lands, are lime, chalk, ſea-ſand, and aſhes. It appears, he ſays, from the accounts given by thoſe chemiſts who have analized theſe ſubſtances, that they are admirably calculated to correct the ſtubborn denſity of clay, ſo as to render it more eaſily reducible by the plough; to open its pores, ſo that it may more readily imbibe and tranſmit water; and that they operate as a powerful ſtimulus, and ſome way or other diſpoſe whatever principles in clayey ſoils are friendly to vegetation, to exert themſelves. Long and eſtabliſhed practice confirms this obſervation: lime, for inſtance, has been applied to theſe ſoils for many years in the counties of Durham, Glouceſter, Hereford, Montgomery, Berwick, Stirling, Perth, and many other diſtricts where ſuch ſoils prevail. Chalk is uſed both in its natural and calcined ſtates, in Hertford, Middleſex, Eſſex, Kent, Wilts, and other ſouthern counties. Sea-ſand is employed as a manure in Cornwall, Devon, Pembroke, Angleſey, Caernarvon, and alſo in ſeveral diſtricts in Scotland. Coal-aſhes, in the neighbourhood of London, are laid with aſtoniſhing ſucceſs on clayey-ſoils, whence brick earth has been taken. Peat aſhes have produced wonderful effects in Berkſhire; and aſhes of both kinds are uſed to great advantage, as a top-dreſſing on the ſtrong ſoils, in all thoſe counties where that practice is eſtabliſhed. Beſides theſe manures, compoſts, eſpecially when formed chiefly of light ſandy, or gravelly earths, with lime and chalk, are alſo applied to clay ſoils with ſucceſs in many parts o fEngland. Few compoſts being made on the better cultivated clayey ſoils in Scotland, the common method is to lay on farm yard dung, the ſame ſeaſon in which a field is limed; by adopting this practice the lime is found to operate more rapidly, and at the ſame time more powerfully."

It has been remarked by lord Dundonald, that "there is a great extent of poor clayey land or ſoil, ſimilar to that which has been mentioned, in many parts of the north of England and in Scotland for the moſt part lying at a conſiderable height above the level of the ſea; and frequently in the vicinity of peat moſſes in the county of Lanark, or Clydeſdale, he ſays, there are computed to be 40,000 acres of peat-moſs totally unimproved, producing nothing itſelf nor contributing in any way to the fertility of the adjacent poor lands, which are as deſtitute of vegetable matter, as the moſs contains a ſuperabundance. It requires a much longer time, and a much greater application of dung and vegetable matters, than would be generally believed, before poor lands of this deſcription can be rendered highly fertile, and made in all reſpects, ſimilar to land that has been long, or for ages under cultivation. Ten times the quantity of peat, or vegetable matter, recommended to be given at once, or 480 tons would ſcarcely bring poor barren land to the colour of rich black mould, known in Scotland by the name of infield-land, and to which, for ages, the dung of the farm has been excluſively applied. Experiments made with an intimate mixture of poor lean clay and peat warrant this aſſertion; here purpoſely ſtated, he ſays, that the over ſanguine cultivator or improver of ground may not imagine, that with a ſummer fallow, and a dunging or dreſſing or two, he may be enabled to complete ſo arduous a taſk. Land is always requiring a ſupply of manure, and repays, in general, more abundantly for the laſt expence when brought to an advanced ſtate of cultivation, than for that which at firſt is incurred. Both ſeed and labour are thereby ſaved, and good crops, with much more certainty, are to be depended upon."

"Paring and burning the ſward of ſome clayey ſoils, he thinks, may be practiſed with advantage, as the burnt clay will diminiſh the ſtiffneſs of the ſoil, and render it more pervious to water. This may be ſtill more economically effected, and in other reſpects, with leſs injury to the ſoil, by half burning the clay, in clamps or in kilns: a preference which can however only be given in ſituations where fuel can at a cheap rate be procured for this purpoſe." See BURNT *Clay*.

Mr. Donaldſon ſays, that, "while it may be admitted, that, by the application of ſuch manures and proper cultivation, clayey lands are made to produce, occaſionally, luxuriant crops; to every perſon acquainted with theſe ſoils, it muſt be obvious, that the crops are, upon the whole, more precarious and uncertain than thoſe on deep fertile loams, and other ſimilar ſoils or ſorts of land. And the natural produce of clay-lands, with regard to weeds, is ruſhes, gooſe-graſs, or wild tanſey, large daiſies, thiſtles, docks, May-weed, poppies, and other coarſe herbage of a ſimilar kind."

The following is the method of improvement that was employed in the bringing of a tract of ninety-three acres of clayey-land which had remained long in an uncultivated ſtate into a proper condition, in order to lay it to graſs, as practiſed by Mr. Beſt, and ſtated in the fourth volume of "Communications to the Board of Agriculture." "Theſe lands," ſays he, "ſince the memory of man, were let at 18 *l.* per annum: from this ſum they increaſed, owing to the advance of the times, to 22 *l.* 5 *s.* which is the moſt they were ever let for." In the year 1788, he began on a field of eight acres, by employing ſome men to take up brambles, furze, and other natural incumbrances, with which two parts in three of that field were covered; in the winter he had it under-ground drained. This, he thinks, is the firſt ſtep which a farmer ought to take, before he converts his land to tillage. He laid the top turf on two ſhoulders, about ſixteen inches deep, leaving a channel open under, which got the land very dry, and ſo it continues. The expence of draining, when he firſt began, was about 30*s.* an acre, but now it is near 40*s.* In December, 1790, he ploughed the whole of this field, and in the February following, ſpread about ten tons of well-mixed dung and earth over every acre. In April he ſowed it with flax; this is a crop that requires, (particularly in ſtrong land, which this is, being on a ſtrong clay, with ſome ſpots of flinty gravel), in its early part, at leaſt twelve hours rain in every week. Unfortunately for him, he had not half rain enough; conſequently, that crop failed. He then made as good a fallow, as the nature of the land and the ſeaſon would permit. At Michaelmas, 1791, he ſowed it with wheat, which produced about eighteen buſhels (ſingle Wincheſter) per acre. As ſoon as the ground was cleared of the wheat, it was ploughed and ſown to vetches, of which he had a great crop; he fed theſe off with ſheep in the ſpring, 1793, and the ground which they cleared by day they lay on at night. After the vetches were all eaten, he made a very good fallow, and, in September, dreſſed it over with ten hogſheads of lime (which coſt 1*s.* 6*d.* per hogſhead), per acre, which he had, in the month of May, mixed with the head-lands well together. About Michaelmas, he ſowed it with wheat again, and had too great a burden; for, in the month of May, 1794, he was obliged to have a man with a keen reap-hook, to cut off all the luxuriant blades, the ear not having made its appearance. This precaution, however, did not fully anſwer his purpoſe, for a great part of the crop was thrown; notwithſtanding, he had full twenty-five buſhels per acre. He then made a fallow, and, in the ſpring 1795, ſowed the field with white oats and graſs-ſeeds of different ſorts, *viz.* rye-graſs, cow-graſs, Dutch clover and hop. The oats were very thick and long; in conſequence of which, the graſs-plants in ſome places did not thrive; for, in ſpots of five or ſix feet ſquare, there was no appearance of any. He had eight quarters of oats per acre. He fed the graſs with ſheep the years 1796, 1797, and till Auguſt, 1798, when he again ploughed it, and dragged in ſome vetches. He had a great crop, and, in the ſpring 1799, fed it off with ſheep, folding them on the ground as they eat the vetches. When this was done, he made a fallow, as good as a wet ſummer would admit of, and ſowed it to wheat again, at the uſual ſeaſon, without any additional manure, and had about twelve buſhels per acre, a good crop for this year, ſome lands in the neighbourhood not producing more than ſix or ſeven. The acre in this county is cuſtomary meaſure, not ſtatute.

It is added, that, from finding this land drained ſo well, he has, every winter, drained a little, as faſt as he could get the land cleanſed; and laſt winter he completed the whole ninety-three acres. He has drained a great many acres of land beſides theſe, and has had it done in the ſame manner, which anſwers extremely well. Twenty acres of the above, ninety-three he has kept in paſture, having, in the ſpace of five or ſix years, dreſſed it over twice with about fifteen tons per acre each time. His manure conſiſts of dung, earth, ſoap-aſhes, and the ſcrapings of turnpike roads: this latter article anſwers remarkably well on a ſtrong clay ſoil. The whole of theſe ninety-three acres are on ſuch a ſoil, with ſome gravel. During the ſummer, it is neceſſary to turn it twice, in order that it may be well mixed; and, by doing this, it is brought to a fine mould; when ſpread on the lands, once bruſhing over with ſome thorns makes it ſoon diſappear. The above twenty acres are at this time worth 25*s.* per acre. In November, 1795, he began ploughing another piece of ground of fourteen acres. From the manner in which this piece of ground lay, his ſervant could not throw it plain, (it being left, the laſt time it was ploughed, in ſix-furrowed ridges), ſo as to bring it with any advantage to a crop in the ſpring. In April, 1796, he ploughed it acroſs; after this, worked it well with drags and harrows. Finding this would not do (owing to the turf not being ſufficiently rotten, which he accounts for, by lying in a rough open ſtate all the winter), he ſet ſome men to hack it over: and, harrowing it well with four horſes abreaſt, it became tolerably fine, with the exception only of the ruſh and ſedge, of which there was a great abundance. The weather being dry, he employed twelve or fifteen women and boys beating over theſe ruſh and ſedge roots, in order to get them out of the earth, ſome men going after them with three-pronged forks, throwing them in heaps and burning them. By doing this, he raiſed a great quantity of aſhes, which he ſpread over the land, and, as ſoon as ſufficiently cold, he harrowed in ſome turnip ſeed, which came up very well: but the land being of a cloſe ſtiff nature, they did not get larger than about the ſize of a cricket-ball; he had them hoed, otherwiſe they would not, in his opinion, have grown to that ſize. He kept 450 ſheep upon them, with a little hay, a month and a few days. In the month of May, previous to this, he put on the head-lands 140 hogſheads of lime, which he cauſed to be well-turned and mixed, and, as the ſheep ate the turnips, this was carried and ſpread on the land. The latter end of October it was ſown with wheat, and produced a good crop, averaging better than twenty buſhels per acre. As ſoon as the wheat was carried off, it was ploughed and ſown to vetches (a greater burden than lands of the value of 40*s.* an acre could produce;) and in the ſpring 1798, he fed them off with ſheep, folding them by night, where they fed by day. He always makes it a point, as ſoon as the ſheep have cleared a day's work for the plough, to plough the land; by doing this, he preſerves the manure of the ſheep from the ſun, and turns in what vetches were left, which, in his opinion, are equal, if not ſuperior, to the droppings of the ſheep. He has obſerved, that where the greateſt quantity has been left and ploughed in, that part of the ground generally works much lighter at ſeed-time; and that, at harveſt, the wheat is ſuperior. This may not do ſo well on a light ſandy loam. He finiſhed ſowing this field to wheat (the ſecond time) by Michaelmas, 1798. He was obliged in May to cut off all the tops of it (as he did in the other field), in order to keep it ſtanding. When harveſt came, he had ſixty tithing per acre, which produced no more than 300 buſhels, and about two pecks in the whole field. If the kern had been ſuch as it was the year before, he ſhould, he believes, have had thirty buſhels per acre. Laſt year it was ſown to barley and graſs-ſeeds. As the barley is not threſhed, he cannot exactly ſtate the quantity grown, but, from appearance, it was judged to be about twenty buſhels per acre: a good crop for this country laſt ſeaſon; the graſs plants look remarkably well, and conſiſt of the following ſorts:—rye-graſs one peck, cow-graſs 6 lbs., Dutch clover 2 lbs.; this he allowed for every acre. It is cuſtomary, he ſays, for the tenant to be at the expence of the graſs-ſeeds. The hop-graſs did not anſwer in the other field; it is his opinion that the ſoil is too heavy and cloſe for it. He very much diſapproves of mowing the firſt year after laying down, particularly on ſtrong lands.

He further ſtates, that, in November, 1795, he ploughed another field, of eleven acres, and threw it very plain. As ſoon as it was finiſhed ploughing, he had it rolled with a heavy roller, that it might be as cloſe as poſſible all the winter, in order to rot the ſpine or turf the better. In the early part of April he dragged in ſome black oats; ſhortly after they were up, an eaſterly wind (to which the field lay quite expoſed) ſtruck them very yellow, exactly like ſtraw, and the ground being ſo very poor, they never recovered it. The ground lay in this ſtate till September, when it was ploughed acroſs, and ſo it remained till the March following. The froſt having opened it, and by dragging and harrowing it well, he brought it to be tolerably fine. In May he dreſſed it over with 20 hogſheads of lime per acre, (which was well mixed with the head-lands in April), then ploughed it as thin as poſſible, and ſowed ſome turnip-ſeed, which came up very well, but did not flouriſh, owing, in his opinion, as he has before obſerved, to the ſoil being too ſtiff and heavy for turnips. At Michaelmas, 1798, it was ſown to wheat without any other manure. The crop produced him nineteen buſhels per acre. As ſoon as the wheat was carried off the land, he ſowed it to vetches (which he is convinced is the beſt artificial ſowing on ſtrong lands), and he had a very good crop, which he fed off with ſheep in the ſame manner as before deſcribed; and laſt Michaelmas it was ſown the ſecond time to wheat without any additional manure; at preſent it is impoſſible for plants to look better. He intends taking three crops from this field, as he did from the laſt, and then to lay it down for three years. He thinks no land ſhould have more than three crops of corn without reſt; at the ſame time ſowing between thoſe crops, ſome ſorts of artificials, for ſheep-feed, which will keep the land clean and in good condition. The ſoil will dictate to the farmer what ſort of artificials to ſow for his advantage. He has, at this time, another field of ten acres in fallow, which has been ploughed theſe twelve months. He intends purſuing exactly the ſame method with this and the remaining thirty acres, as he has done with the former, and when finiſhed, he has no doubt but that the ninety-three acres will be worth one hundred pounds per annum.

The great advantage of adopting proper modes, in bringing lands of this nature into the ſtate of good graſs, or *ſward*, is here ſhown in a very ſtriking manner; and it is rendered ſtill more evident in the practice detailed below.

In reſpect to the breaking up and re-laying clayey land to the ſtate of ſward, Mr. Amos has obſerved in the ſame volume of "Communications," that it is the moſt obdurate and unmanageable ſoil which the farmer has to encounter, the too great adheſion of its particles rendering it unfit for vegetation, but which may be in ſome degree corrected by lime, ſand, aſhes, long dung, marle; by frequently expoſing freſh ſurfaces of it to the influence of the ſun and atmoſphere; by planting on it ſucculent plants, as beans, red clover, &c.; which having top roots not only render the moſs leſs coheſive thereby, but alſo add to it much carbon. And that as the lower leaves of the denſe foliage of theſe vigorous vegetables alſo give out much carbonic acid by their reſpiration in the ſhade; which, perpetually ſinking down upon the ſurface of the ſoil, ſupplies it with carbon, which renders it more nutritive to other vegetables, which may afterwards grow upon it. The mode diſplayed at fig. 1. in Plate X. on *Agriculture*, anſwers the purpoſe in the moſt effectual manner, as ſhown by the ſection of a 12 feet ridge.

But in breaking up graſs land of this kind of ſoil, great attention ſhould be paid to ploughing the furrows, ſo as to expoſe the greateſt ſurface poſſible to the influence of the ſun and atmoſphere, and to furniſh the greateſt quantity of mould for covering the ſeed.

It is ſuppoſed that furrows nine inches broad and three inches and a half thick are the beſt proportioned ſize. He is however truly ſenſible that no certain ſtandard can be fixed for the breadth and width of the furrows; that muſt entirely depend upon the depth of the ſoil. By limiting the breadth and thickneſs of the furrow as above, he only means that thoſe proportions ſhould neither be much exceeded nor abated where the ſtaple of the ſoil will permit.

"In regard to the firſt crop, as the ſize of the ridges is already formed upon all graſs lands, nothing can be done, but to plough the ridges in the manner deſcribed, early in February. As ſoon as the weather permits, in the laſt week of February, or on the firſt or ſecond week in March, to ſow five buſhels of good oats upon every acre; then to harrow the land only juſt enough to cover the ſeed; afterwards to let the whole be water furrowed, and the drains opened, ſo that no water may ſtand upon the land. Nothing more is wanted to be done till the latter end of May or beginning of June, when the crop ſhould be well weeded.

And for the ſecond crop, the land ſhould be gone over "early in November to ſee that no water ſtands upon it, and that the water furrows and croſs grips or drains are kept clear and open. And as ſoon in February, as the weather and condition of the ſoil will permit, to drill ten pecks of beans upon every acre, twenty-ſeven inches between each row and three inches deep; then to harrow the ridges twice or thrice with *ſwinging trees* as long as the ridges are broad, to which as many harrows ſhould be tied as will cover them, and the horſes walk in the open furrows. But as ſoon as the beans are fairly above ground, they ſhould be rolled and harrowed; ſome time in May be horſe-hoed, by ploughing a furrow off from the beans on each ſide, making a ridge in the intervals between the rows. The beans will then ſtand upon a ridge of about ſix or eight inches wide, which muſt be well hand-hoed. In about a week after, the earth muſt be returned again to the beans in the rows. In about two weeks more the double mould-board plough ſhould be uſed to ſcour up the middle of the intervals, and to lay the earth cloſer to the beans. If any more weeds appear they muſt be pulled up by the hand. And as ſoon as the ground is cleared of the beans, the land ſhould be ſcuffled the croſs way of the ridges, then harrowed once or twice, and the weeds collected in heaps and burnt.

"And early ſowing ſhould be practiſed, as the mildew is more injurious to late crops than forward ones, owing to the great dampneſs of the ground in autumn.

"For the third crop, after having ſcuffled, and cleanſed the ground well, it muſt then be ploughed up in the manner denoted above, four inches deep if the ſtaple will permit. And when the ſeed is to be drilled the ridges ſhould be harrowed twice or thrice in a place, then ten pecks of wheat drilled upon every acre, and finiſhed by harrowing the land once; the leſs harrowing the better, provided there is depth of mould for permitting the ſeed to be drilled two inches and a half deep. But when the ſeed is to be ſown broad caſt, it ſhould be ſown after the land is ploughed, at the rate of twelve pecks to the acre; harrowing the land juſt enough to cover the ſeed; then water furrow it, and afterwards grip or drain it completely in both caſes."

Where "the ſtems and foliage of the wheat are too vigorous, it may be advantageous to eat it down with ſheep the latter end of March, or beginning of April, and afterwards to harrow it the length way and to roll it the croſs way of the ridges. And about the latter end of May the wheat ſhould be breaſt or horſe-hoed if drilled; if ſown broad caſt, the weeding muſt be done by hand; the ſame operations ſhould be performed a ſecond time in the month of June."

For the "fourth, or fallow crop, the land ſhould be ploughed acroſs into ridges four inches and a half deep, early in November, and afterwards well water-furrowed, and gripped or drained completely. The field will then lie in deep open furrows and high narrow ridges, and conſequently be expoſed to the largeſt extent of ſuperficies that is poſſible, which is the *ſine qua non* of ploughing ſuch land. Sometimes in February, as ſoon as the ſeaſon and weather will permit, the ridges muſt be ſplit down the middle and reverſed, ſo that the whole ſurface-ſoil may be equally expoſed to the influence of the ſun and atmoſphere. And about the beginning of April, the ridges ſhould be drawn down by the break or drag-harrow going acroſs them once or twice; after lying in this ſtate ſome time, the land ſhould get a clean ploughing four inches deep the latter end of the ſame month. About the middle of May is the laſt time to lay on the auxiliary earths, *viz.* four chaldrons of lime, or ſix chaldrons of chalk, or fifty tons of calcareous marl, or four chaldrons of aſhes, or twenty cubic yards of tanners' bark, or fifty tons of ſand, or fifty tons of peat-earth, &c. upon every acre; then drag-harrow the land both length and croſſways to incorporate the whole intimately together. If the land is very rough, it may be reduced a little either by the ſpike-roller, or a heavyiſh plain one, to a roundiſh clod; but it ſhould not by any means be made too fine. When long dung is the intended manure, it ſhould not be laid on till after the ſecond clean ploughing has been given, which ſhould be done the later end of May in both caſes: after the middle of June, the dung may be laid on after the rate of ten or twelve tons to the acre; the land in either caſe muſt then be ploughed into ridges of from nine to twelve feet wide, and gathered up in the manner deſcribed above; then ſow half a peck of cole-ſeed upon every acre, if ſown broad caſt, or a quarter of a peck, if drilled; and then harrow the whole once. If any weeds ſpring up, they muſt be hand-hoed, whether the ſeed has been drilled or ſown broad caſt.

"The cole ſhould be eaten off in the month of September; then plough the land immediately after the cole has been eaten off three inches and a half deep, reſerving the furrows, which muſt be left clear and open for the ſake of draining the land in winter; open alſo all the croſs grips or drains completely, ſo that no water may be ſuffered to ſtand upon the land; for to all improvements draining is the firſt ſtep. As ſoon as the weather permits, in April, the land muſt be ploughed, for the laſt time, into three inches deep furrows, which muſt be reſerved again; reduce the ſurface to a very fine tilth, by harrowing and rolling it completely for the reception of the ſeeds. Then upon every acre he adviſes the ſowing the following ſeeds:"

"*Of artificial Graſs-ſeeds.*

Cow clover, - - - - -	8 pounds.
White ditto, - - - - -	10 ditto.
Trefoil, - - - - -	4 ditto.

"*Of natural Graſs-ſeeds.*

Sweet ſcented vernal graſs, - -	½ peck.
Meadow foxtail graſs, - - -	1 ditto.
Rough-ſtalked meadow graſs, - -	1 ditto.
Meadow feſcue graſs, - - -	½ ditto.
Rye graſs, - - - - -	2 ditto."

This "compoſition and propoition of ſeeds are the moſt ſuitable for clayey or moiſt ſoils, and will form in two or three years a moſt excellent meadow, as all the plants ſown are ſtrong and hardy perennials. After the ſeeds have been all ſown, the land ſhould be buſh-harrowed once, the length way of the ridges, and then rolled acroſs."

And "the next thing to be done," he ſays, "is carefully to open all the water-furrows with a double mould-board plough, four inches deep, no width at bottom, but eight inches wide at top. Then open all the croſs grips or main drains in the manner expreſſed" at *fig.* 2. in the ſame plate. "Afterwards roll the whole down the croſs way of the lands."

It is added, that "no ſtock ſhould be ſuffered to graze on the ſeeds till they have got proper hold of the ground; when that happens, ewes, and lambs, and yearly beaſts are the moſt proper ſtock for them the firſt year. And as the art of increaſing the quantity of leaves round the roots of young graſſes, conſiſts in eating off the central ſtems by ſheep and cattle early in the ſeaſon, whence new graſſes are produced around the firſt joint of the ſtem thus bitten off, it is readily underſtood why paſtures, which are perpetually grazed, are ſo much thicker or cloſer crowded with graſs roots, than thoſe which are annually mowed. Hence the impropriety of mowing the graſſes the firſt, or even the ſecond, third, or fourth year; eſpecially upon this ſoil, which produces them very tardily. By the above management, the land will, he thinks, keep one-third more ſtock than it did for ſeveral years. But, after a certain period of time, the graſſes degenerate, and the paſture returns to its original ſtate, which, he ſays, ſhews the neceſſity of converting graſs land into tillage, and of laying down ſuch lands with graſs-ſeed alternately."

CLAYEY *Loam*, that ſort of loam which contains a large proportion of clay in its compoſition. It is a ſort of land that is of the more ſtiff kind, but which is highly productive when properly cultivated. It abounds much in many diſtricts. See LOAM and SOIL.

CLAYEY *Marl*, that ſort of marle which has much of the clayey ingredient in its compoſition. See MARL.

CLAYEY *Soil*, that ſort which is principally conſtituted of clayey materials. Extenſive diſtricts are met with in which the ſoil is chiefly of this ſort. See SOIL.

CLAYING OF LAND, the proceſs of applying this ſort of material on land, which, in many caſes, is found extremely beneficial in affording a better texture and conſiſtence. In the county of Norfolk the term claying is often improperly applied to the practice of marling.

In many ſituations, where marl is not to be had, clay may often be found at no great depth below the ſurface, and may be had recourſe to with the greateſt benefit on the more light poor ſorts of land. See SOIL.

The application of it is a buſineſs that may proceed during moſt of the ſummer as well as the autumnal months, and often in the winter, with much propriety and convenience; but it is conſtantly the moſt advantageouſly laid on before the commencement of the winter froſts, as in that way it is more perfectly reduced and incorporated with the land. The manner of performing the work is ſimilar to that made uſe of for marl. See MARLING.

CLAYING *of Sugar*. See SUGAR.

CLAYONAGE, *in the Military Art*, hurdles for covering the wooden work of a gallery for the paſſage of the ditch, and for ſecuring the people employed in carrying on the ſaps againſt the fire of the beſieged when it is dangerous.

CLAYTON, THOMAS, in *Biography*, took his degree of doctor in medicine at Oxford towards the end of the ſeventeenth century, and ſoon after went to Virginia, from whence he correſponded with the Royal Society. Several of his communications, treating of the culture and different ſpecies of the nicotiana (tobacco), are publiſhed in numbers 201, 4, 5, and 6, of the “Philoſophical Tranſactions,” and in number 454 is an ample account of medicinal plants which he had diſcovered growing in that country. Haller ſuppoſes that the “Flora Virginica exhibens plantas quas T. Clayton in Virginia obſervavit et collegit,” was compoſed from papers left by him It was publiſhed by Gronovius, at Leyden, in 1743, 8vo., and again in 4to. in 1762. Haller. Bib. Bot.

Clayton, Robert, a learned prelate of the church of Ireland, was born in the capital of that kingdom, in 1695. He was the ſon of Dr. Clayton, miniſter of St. Michael in that city, and dean of Kildare. He received his claſſical education at Weſtminſter ſchool; whence he removed to Trinity college, Dublin, of which he was ſome time after elected a fellow. The date of his firſt degrees, and of his ordination, are not known, but he became doctor in divinity in 1729. On his father's death, coming into poſſeſſion of a handſome fortune, he conſcientiouſly reſigned his fellowſhip without any proſpect of compenſation by church preferment; a meaſure, it muſt be confeſſed, not very uſual among members of Univerſities. But this ſcrupulous generoſity of diſpoſition appears to have been a prominent feature of Dr. Clayton's character; for on his marriage in 1728, he preſented the fortune which he received with his wife to her ſiſter; and made a better proviſion for his own ſiſters than had been done by his father, by doubling the legacies which he had left them. It was this beneficent temper that led principally to his advancement in his profeſſion. During a temporary reſidence in London, ſhortly after his marriage, a perſon applied to him for pecuniary relief, whoſe caſe was recommended by Dr. Samuel Clarke. Dr. Clayton, entering fully into the ſituation of the petitioner, preſented him with a donation of three hundred pounds. This munificent act procured him the acquaintance and the friendſhip of Dr. Clarke; and it is thought that this intimacy contributed to the heterodoxy which Dr. Clayton afterwards manifeſted with regard to many of the doctrines of his church. Dr. Clarke took an early opportunity to introduce his friend to queen Caroline, who had already, from the report of his beneficence, entertained a favourable opinion of his character, which was greatly ſtrengthened and confirmed by the kind offices of lady Sundon, a relation of Dr. Clayton by marriage, and at that time a great favourite at court. Under theſe very favourable auſpices, which Dr. Clayton's perſonal merit gradually ſecured for him, he obtained the queen's recommendation to the lord lieutenant for the firſt vacant biſhopric in Ireland, and in conſequence was preſented to the ſee of Killala in January 1729—30. In November 1735 he was tranſlated to Cork, and to Clogher in 1745. Thus far Clayton had been diſtinguiſhed rather as the polite gentleman than the erudite ſcholar and divine; and from his long ſilence in the literary world, even after his elevation in the church, and his unaſſuming diffidence upon topics of learned diſquiſition, ſo low was the common opinion of his abilities, that the firſt publication which appeared under his name, “An Introduction to the Hiſtory of the Jews,” was generally attributed to ſome other hand. This ungrounded prejudice was, however, ſoon removed by unqueſtionable evidence that he poſſeſſed talents of a ſuperior kind. In 1747 he publiſhed in 4to. an elaborate work, entitled, “The Chronology of the Hebrew Bible vindicated, with ſome Conjectures in Relation to Egypt,” &c. In 1749, he purſued his biblical diſquiſitions, by publiſhing “A Diſſertation on Prophecy,” which was followed in 1751 by “An impartial Enquiry into the Time of the Coming of the Meſſiah, in two Letters to an eminent Jew.” In the courſe of this year was publiſhed, in octavo, “An Eſſay on Spirit, wherein the Doctrine of the Trinity is conſidered in the Light of Reaſon and Nature, as well as in the Light in which it was held by the ancient Hebrews, &c.” This work, as may naturally be ſuppoſed from its title, excited much attention. In conſequence of the biſhop of Clogher having prefixed a dedication to it, addreſſed to the primate of Ireland, and ſubſcribed with his name, he was univerſally conſidered as the author, and all the odium which it excited by the ſuppoſed hereſy of its tenets, was thrown upon him, ſo as to place an inſeparable bar in his way to farther eccleſiaſtical promotion. In fact, however, the biſhop was only its foſter father, the work having been written, as afterwards appeared, by a young clergyman of his dioceſe, who was too ſtrongly apprehenſive of the conſequences to bring it forward under his own name. The alarm ſpread by this publication among the clergy may be eſtimated by the number of pamphlets to which it gave occaſion. The controverſy to which it prompted was not, however, marked by any diſplay of ſuperior talent and erudition. Dr. Clayton next appeared before the public in a work univerſally allowed to be his legitimate production; it was entitled, “A Vindication of the Hiſtories of the Old and New Teſtament, in Anſwer to the Objections of the late lord Bolingbroke, in two Letters to a young Nobleman.” It was publiſhed in octavo, 1752. This was only the firſt part of an extenſive deſign, which Dr. Clayton afterwards proſecuted; for in 1754, he publiſhed “A ſecond Part, wherein the Moſaical Hiſtory of the Creation and Deluge is philoſophically explained, the Errors of the preſent Theory of the Tides detected and rectified, &c.” There is much ingenuity and learning diſplayed in theſe works; but many of the remarks diſcover a deficiency of judgment, and a mind too much ſwayed by hypothetical fancies. In the interval between the publication of theſe two pieces, Dr. Clayton publiſhed a tranſlation of “A Journal from Grand Cairo to Mount Sinai and back again; from a Manuſcript written by the Prefetto of Egypt, in Company with the Miſſionaries *de propaganda Fide* at Grand Cairo. To which are added, ſome Remarks on the Origin of Hieroglyphics and the Mythology of the ancient Heathens.” The principal object of the biſhop in the tranſlation and publication of this work, was to recommend to the attention of the Society of Antiquaries certain ancient inſcriptions which are mentioned in it, as exiſting in a part of the wilderneſs of Sinai, known by the name of the *Written Mountains*, and from which his lordſhip conceived that it might be poſſible to recover the ancient Hebrew character. The ſociety did not, however, ſecond his views, notwithſtanding his munificent offer of aſſiſtance to defray the expences which might attend the experiment. Nor do his lordſhip's conjectures appear to have been well founded, for when Mr. Edward Wortley Montague afterwards viſited the very ſpot where ſuch important diſcoveries were expected to be made, he was grievouſly diſappointed by finding the inſcriptions intermixed every where with repreſentations of human figures, which clearly demonſtrated that they were not the work of any of the deſcendants of Jacob. The biſhop publiſhed, in 1755, a correſpondence which had paſſed between him and Mr. William Penn on the ſubject of baptiſm. The next year was marked by a bold attempt on the part of his lordſhip to introduce ſome material innovation into the liturgy of the eſtabliſhed church. He had in his writings expreſſed his diſapprobation of the Athanaſian and Nicene creeds; and, prompted by his wiſh to have them expunged, he determined to bring the matter to a fair diſcuſſion, by introducing the ſubject in the form of a motion to the Iriſh Houſe of Lords, which he did on the 2d of Fectruary, 1756, by moving, That thoſe creeds ſhould, for the future, be left out of the liturgy of the Church of Ireland. The ſpeech which he delivered on this occaſion was afterwards publiſhed, and paſſed through ſeveral editions. Dr. Clayton's conduct and ſentiments on this occaſion gave very general offence to his eccleſiaſtical brethren, and created him a hoſt of powerful enemies. Great, however, as was the outcry raiſed againſt him, no ſteps of a public nature were taken to arraign his conduct, until the appearance of the third part of the "Vindication of the Hiſtory of the Old and New Teſtament" in 1757, in which, unappalled by the formidable aſpect of his adverſaries, he purſued his ſpeculations even farther than he had before done. But his preſent attack was deemed by his more orthodox eccleſiaſtical ſuperiors and brethren to be of ſo hoſtile a complexion, that they came to a reſolution to make his proceedings the ſubject of legal inquiry. Under their influence, his majeſty, George the Second, directed the duke of Bedford, then lord lieutenant of Ireland, to inſtitute a proſecution againſt the biſhop of Clogher. Agreeably to this, a day was fixed for a general meeting of the Iriſh prelates at the houſe of the primate, and Dr. Clayton was ſummoned to attend. Before, however, the time arrived, an end was put to their malicious proceedings, by the death of the venerable object of their enmity and perſecution. The thought that he was abandoned by the king, from whom, as placed above the influence of the paltry animoſities by which his ſubjects may often be divided, he had hoped for ſhelter and protection in the gathering ſtorm, joined to his repugnance, to have paſſed againſt him a verdict of cenſure or deprivation, is thought to have affected his ſpirits ſo deeply, as to bring on an obſtinate nervous fever, of which he died, February 26th, 1758, in the 64th year of his age. Biog. Brit.

CLAYTON, THOMAS, an Engliſh muſician, and one of the royal band in the reign of king William and queen Mary, who having been in Italy, had not only perſuaded himſelf, but had the addreſs to perſuade others, that he was equal to the taſk of reforming our taſte in muſic, and eſtabliſhing operas in our own language, not inferior to thoſe which were then ſo much admired on the Continent. And the firſt muſical drama that was wholly performed after the Italian manner, in recitative for the dialogue or narrative parts, and meaſured melody for the airs, was "Arſinoe Queen of Cyprus," tranſlated from an Italian opera of the ſame name, written by Stanzani of Bologna, for that theatre, in 1677, and revived at Venice 1678. And the Engliſh verſion of this opera, ſet by Clayton, was our firſt attempt at a muſical drama after the manner of the Italians, with recitative in the dialogue, inſtead of declamation. In the compoſer's preface to the printed copy of the words, he ſays, that "the deſign of this entertainment being to introduce the Italian manner of muſic on the Engliſh ſtage, which has not been before attempted, I was obliged to have an Italian opera tranſlated: in which the words, however mean in ſeveral places, ſuited much better with that manner of muſic, than others more poetical would do. The ſtyle of this muſic is to expreſs the paſſions, which is the ſoul of muſic; and though the voices are not equal to the Italian, yet I have engaged the beſt that were to be found in England; and I have not been wanting, to the utmoſt of my diligence, in the inſtructing of them. The muſic being recitative, may not, at firſt, meet with that general acception, as is to be hoped for, from the audience's being better acquainted with it: but if this attempt ſhall be a means of bringing this manner of muſic to be uſed in my native country, I ſhall think my ſtudy and pains very well employed."

The ſingers were all Engliſh, conſiſting of Meſſrs. Hughes, Leveridge, and Cook; with Mrs. Tofts, Mrs. Croſs, and Mr. Lyndſey. This opera was firſt performed at Drury-lane, January 16th, by ſubſcription; the pit and boxes were reſerved for ſubſcribers, the reſt of the theatre was open as uſual, at the ſubſcription muſic. In the Daily Courant, Arſinoe is called "a new opera, after the Italian manner, all ſung, being ſet by maſter Clayton, with dancing and ſinging before and after the opera, by ſignora F. Margarita de l'Epine." This ſinging was probably in Italian.

Clayton is ſuppoſed to have brought from Italy a collection of the favourite opera airs of the time, from which he pillaged paſſages and adapted them to Engliſh words; but this is doing the muſic of Arſinoe too much honour. In the title-page of the muſic, printed by Walſh, we are aſſured that it was wholly compoſed by Mr. Thomas Clayton; and in juſtice to the maſters of Italy at that time, it may be allowed to be his own, as nothing ſo mean in melody and incorrect in counterpoint was likely to have been produced by any of the reigning compoſers of that time. For not only the common rules of muſical compoſition are violated in every ſong, but the proſody and accents of our language. The tranſlation is wretched; but it is rendered much more abſurd by the manner in which it is ſet to muſic. Indeed, the Engliſh muſt have hungered and thirſted extremely after dramatic muſic at this time, to be attracted and amuſed by ſuch traſh. It is ſcarcely credible, that in the courſe of the firſt year this miſerable performance, which neither deſerved the name of a *drama* by its poetry, nor an *opera* by its muſic, ſhould ſuſtain twenty-four repreſentations, and the ſecond year eleven.

But ſuch was now the paſſion for this exotic ſpecies of amuſement, even in its liſping infant ſtate, that the perſpicacious critic and zealous patriot, Mr. Addiſon, condeſcended to write an opera for the ſame Engliſh ſingers as had been employed in Arſinoe. Mr. Addiſon, though he had viſited Italy, and was always ambitious of being thought a judge of muſic, diſcovers, whenever he mentions the ſubject, a total want of ſenſibility as well as knowledge in the art. But this admirable writer and reſpectable critic in topics within his competence, never manifeſted a greater want of taſte and intelligence in muſic than when he employed Clayton to ſet his opera of Roſamond. Indeed, it ſeems as if nothing but the groſſeſt ignorance, or defect of ear, could be impoſed upon by the pretenſions of ſo ſhallow and contemptible a compoſer. But, to judges of muſic, nothing more need be ſaid of Mr. Addiſon's abilities to decide concerning the comparative degrees of national excellence in the art, and the merit of particular maſters, than his predilection for the productions of Clayton, and inſenſibility to the force and originality of Handel's compoſitions in Rinaldo, with which every real judge and lover of muſic ſeem to have been captivated.

This opera, in ſpite of all its poetical merit, and the partiality of a conſiderable part of the nation for Engliſh muſic and Engliſh ſinging, as well as fervent wiſh to eſtabliſh this elegant ſpecies of muſic in our own country without the aſſiſtance of foreigners, after ſupporting with great difficulty only three repreſentations, was laid aſide and never again performed to the ſame muſic.

In the year 1733, this Engliſh drama was ſet, as a *coup d'eſſai*, by Mr. Thomas Aug. Arne, afterwards Dr. Arne, and performed at the little theatre in the Haymarket; in which his ſiſter Miſs Arne, afterwards Mrs. Cibber, performed

formed the part of Roſamond; that admirable actreſs appearing firſt on the ſtage in this character as a ſinger. The three following airs were admirably ſet, and remained long in favour: "No, no, 'tis decreed,"—"Was ever nymph like Roſamond," and "Riſe glory, riſe." See Opera and Addison.

CLAYTONIA, in *Botany*, (named from John Clayton, who collected plants, chiefly in Virginia, for Gronovius, which were publiſhed by him in his "Flora Virginica.) Linn. Gen. 287. Schreb. 402. Gært. 745. Juſſ. 314. Vent. 3. 260. Lam. Ill. 394. Claſs and Order, *pentandria monogynia*. Nat. Ord. *Succulentæ*, Linn. *Portulaceæ*, Juſſ. Vent.

Gen. Ch. *Cal.* two-leaved, perſiſting; leaves egg-ſhaped, rather acute, oppoſite. *Cor.* Petals five, egg-ſhaped or oblong, obtuſe, narrowed at the baſe, longer than the calyx. *Stam.* Filaments five, awl-ſhaped, a little ſhorter than the corolla, affixed to the claws of the petals; anthers oblong, incumbent. *Piſt.* Germ ſuperior, roundiſh; ſtyle ſimple, the length of the ſtamens; ſtigma trifid. *Peric.* Capſule egg-ſhaped, one-celled, three valved, included in the calyx. *Seeds* three, roundiſh.

Eſſ. Ch. Calyx two-celled. Petals five. Stigma three-cleft. Capſule one-celled, three-valved, three-ſeeded.

Sp. 1. C. *virginica*, Linn. Sp. 1. Mart. 1. Lam. 2. Pl. 144. fig. 1. Willd. 1. Gron. Virg. 25. Bot. Mag. 941. (Ornithogalo affinis virginiana; Pluk. Alm. tab. 102. fig. 3. Rudb. Elyſ. 2. p. 139. fig. 6.) "Leaves linear-lanceolate, petals entire." *Root* ſmall, tuberous. *Stems* about three inches high, ſlender. *Root-leaves* narrow-linear, almoſt gramineous. *Stem leaves* generally two, oppoſite, linear, green, ſmooth, a little fleſhy. *Flowers* white, ſpotted or ſtreaked with red on the inſide, in a looſe terminal raceme. A native of Virginia, flowering in April. There is a variety with lanceolate leaves, and acutiſh calyxes. 2. C. *ſibirica*, Linn. Sp. 2. Mart. 2. Lam. 2. Willd. 2. Gmel. Sib. 4. p. 89. Gært. tab. 129. fig. 3. (Limnia, Linn. Act. Upſ. 1746. tab. 5. Act. Holm. 1746. tab. 5.) "Leaves nerved, root and ſtem ones egg-ſhaped; petioles trifid," Willd. *Root* tuberous. *Stem* declining. *Root-leaves* petioled, quite ſmooth. *Stem-leaves* two, oppoſite, ſeſſile. *Flowers* red, racemes two, unilateral, one of them two-leaved. A native of Siberia. 3. C. *perfoliata*, Willd. 3. Donn. Hort. Cant. p. 25. "Leaves without nerves, root ones rhomb-egg-ſhaped, ſtem ones ſomewhat connate; flowers umbel-verticillate; petals entire," Willd. *Root* annual. *Stem* four or five inches high, erect. *Root-leaves* petioled, ſomewhat fleſhy. *Stem* ones two, oppoſite; either rhomb-egg-ſhaped, attenuated, cohering; or egg-ſhaped, connate on one ſide, emarginate on the other. *Flowers* white, two or three about the middle of the ſtem, peduncled, each of them ſupported by a ſmall oblong bracte; ſix or eight in a terminal umbel, peduncled, without bractes. A native of North America.

C. *portulacaria*. See Portulacaria.

CLAZOMENÆ, in *Ancient Geography*, a town of Aſia Minor, and one of the 12 Ionian cities ſituated in Lydia. Herodotus, who mentions it, aſſigns it in one place to Ionia, and in another to Lydia. The ancient city ſtood on the continent, and was fortified by the Ionians at a great expence, in order to put a ſtop to the Perſian conqueſts. But, after the defeat of Crœſus, and the ſurrender of Sardis, the inhabitants were ſo terrified, that they abandoned the city, and withdrew, with all their effects, to one of the neighbouring iſlands, where they built the city of Clazomenæ, ſo often mentioned in the Roman hiſtory. Pauſanias (Achaic. c. 3.) informs us, that Alexander joined it to the continent by a cauſeway 250 paces long; whence Strabo, Pliny, Ptolemy, and moſt of the ancient geographers, count it among the cities on the continent. The Romans, according to Livy, (lib. xxxviii. c. 39.) always treated the inhabitants with great kindneſs, apprized of the importance of this city to their conqueſts in Aſia; for they not only declared them a free people, but put them in poſſeſſion of the iſland of Drymuſa, and often quarrelled with the princes of Aſia on their account. Auguſtus repaired and embelliſhed their city with many magnificent buildings; whence, on ſome medals, he is ſtyled the founder of Clazomenæ, though this city was undoubtedly founded by the Ionians, and from the beginning was one of the Ionian confederacy. Some antiquarians take Clazomenæ for the ancient city of Grynium, which gave the epithet of Grynæus to Apollo; for, in ancient times, Apollo had a famous temple in the vicinity of Clazomenæ. Cybele was likewiſe one of their chief deities, and alſo Diana, as we learn from ſeveral ancient medals and inſcriptions. The Clazomenians held out againſt the Lydians, after moſt of the other cities of Ionia were reduced by Alyattes, who beſieged, but could not maſter Clazomenæ. The Perſians gained poſſeſſion of it in the time of Darius Hyſtaſpis, and ſuch was its importance in their eſtimation, that they would not part with it at the famous peace of Antalcides. Alexander reinſtated them in their ancient liberty and privileges; which were enlarged by the Romans, whom they aſſiſted on all occaſions with great fidelity. Clazomenæ anciently derived great profit from its oils. On one occaſion its inhabitants had recourſe to a ſingular contrivance for reſtoring their finances. After a war that had exhauſted the public treaſury, they found themſelves indebted to the diſbanded ſoldiers to the amount of 20 talents (4,500 *l*); which, being unable to raiſe, they paid them, during ſome years, intereſt, which they fixed at 5 *per cent.* They afterwards ſtruck copper money, to which they affixed the ſame value as if it were ſilver. The rich conſented to take it; the debt was liquidated, and the revenues of the ſtate adminiſtered with economy, enabled them gradually to call in the adulterated coin circulated in commerce. The ancient Clazomenæ was the native place of Anaxagoras. On or near the ruins of this illuſtrious city, was built the preſent *Dourlak*, or *Vourla*, a ſmall town, ſituated on the ſouth coaſt of the gulf of Smyrna.

CLEAN *Lough*, in *Geography*, a ſmall lake of the county of Leitrim, Ireland, which is conſidered as the fountain of the noble river Shannon. This lake is not four miles diſtant from the river Bonnet, which carries boats into Lough Gilly, and thence into Sligo bay. Perhaps, ſays Dr. Beaufort, the day may come, when the ſpirit of enterprize and commerce will open itſelf a paſſage by this channel.—Beaufort.

CLEANDRIA, in *Ancient Geography*, a place of Aſia Minor, in the Troade, where Strabo places the ſource of the Rhodius.

CLEANTHES, in *Biography*, a ſtoic philoſopher, and a diſciple of Zeno, was born in the year 339 B. C. and died in 240 B. C. He wrote many pieces, none of which are come down to us, except his "Hymn to Jupiter," and a few fragments; the ſeveral editions of which have been enumerated, with the various readings, and critical remarks, by the learned reviewer of Butler's edition of "Marcus Muſurus," &c. containing this hymn, and other fragments. (Monthly Review, enlarged, vol. xxv, p. 18, &c.) It was firſt publiſhed by Fulvius Urſinus, in 1568; then by Henry Stephens, in his "Poeſis Philoſophica," in 1573; afterwards by Cudworth, in his "Intellectual ſyſtem," fol. 1678; again in Moſheim's Latin tranſlation of Cudworth, in 1733; a fifth time in the third diſſertation added to Daniel Secundum Septuaginta, Rom. fol. 1773; a ſixth time in the 2d edition of Moſheim's tranſlation of Cudworth, publiſhed after his death, Leyd. Bat. fol. 1773; again in Brunck's "Analecta," in 1776, and afterwards by Brunck, in his edition of the "Gnomici Poetæ;" a ninth time in the "Eclogæ Phyſicæ" of John Stobæus, publiſhed at Gottingen, 8vo. 1792, by A. H. Heeren. It has alſo been tranſlated into German, Latin, and Engliſh. For the Engliſh tranſlation by Mr. Weſt, at the deſire of a friend, who was pleaſed to find ſuch juſt ſentiments of the deity in a Heathen, and ſo much poetry in a philoſopher; ſee "Odes of Pindar," &c. vol. ii.

CLEANTHES, one of the firſt inventors of painting in Corinth. He is ſaid to have learned the art from Ardices, his countryman, and was one of thoſe painters who were ſtyled monochromatiſts, becauſe their art extended no farther than to draw the ſimple outline of the figure, and fill it up with one colour only. Strabo, however, deſcribes ſome large compoſitions of this maſter. Winkelman. Orlandi. Della Valle, Vite d'Pitt. Ant.

CLEAR, in *Building*, is ſometimes uſed among the workmen for the inſide work of a houſe, &c.

CLEAR, in *Sea Language*, is applied to the weather, when it is fair and open; to the coaſt, when the navigation is not interrupted by rocks, &c. to the cordage, cables, &c. when they are diſentangled ſo as to be ready for immediate ſervice. In theſe ſenſes it is oppoſed to foul.

CLEAR, *Cape*, in *Geography*, in the iſland of Clare ſouth of the county of Cork, the moſt ſouthern point of land in Ireland. N. lat. 51° 19′. W. long. 9° 24′.

CLEAR *lake*, a lake in the N.W. part of North America, connected with the Athabaſca lake by the river Hay, and with the Peace river by the river Pine. See ATHABASCA.

CLEARE, ST. a village in Cornwall, being a vicarage in the Weſt Hundred; the ſituation of the ſteeple of its church was determined in the government trigonometrical ſurvey in 1796, by an obſervation from Bindown ſtation, diſtant 35,256 feet; and another from Kitt Hill ſtation diſtant 42,931 feet, and bearing 74° 42′ 9″ N.E. from the parallel to the meridian of Butterton ſtation; whence is deduced its latitude 50° 29′ 16″ N. and its longitude from Greenwich 4° 27′ 20″.6 W. or $17^{m}\,49^{s}.4$ in time. In 1777 the Liſkeard canal was in contemplation to terminate at Bark-Mill bridge in this pariſh, for bringing up lime and ſea ſand for manures, coals, &c. and exporting corn, &c.; but the ſame has not been carried into effect. See CANAL.

CLEARER, a tool uſed in *Rope-making*, ſimilar to the hatchell, but with finer teeth, as the hemp is always finiſhed on it for linen and twines for ſail-makers, &c.

CLEARING, in *Agriculture*, a term ſometimes applied, in threſhing corn, to ſignify a heap large enough to be winnowed.

CLEARING *the Anchor* and *the Hawſe*. See ANCHOR and HAWSE.

CLEARING *of Land*, in *Agriculture*, the removing of ſuch obſtacles and impediments as retard or prevent its cultivation and improvement. See *Removing Obſtructions to* TILLAGE.

CLEARING of *Liquors*. See CLARIFICATION.

CLEAS, in *Agriculture*, a provincial word, ſignifying the hoofs or claws of cattle, ſheep, hogs, &c.

CLEATS, in *Ship building*, are pieces of wood of different ſhapes, uſed for various purpoſes in maſt-making, block-making, and rigging. Thoſe uſed for ſtopping of ſhores are commonly made of elm, ſimilar to wedges, but only taper from one ſide; thoſe for ſtopping of rigging are haunched on the back with a hollow, from one-third of the length, the thin end being ſhaped with a duck's bill; theſe are made of oak; but, for maſt-heads, of elm. Cleats uſed in block-making are made of oak plank or board, and when ſawed to different ſhapes for the purpoſes to which they are to be applied, they are made ſmooth, and finiſhed with gouges, chiſſels, and raſps. In rigging they are uſed for ſtops, and ropes are faſtened to them. *Arm* or *ſling cleats* are nailed on each ſide of the ſlings of the lower yard, and have an arm at one end, which lies over the ſtraps of the jeer-blocks, to prevent their being chaffed; theſe are made of elm-plank, in length one and a quarter of the diameter of the yard, in breadth one-fourth of the length, and in thickneſs two-thirds of the breadth; the ſhoulder is one-third of the length of the cleat, and hollowed on the back from the ſhoulder to the end. *Belaying-cleats* are ſhaped like range-cleats, but ſmaller; they have two arms or horns, and are nailed through the middle to the maſts, or elſewhere, and to them ropes are belayed. *Comb-cleats* are made of aſh, or elm, board; they are ſemicircular, with their backs rounded ſo as to reſemble a cock's comb, and they have one or more hollow cavities gouged in the middle for the purpoſe of confining a rope to one place. *Range-cleats* to which are belayed tacks and ſheets, are from three to ſeven inches thick, and in length ſeven times the thickneſs. The arms are each one third of the length, and made round; the middle, between the two arms, is left ſquare, twice the thickneſs in breadth, through which it is bolted or faſtened; the back is curved in the length, that the arms may riſe from the inſide ſtraight. *Shroud cleats* are ſimilar to belaying-cleats, with the addition of an inſide piece, out of the ſame ſolid, long enough to have a ſcore on each ſide of the middle part of the cleat, to contain the ſeizings which faſten it to the ſhroud; the inſide is hollowed to fit the ſhroud, and another ſcore cut acroſs the middle of the cleat for the middle ſeizing; the ſcores are rounded on the outſide edges, and cut deep enough to bury the ſeizing, in order to prevent its being worn when the rope is belayed. *Sling-cleats* are made of elm-plank, in length one and a quarter of the diameter of the yard, in breadth one-fourth of the length, and in thickneſs two-thirds of the breadth. The ſhoulder is to be one-third of the length of the cleat, and hollowed on the back from the ſhoulder to the end; theſe are uſed as ſtops to the ſtraps of jeer-blocks, &c. to the lower yards. *Stop-cleats* are made of oak plank or board, of all lengths under twelve inches; the largeſt are commonly for gammoning bowſprits and as ſtops to ſtay collars. The breadth is one-fourth of the length, the thickneſs two-thirds of the breadth, and they are hollowed on the back. Thoſe for laſhings on the maſt-heads are made of elm, three times the thickneſs in breadth, and one and a half of the breadth in length. Stop cleats are nailed to the yard-arms, to prevent the ſlipping of the rigging and the gammoning, &c. *Thumb-cleats* are ſimilar in ſhape to arm-cleats, but are much ſmaller; they are nailed up vertically to hang any thing on; or horizontally, as ſtop-cleats. Cleats are nailed wherever they are wanted with more or fewer nails, according to the ſtrain they reſiſt.

CLEAVERS, or CLIVERS, in *Botany*. See GALIUM *Aparine*.

CLEBUCZ, in *Geography*, a town of European Turkey, in Dalmatia; 11 miles S.S.E. of Moſter.

CLEBURG, a town of Germany with a caſtle, in the circle of the Upper Rhine, and duchy of Deux Ponts, which gives name to a branch of the Palatine family; 28 miles S.S.W. of Deux Ponts.

CLEBURY. See CLEOBURY.

CLECHE′, or CLECHY, a French term in *Heraldry*, ſignifying any ordinary or bearing that is pierced throughout, *i. e.* when the whole figure is ſo much perforated that the chief ſubſtance is taken from it, and nothing remains viſible but the edges.

CLECY, in *Geography*, a town of France in the department of Calvados, and diſtrict of Falaiſe; containing about 1700 inhabitants; 3½ leagues W. of Falaiſe.

CLEDAGH, the name of ſeveral rivers in Wales; one runs into the Uſk in Monmouthſhire; another runs into the river of Neath, 5 miles N. of Neath in Glamorganſhire; a third runs into the Muthvey, 2 miles E. of Langadock in Caermarthenſhire; and a fourth runs into the Clethy in Pembrokeſhire.

CLEDAGNVAGH, a river of Wales, which runs into the Uſk, about a mile W. of Abergavenny.

CLEDEN, a town of France, in the department of Finiſterre, and diſtrict of Quimper; 2 leagues W. of Pontcroix.—Alſo, a town in the ſame department, and diſtrict of Morlaix; 1½ league W. of St. Pol-de-Leon.—Alſo, a town in the ſame department and diſtrict of Châteaulun; 5 miles S.W. of Carhaix.

CLEDGE, a name given by miners to the upper part of the ſtratum of fuller's earth.

CLEDGY, in *Agriculture*, a term applied to ſuch kinds of land as are ſtiff, ſtubborn, and of a hard tenacious quality, from the mixture of clay in them.

CLEDHEWEN, a river of Wales, which runs into the Dungledy, in Pembrokeſhire.

CLEDONISM, Cledonismus, a kind of divination in uſe among the ancients.

The word is formed from κληδων, which ſignifies two things, *rumor*, a report, and *avis*, a bird: in the firſt ſenſe *cledoniſm* ſhould denote a kind of divination drawn from words occaſionally uttered. Cicero obſerves, that the Pythagoreans made obſervation not only of the words of the gods, but of thoſe of men; and accordingly, believed the pronouncing of certain words, *v. g. incendium*, at a meal, very unhappy. Thus, inſtead of priſon, they uſed the word *domicilium;* and to avoid *erinnyes*, furies, ſaid *eumenides.*

In the ſecond ſenſe, cledoniſm ſhould ſeem to be a divination drawn from birds; the ſame with ornithomantia.

CLEEF, Joas, or Joost Van, in *Biography*, a painter, native of Antwerp, who enjoyed the reputation of being one of the beſt colouriſts of his time. The period of his birth is not known, but it appears that he entered into the company of painters at Antwerp, in the year 1511.

Soon after the marriage of Philip of Spain to Mary queen of England, he came to London; but ſeeing ſome pictures of Titian preferred to his own, he became frantic with rage and diſappointment, and from that time was nick-named Jooſt the Madman. There was an altar picture by him at the church of Notre Dame at Antwerp, which is ſaid to have poſſeſſed much of the purity of the Roman ſchool of painting: the ſubject was S. Coſmo and Damiano. The period when this artiſt died is unknown. Deſcamps. Heinecken. Pilkington.

Cleef, Hendrick, Henry, Martin, and Willem Van, three brothers, painters of Antwerp; the firſt, Hendrick, excelled in landſcape, and having ſpent many years in ſtudying at Rome, publiſhed upon his return many views of the ruins of ancient temples exiſting in that city. He was received into the company of painters at Antwerp in 1533, and died in 1589. Martin, the ſecond brother, was the diſciple of Francis Floris, and was admired for his hiſtory pieces with ſmall figures. Many landſcape painters, and amongſt others Gillis Coninxloo employed him to paint the figures in their landſcapes. He became one of the company of painters at Antwerp in 1551, and died aged 50. Willem, the other brother, excelled in large figure painting, but died young. Martin had four ſons, all painters, *Gilles*, *Martin*, *George*, and *Nicolas*. The firſt painted well in ſmall, but died young; the ſecond lived a long time in Spain, and afterwards went to the Indies: Nicolas was ſtill living at Antwerp in the time of Van Mander, in the year 1604. According to Strutt and Heinecken, Henry and Martin Van Cleef engraved a few pieces. Deſcamps. Heinecken.

Cleef, John Van, a Flemiſh painter of conſiderable note, was born at Venloo, in 1646, and having diſcovered, when young, a ſtrong inclination for the art, was placed under the tuition of Gentile, an hiſtorical painter at Bruſſels, with whom, however, he remained but a ſhort time: he then became a diſciple of Gaſpar de Crayer, to whom he was ſo much attached, that he continued with him until his death; when he was judged capable to put the laſt hand to ſome deſigns left unfiniſhed by Gaſpar, particularly the cantoons for the tapeſtry intended for Lewis XIV.

He had a manner peculiar to himſelf, and in compoſition and deſign far ſurpaſſed his maſter, though he fell ſhort of him in colouring. His pencil was bold and flowing: his pictures, though full of figures, are free from confuſion; and he thoroughly underſtood the introduction of architectural decoration.

He painted the principal altar-pieces of Ghent, many of which are deſcribed by his hiſtorian, Deſcamps. Amongſt the moſt celebrated is a large picture at the church of St. James, repreſenting Chriſt delivering the Souls out of Priſon; and another in the church of a convent, where the Nuns are relieving thoſe afflicted with the Plague; the Virgin and Child, S. Auſtin, S. Catherine, and other ſaints, are ſeen in the ſky. This artiſt died in the year 1716, aged 70. Deſcamps.

CLEENISH, in *Geography*, a ſmall iſland in Lough Erne, county of Fermanagh, Ireland, about three miles from Enniſkillen.

CLEES, Les, or Les Esclees, a town of Swiſſerland, in the canton of Berne, ſeated on the Orbe, in the road to France; 8 miles S.W. of Yverdun.

CLEETA, in *Biography*, an ancient Greek architect and ſculptor. He built the Palæſtra, or large court near Olympius, uſed for the horſe and chariot races at the celebrated Olympic games, which were held in this place at the cloſe of every olympiad, that is every fifth year. It was magnificently decorated with porticoes and other ornaments, and the author was ſo proud of his performance, that he introduced the following inſcription under one of the ſtatues which he had made at Athens; "Cleeta, the ſon of Ariſtocles, who invented the Palæſtra of Olympius, did this." Milizia. Mem. degli Arch.

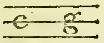
CLEF, (from *clavis*, Lat. and κλεις, Gr. *a key*), a character in *Muſic* to denote what part of the general ſcale the ſounds before which it is placed are to be ſung or played. Previous to the time of pope Gregory, to whom the ſquare and lozenge notes uſed in canto fermo are aſcribed, and which are now beſt known by the name of *Gregorian notes*, there were various methods of pointing out the elevation and depreſſion of the voice in chanting the maſs, not only before the time-table was formed, but even before lines and ſpaces were uſed. Theſe indications of change of voice were placed over the words long before a ſingle line aſcertained the difference of their ſituation. This was followed by a 2d, a 3d, and a 4th line, to which, with the ſpaces, canto fermo, in Roman miſſals, is ſtill limited.

The names and examples of all the firſt characters uſed for the modulation of voice may be ſeen in the General Hiſtory of Muſic, vol. ii. from p. 33 to 55.

After lines had increaſed to 8, in the 10th century, only the ſpaces were uſed, not for the notes, but ſyllables, the notes being placed in a kind of frame, on the left ſide, one to each ſyllable of the words. After this an alphabetic character was placed at the beginning of each line, capitals for the grave ſounds, and minuſcules for the acute. To this kind of notation *points* ſucceeded. Padre Martini has given three examples of only one line, to regulate the points uſed as notes over the words, a red line for the key of F, and a yellow one for that of C. This ſeems the origin of clefs, which are only Gothic letters corrupted.

Vincenzio Galilei (Dial. della Muſ. Ant. e Mod. p. *36*.) ſays, that a little before the time of Guido the points were placed on ſeven lines only, without uſing the ſpaces; perhaps in imitation of the ſeven ſtrings of the ancient lyre.

Few, however, of theſe methods of notation ſeem to have been generally received in contemporary miſſals, after the Greek characters were diſuſed; for in the MS. ſpecimens which we have ſeen, the marks placed over the words, in the middle ages, previous to the time of Guido, often appear arbitrary, and to have been adopted only in ſome particular church, convent, or fraternity.

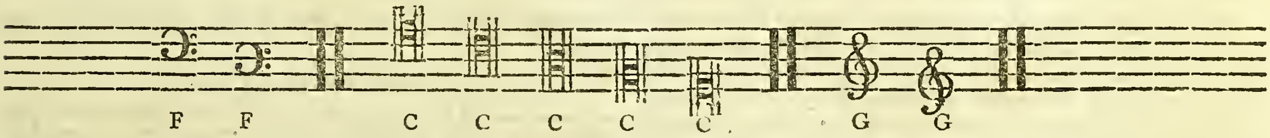
The ſinging clefs, or *claves ſignatæ* of the middle ages, were nothing but a c, a g, or an F, placed on one of the four lines uſed in canto fermo, as thus, 

Having traced the origin of clefs from ancient MSS., and the progreſſive improvements in ſimplifying them in proportion as the muſical art became more complicated, we ſhall waſte no time or paper in deſcribing new ſchemes of notation, and expedients for diminiſhing or augmenting the number of clefs in preſent uſe, but proceed to exhibit their form and explain their practical uſe in the moſt preciſe and clear manner we are able, without deviating from the method in which they have long been taught by the moſt learned, intelligent, and experienced muſicians, who have ſubmitted to the drudgery of inſtructing, not only pupils who receive pleaſure from the ſkill of others, and wiſh to entertain themſelves, but even thoſe on whom it is forced, and who having neither ear nor inclination for muſic, dread the ſight of a maſter, and regard him in no better light than a perſecutor.

The *tenor clef*, that ſtumbling block to the idle and liſtleſs, would be as legible as the treble or baſe, if learned in the ſame manner, and the pupils were accuſtomed to play favourite airs in all kinds of tenor clefs, and tranſpoſe by them early in their ſtudies. The printing new editions of old authors of organ and harpſichord pieces, without the admiſſion of tenor clefs, is a miſchievous indulgence, which having precluded the trouble of learning theſe clefs, renders all the old editions of the beſt authors of the laſt century unintelligible; as it does all the muſic in ſcore written or printed abroad; all vocal muſic from Italy, and harpſichord leſſons from Germany compoſed 20 or 30 years ago; all the works of Sebaſtian Bach, and the early productions of his admirable ſon, Emanuel, for the harpſichord, of which the treble or right-hand part is in the ſoprano clef, or tenor on the firſt line. Theſe, however excellent, are become totally obſolete and illegible to all but regular bred profeſſors, in our country only.

Three clefs, removeable from time to time, include the whole ſyſtem of muſical ſounds. Theſe are denominated BASE, TENOR, and TREBLE.

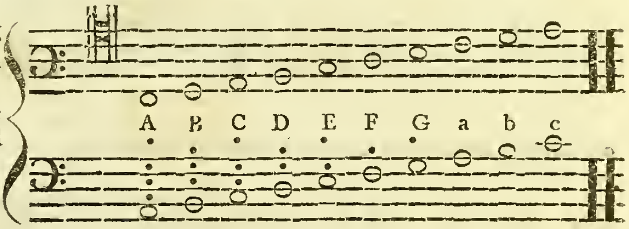
It is to be remembered that theſe ſeveral clefs are always placed on a line at the beginning of the five-line ſtaff, never on a ſpace; and though removeable, always retaining the power of giving the name of F, C, or G, to whatever line they are removed: as the baſe clef makes every line on which it is placed F; the tenor C; and the treble G.



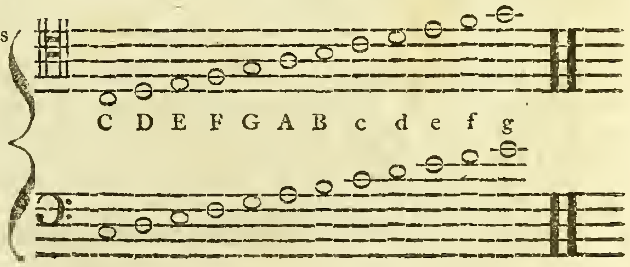
Now as theſe clefs have different appellations to diſtinguiſh them from each other, we ſhall give a gammut of thoſe leaſt in uſe, as a kind of dictionary, with equivalent ſounds in the two well-known clefs of G and F, to explain them.

The baſe clef on the 3d line is called the *baritono clef*, and is 3 notes higher than the common baſe clef on the 4th line.

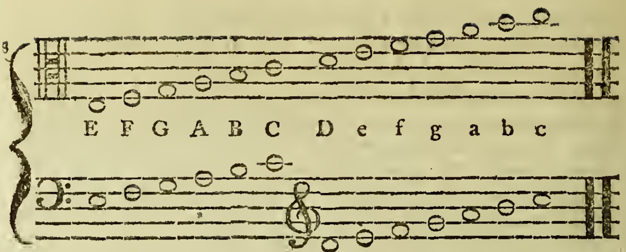
The tenor clef on the 5th line is equivalent to the baſe clef on the 3d line, and in old muſic, theſe two clefs are uſed promiſcuouſly.



Alto tenore, or high tenor clef on the 4th line, renders ſounds 5 notes higher than the baſe.

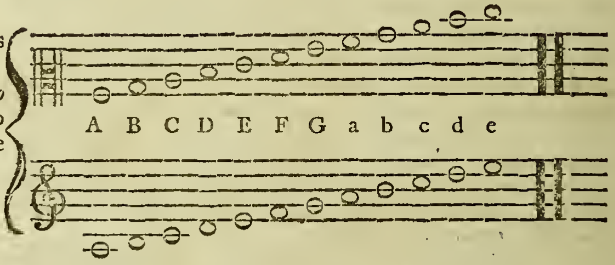


Contralto, or counter-tenor clef on the 3d line, 7 notes lower than the treble, and 7 notes higher than the baſe.

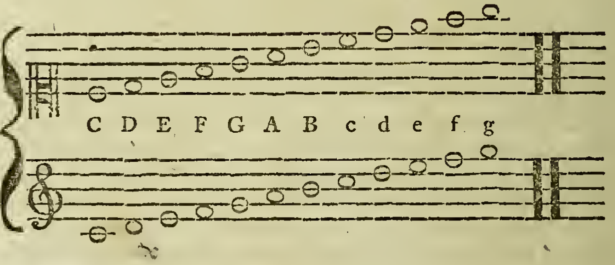


The *mezzo ſoprano*, or ſecond treble clef on the 2d line, is 5 notes lower than the treble.

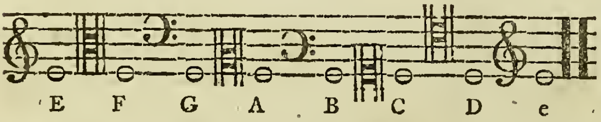
This clef is now ſeldom uſed; but in Purcell's time the *alto viola*, or inſtrumental-tenor part, was written in the mezzo ſoprano clef, which was the cuſtom in France till the middle of the laſt century.



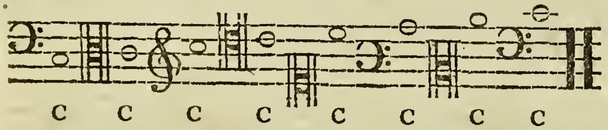
Soprano, or ſupreme clef, in which all treble voice-parts are compoſed in Italy and Germany, is the tenor clef on the firſt line, and renders every ſound a 3d lower than the treble.



Dr. Pepuſch, after giving his pupils a regular ſcale in each clef, made them familiarize themſelves to the changes which they occaſioned in the names of the notes and in their ſituation on the ſtaff, by written exerciſes, giving them a ſeries of 8 or more notes on the ſame line or ſpace, and obliging them to find a clef for every note which will make it aſcend or deſcend one degree, as thus:



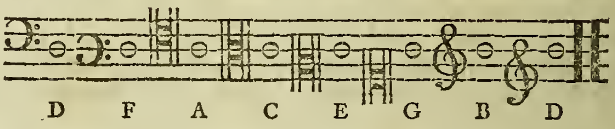
or, though ſeeming to aſcend, remaining ſtationary,



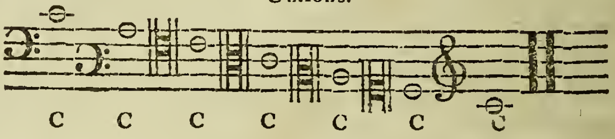
This method was recommended by Mr. Galliard, in his tranſlation of "Toſi's Obſervations on florid Song," Pl. No. 2. p. 17. pointing out its utility in tranſpoſition. But he was not the firſt who ſuggeſted this expedient; we find it in "Cerone della Muſica," p. 515. a work in Spaniſh, publiſhed at Venice 1614. See TRANSPOSITION.

Rouſſeau (Dict. de Muſ.) has adopted the ſame method, and given in *Plate* A, *fig*. 4 and 8, the two following examples.

Notes aſcending by 3ds.



Uniſons.



CLEF *de mouſquet, de carabine, de piſtolet, d'arquebuſe à rouet*, the ſpanner or lock of a muſquet, carabine, &c.

CLEFMONT, in *Geography*, a town of France, in the department of the Upper Marne, and chief place of a canton in the diſtrict of Chaumont; 17 miles S. of Bourmont. The place contains 380, and the canton 6996 inhabitants; the territory includes 180 kiliometres and 21 communes.

CLEFS, a town of France, in the department of the Maine and Loire, and diſtrict of Baugé, 2 leagues N. of it.

CLEFS *d'une ville ou place de guerre*, the keys of all the gates of a ſtrong place, as a fort, citadel, caſtle, town, or city of war, which an officer is charged with carrying every evening after the ſhutting of the gates, to the governor, or the perſon who commands in his abſence. The magazines, which contain pieces of artillery, are locked under three keys; one of which is carried to the commandant of the place, the ſecond to the commiſſary of artillery, and the third remains in the hands of the perſon who has charge of the magazine.

CLEFT, in *Grafting*. See ENGRAFTING.

CLEFTS, or CRACKS, in the heels of horſes, are occaſioned by hard labour, unwholeſome food, want of exerciſe, and waſhing them when hot. They are cured by cutting off the hair, and anointing with the oil of hemp-ſeed or linſeed, and keeping them clean.

CLEGG, JOHN, in *Biography*, a pupil of Dubourg on the violin, who travelled into Italy with Lord Ferrers, where he improved himſelf ſo much, that, on his return in 1723, he excelled in force and execution every performer in England, till the year 1742, when he had ſo deranged his faculties by intenſe ſtudy and practice, that he was confined in the hoſpital of Bedlam; where, during intervals of ſanity, he was allowed the uſe of his inſtrument; and it was long a faſhionable, though inhuman, amuſement, to viſit him there, among other lunatics, in hopes of being entertained by his fiddle or his folly. He was long the ſubject of praiſe, and regarded as a young man of ſuch ſuperior genius and abilities, that no one who had ever heard him would allow that he was equalled by any performer, on the ſame inſtrument, in Europe.

CLEGHORN, GEORGE, a diſtinguiſhed practitioner in medicine, was born at Granton, near Edinburgh, in December 1716. Shewing early an inclination to the ſtudy of medicine he was ſent to Edinburgh, and placed under the tuition of Dr. Alexander Monroe. While there he became acquainted with Dr. Fothergill, by whom he was materially aſſiſted in his ſtudies. In the year 1736 he was appointed ſurgeon to the 22d regiment of foot, then ſtationed in the iſland of Minorca, where he continued thirteen years. During his reſidence in this iſland, he employed his leiſure time in diſſecting monkeys and other animals, with which the place abounded; he alſo examined and acquired a knowledge of the plants and other natural productions of the country. In theſe purſuits he was much aſſiſted by correſponding with Dr. Fothergill, who procured and ſent him the neceſſary books, accompanied with hints, ſuggeſting the objects moſt deſerving his attention. In 1749 he quitted Minorca, and went to Ireland, and the year following he came to London, and publiſhed his "Treatiſe on the Diſeaſes of Minorca," 8vo. the reſult of his obſervations during his long reſidence in the iſland. The work is valuable, containing accounts of the air and ſoil, with deſcriptions of the medicinal plants. Then follow accounts of the diſeaſes moſt frequent in the country, with the methods he found moſt efficacious in combating them. He now went to Dublin, and commenced lecturer in anatomy, in which he acquired ſuch celebrity, that in 1754 he was appointed profeſſor in that ſcience by the univerſity. In 1774 he was made honorary member of the College of Phyſicians in Dublin. He was alſo one of the original members of the Academy for promoting Arts and Sciences in that city; and, about the ſame time, he had the honour of being nominated fellow of the Royal Medical Society at Paris. As Dr. Cleghorn had no family, he ſent for the widow of his brother, with nine children, whom he adopted, and treated as his own. He died December 1789. Lettſom's Memoirs of Medicine.

CLEGUEREE, in *Geography*, a town of France, in the department of Morbihan, and chief place of a canton in the diſtrict of Pontivy, two leagues N.W. of it. The place contains 3793, and the canton 14.964 inhabitants; the territory comprehends 187½ kiliometres and 9 communes.

CLEIDES, or CLIDES *inſulæ*, in *Ancient Geography*, ſmall iſlands of the Mediterranean, lying to the eaſt of the iſland of Cyprus, and very near it. Strabo reckons two, and Pliny four. The promontory near theſe iſlands had the ſame name, according to Herodotus.

CLEIDION, in *Antiquity*, the ſame with *clavicula*. See CLAVICULÆ.

CLEIDOMASTOIDEUS, in *Anatomy*, a name given by Albinus to that part of the ſterno-cleido-maſtoideus, which ariſes from the clavicle, and is deſcribed by him as a diſtinct muſcle. See STERNO-CLEIDO-MASTOIDEUS.

CLELBY RIVER, in *Geography*, one of the ſtreams which fall into Milford Haven in South Wales, navigable up to Canniſter bridge near Narberth. See CANAL.

CLELLES, a town of France, in the department of the Iſere, and chief place of a canton in the diſtrict of Grenoble; the place contains 681, and the canton 3811 inhabitants; the territory includes 162½ kiliometres and 9 communes.

CLEMA, in *Antiquity*, a ſpecies of vine, a twig of which was the enſign of a centurion's office.

CLEMATIS, in *Botany*, (from *κλημα*, *riticula*, *ſarmentum*, becauſe it climbs trees, by means of its pliant twigs, like thoſe of the vine), Linn. Gen. 696. Schreb. 950. Willd. 1083. Gært. 456. Juſſ. 232. Vent. 3. 55. Claſs and order, *polyandria polygynia*. Nat. ord. *Multiſiliquæ*, Linn. *Ranunculaceæ*, Juſſ. Vent.

Gen. Ch. *Cal.* none. *Cor.* Petals four, rarely five, ſix or eight, oblong, lax, pubeſcent. *Stam.* Filaments numerous, awl-ſhaped, ſhorter than the corolla; anthers adnate to the filaments. *Piſt.* Germs from four to twenty, roundiſh, compreſſed; ſtyles awl-ſhaped, longer than the ſtamens. *Peric.* none. *Seeds* numerous, roundiſh, compreſſed, tailed with the long permanent ſtyle in various forms.

Eſſ. Ch. Calyx none. Petals four, five or ſix. Seeds tailed.

Obſ. 1. Gærtner calls the external integument of the ſeed a capſule; but acknowledges at the ſame time, that, as there is no viſible umbilical cord, the ſeed may not improperly be ſtyled naked.

Obſ. 2. La Marck aſſerts that there is no real generic diſtinction between clematis and atragene; and that Linnæus abſurdly calls the ſame part of the fructification *corolla* in one, and *calyx* in the other. According to him, what Linnæus took for petals in atragene are only enlarged and often barren filaments of the exterior ſtamens; a circumſtance which occurs in ſeveral acknowledged ſpecies of clematis, and in ſome of nymphæa.

* *Stems climbing.*

1. C. *cirrhoſa*, Linn. Sp. Pl. 7. Mart. 1. Lam. 9. Willd. 1. (Clematitis peregrina, foliis pyri inciſis, Bauh. Pin. 300. Petiv. Gaz. tab. 126. fig. 1. Tourn. Inſt. 293. C. altera bætica, Cluſ. Hiſt. 1. p. 123. C. cretica foliis nunc ſingularibus nunc ternis, Tourn. Cor. 20.) Ever-green virgin's bower. "Cirrhoſe; leaves ſimple." Linn. "Leaves generally ſimple; ſtem cirrhoſe; peduncles lateral, calycled under the flower." Lam. *Stem* woody, reſembling that of the vine, ten or twelve feet high, ſending out branches from every joint, which render it a thick buſhy plant. *Branches* cylindrical, leafy, attaching themſelves to neighbouring objects by means of a kind of cirri, which are, in fact, only the permanent petioles of fallen leaves, none of them being found on the young ſhoots. *Leaves* on the ſame plant both ſimple and ternate; thoſe on the woody part of the ſtem,

and on the branches of two years growth, ſimple, petioled, egg-ſhaped, toothed, a little reſembling thoſe of the pear tree, but ſmaller; growing on the knots, often ſeveral together, in the axils of the cirri; thoſe on the young ſhoots commonly ternate, oppoſite, petioled; leaflets egg-ſhaped, a little cut or crenulate, ſmooth, green, ſhining. *Flowers* white; peduncles ſcarcely an inch long, lateral, axillary, one-flowered; petals large, elliptical, pubeſcent on the outſide; calycle, or rather involucre, one-leafed, concave, two-lobed, ſituated two or three lines below the corolla. *Seeds* with a plumoſe or ſilky tail. A native of Andaluſia and the iſland of Candia, but is ſufficiently hardy to bear the cold of our winters without injury. There are plants in Chelſea garden which have ſtood more than fifty years in the open air without protection from the ſeverity of the weather. It is uſed as a covering for arbours and other trellis-work, which it completely covers with it's thick foliage, and adorns with its large flowers. Gerard, by whom it was cultivated in 1596, calls it "Travellers' joy of Candia;" Johnſon, "Spaniſh traveller's joy;" and Parkinſon, "Spaniſh wild climber." 2. C. *florida*, Willd. 2. Hort. Kew. 2. p. 258. Thunb. Jap. 240. Bot. Mag. 894. "Leaves twice compound; leaflets binate and ternate; petals egg-ſhaped." *Root* perennial. *Stem* ſtriated, purple, entirely ſmooth. *Leaves* oppoſite, pinnæ ſeſſile, egg-ſhaped, acute, entire, or very rarely cut, villous. *Flowers* yellowiſh, large, ſpreading, axillary, ſolitary, peduncled; peduncle villous, one-flowered, longer than the leaves; petals egg-ſhaped, acuminate: ſtamens linear-lanceolate, purpliſh, unequal, half the length of the corolla, Thunb. A native of Japan. 3. C. *viticella*, Linn. Sp. Pl. 1. Mart. 2. Lam. 12. Willd. 3. Bot. Mag. 565. (Clematitis cærulea vel purpurea repens, Bauh. Pin. 300. —— flore pleno, 301. Tourn. 294.). "Leaves compound, and twice compound; leaflets egg-ſhaped, quite entire." Linn. "Leaves compound, and twice compound; petals margined, dilated at the tip, ſpreading." Lam. *Root* perennial. *Stems* ſlender, weak, branched, leafy, with many joints. *Leaflets* from nine to fifteen, ovate-acute, ſmooth, entire, ſometimes with one or two lobes; upper ones ſimple or ternate. *Flowers* blue, obſolete-purple, bright purple or red, peduncled; petals bordered on each ſide by a thin, whitiſh, pubeſcent membrane, which grows broader near the tip, and makes them appear wedge-ſhaped; ſtamens ſmall; filaments ſhort; ſtyles quite ſmooth. A native of Spain and Italy in hedges. Four varieties are cultivated in the nurſeries: ſingle blue, ſingle purple, ſingle red, and double purple. The latter is eſteemed the moſt ornamental, and continues the longeſt in flower, opening its flowers in June or July, and retaining them to the end of Auguſt. There is another variety, but not much eſteemed, with white flowers, only three or four feet high, which Miller received from mount Baldo. 4. C. *viorna*, Linn. Sp. Pl. 2. Mart. 3. Lam. 13. Willd. 4. (Flammula ſcandens, flore violaceo clauſo, Dill. Elth. tab. 118. fig. 144.) Leathery-flowered virgin's bower. "Leaves compound and twice compound; ſome of the leaflets trifid." Linn. "Leaves compound and twice compound; petals coriaceous, acute, half ſhut." Lam. *Root* perennial. *Stems* three or four feet high, cylindrical, ſtriated. *Leaves* oppoſite, petioled; leaflets from nine to twelve, three on each pinna, generally entire, a few trifid, ovate-acute, green and ſmooth on the upper ſurface, veined and paler underneath. *Flowers* purple or bluiſh violet, axillary, ſolitary; peduncles long, with a pair of ſimple leaves in the middle; petals with a whitiſh, cottony border, ſmaller than that of the preceding ſpecies; anthers terminated with a tuft of hairs. *Seeds* with long plumoſe tails. A native of Virginia and Carolina. 5. C. *criſpa*, Linn. Sp. Pl. 3. Mart. 4. Lam. 14. Willd. 5. Dill. Elth. tab. 73. fig. 84. Curled virgin's bower. "Leaves ſimple and ternate; leaflets entire or three-lobed." Linn. "Leaves compound, and twice compound; leaflets lanceolate; petals half-ſhut, ſomewhat curled at the ſides; margin membranous, undulated, wrinkled." Lam. *Root* perennial. *Stems* weak, faſtening themſelves to the neighbouring plants by the twining petioles of their leaves. *Leaflets* from nine to fifteen, narrower than thoſe of the preceding ſpecies. *Flowers* large, reddiſh, ſolitary; peduncles ſhort; petals leſs thick than thoſe of C. viorna, with many longitudinal furrows; anthers hairy at the ſummit. Tails of the ſeeds thick, awl-ſhaped, not plumoſe, but pubeſcent with ſhort cloſe-preſſed hairs. A native of Carolina. Thunberg deſcribes a Japaneſe plant under the ſame name, with a ſtem ſtriated, zig-zag, ſmooth; leaves five-nerved, petioled, acute, ſmooth; and flowers in a compound, trichotomous panicle; but its mode of infloreſcence muſt ſurely determine it to be a diſtinct ſpecies. 6. C. *calycina*, Mart. 16. Willd. 6. Hort. Kew. 2. 259. Vahl. Symb. 2. 75. Bot. Mag. 959. (C. balearica, Lam. 10.). Minorca virgin's bower. "Involucre calycine, approximating; leaves ternate, middle one three-parted." Hort. Kew. "Leaves compound, finely laciniated; flowers calycled, lateral; petals ſpotted within." Lam. *Root* perennial. *Stem* ſix feet high or more, branched, leafy. *Leaves* oppoſite, green, ſmooth, continuing nearly all the year; petioles tripartite, remaining after the leaves, and diſcharging the office of tendrils. *Flowers* white, large, ſolitary, axillary; peduncles two inches long; involucre one-leafed, bell-ſhaped, two-lobed, changing ſometimes into a pair of leaves; petals elliptic-oblong, nerved, pubeſcent on the outſide; ſprinkled on the inſide with ſmall, red, longiſh ſpots; filaments a little enlarged at their baſe; anthers ſmall; ſtyles plumoſe and ſilvery. A native of Minorca, flowering in autumn, and often in winter when the ſeaſon is mild. 7. C. *orientalis*, Linn. Sp. Pl. 4. Mart. 5. Lam. 5. Willd. 7. (Clematitis orientalis apii folio, Tourn. Cor. 20. Flammula, Dill. Elth. tab. 119. fig. 145.). "Leaves compound; leaflets cut, angular, lobed, wedge-ſhaped; petals villous on the inſide." Linn. "Leaves compound; leaflets wedge-ſhaped, three-lobed, ſomewhat toothed, acuminate; petals villous on the inſide." Willd. *Root* perennial. *Stems* from four to eight feet high, ſtriated, leafy. *Leaves* glaucous. *Flowers* yellowiſh, with a tinge of ruſſet on the outſide; petals lanceolate, almoſt ſmooth on the outſide, in ſhort panicles on tripartite peduncles. Tails of the *ſeeds* plumoſe, ſilky. A native of the Levant. 8. C. *glauca*, Willd. 8. Willd. Arb. tab. 54. fig. 1*. "Leaves compound; leaflets egg-ſhaped, ſometimes lobed, obtuſe, mucronate; petals ſmooth within ſide, pubeſcent at the edge." Perfectly diſtinct from the preceding in its whole habit, as well as in the particulars expreſſed in the ſpecific character. 9. C. *hexapetala*, Linn. Jun. Supp. 271. Forſt. Prod. n. 230. "Leaves compound; leaflets egg-ſhaped, ſerrated; peduncles two-leaved; corolla ſpreading, with ſix petals." *Root* perennial. *Flowers* yellowiſh, dioicous; peduncles branching, trichotomous. A native of New Zealand. 10. C. *triflora*, Willd. 10. Vahl. Symb. 3. p. 74. (C. mauritiana, Lam. 6.) "Leaves ternate; leaflets egg-ſhaped, mucronate; peduncles three-flowered." Vahl. "Leaves ternate; leaflets ſomewhat heart-ſhaped, ſerrated; tail of the ſeeds very long, plumoſe." Lam. *Root* perennial. *Stems* ſlightly ſtriated. *Flowers* whitiſh; peduncles lateral, oppoſite, axillary near the end of the ſhort pendant branches; petals oblong, villous on both ſides. *Seeds* purple, villous. A native of the iſlands of Bourbon and Madagaſcar, in woods. The natives of Madagaſcar make a cataa cataplaſm of the leaves, and employ it as a cure for the tooth-ache. The cataplaſm is carefully wrapped up in eight or ten folds of linen, and applied externally to the check of the patient. If ſuffered to touch the ſkin, it will produce a bliſter. 11. C. *virginiana*, Linn. Sp. Pl. 6. Mart. 7. Lam. 7. Willd. 11. Pluk. Mant. tab. 389. fig. 4. (C. Floridenſis flore albo odoratiſſimo; Albin. Anat. tab. 7. C. aquatica trifoliata; Gron. Virg. n. 270.) "Leaves ternate; leaflets heart-ſhaped, ſomewhat lobed and angular; flowers dioicous." *Root* perennial. *Stems* numerous, ſix feet high, or more. *Leaves* ſmooth, dark green on the upper ſurface, almoſt three-nerved underneath; veins branched, reticulated. *Flowers* white, in ſhort panicles, reſembling umbels; peduncles once or twice ternate; petals villous on the outſide, naked and veined within. The female flower has ſtamens, but the anther is deſtitute of pollen. 12. C. *japonica*, Mart. 9. Lam. 16. Willd. 12. Thunb. Jap. 240. "Leaves ternate; leaflets elliptic-ovate, ſerrated; flowers cylindrical." *Root* perennial. *Stem* filiform, ſtriated, purple, villous. *Leaves* petioled, ternate, growing ſeveral from each joint; petiole three inches long, capillary, looſe; leaflets an inch long, on ſhort petioles, acuminate, uniformly ſerrated from the middle to the tip, nerved, villous, the terminating one largeſt. *Flowers* purple, ſolitary, lateral, peduncled; peduncles the length of the leaflets. A native of Japan, flowering in Auguſt and September. 13. C. *trifoliata*, Willd. 13. Thunb. in "Linnæan Tranſactions," vol. ii. p. 337. (Scandens, Flor. Jap. n. 43.) "Leaves oppoſite, ternate, ſmooth; leaflets egg-ſhaped, repand-toothed." A native of Japan. 14. C. *dioica*, Linn. Sp. 5. Mart. 10. Lam. 8. Willd. 14. Sloan. Jam. 84. Hiſt. tab. 128. fig. 1. "Leaves ternate, quite entire; flowers dioicous." *Root* perennial. *Stems* ſlender, tough, ten or twelve feet high. *Leaves* coming out on each ſide of the ſtem; leaflets large, egg-ſhaped, with three or five longitudinal nerves. *Flowers* white; peduncles on the joints cloſe to the petioles, one on each ſide, long, naked, horizontal, extending beyond the leaves, before they divide and branch; branching into three or four pairs of ſubordinate peduncles, theſe dividing again into three ſmaller, each of which ſupports a ſingle flower. The loweſt pair of primary peduncles extends four or five inches, the others gradually diminiſhing to the top, and forming a pyramidal thyrſe of flowers; petals narrow, reflexed; ſtamens erect. Miller. A native of South America. La Marck doubts whether it be ſpecifically diſtinct from C. virginiana, but from Miller's deſcription, the infloreſcence is clearly different. Loureiro found a plant in Cochin-China, which he ſuppoſed to be the ſame as the C. dioica of Linnæus. It has about eighty ſeeds diſpoſed in a head, which are obtuſely three-cornered, and compreſſed, with a very long tail, fringed with many white hairs. But its identity may juſtly be doubted. Its infloreſcence ſeems to approach nearer that of C. virginiana. 15. C. *americana*, Mart. 17. "Leaves ternate; leaflets cordate-acuminate, quite entire; flowers in corymbs." *Root* perennial. *Stems* ſtrong, twenty feet high, or more, faſtening themſelves by their claſpers to the neighbouring trees. *Flowers* white; peduncles axillary, long, naked, branching. *Seeds* finely feathered. Sent to Miller from Campeachy, by Dr. Houſton. 16. C. *indiviſa*, Willd. 15. (C. integrifolia, Forſt. Prod. n. 231.) "Leaves ternate; leaflets egg-ſhaped, quite entire, mucronate; peduncles axillary, panicled, two-leaved." A native of New Zealand. 17. C. *paniculata*, Willd. 16. Thunb. in "Linnæan Tranſactions," 2. 337. (C. criſpa, Thunb. Jap. 239.) "Leaves quinate-pinnated; leaflets heart-ſhaped, egg-ſhaped, entire." *Root* perennial. *Stem* zig-zag, ſtriated, ſmooth. *Branches* alternate. *Leaves* petioled; leaflets petioled, acute, undivided, ſmooth; lower ones the largeſt; petioles zig-zag. *Flowers* white, axillary; peduncles thrice-ternate-panicled, filiform. A native of Japan. 18. C. *chinenſis*, Mart. 18. Willd 18. Retz. Obſ. 2. tab. 2. "Leaves quinate-pinnated; leaflets lanceolate." *Root* perennial. *Stems* tetragonous, weak, ſo as to want ſupport, ſcarcely climbing. *Leaflets* petioled, the pairs remote from each other. *Flowers* pale purple, ſmall, oppoſite, axillary; peduncles three, or five-flowered; lateral pedicels with a pair of ſmall bractes, far removed from the flower; end one naked; petals linear-lanceolate, inner edge marked with a tomentous line. Tail of the piſtils ſcarcely ſhorter than the anthers. Retz. A native of China. 19. C. *ſinenſis*, Lour. Cochin. 345. 3. "Leaves quinate; leaflets ovate-lanceolate, nearly ſeſſile." *Stems* round, very long, branched, climbing. *Flowers* red purple; peduncles axillary, many-flowered; corolla ſpreading. *Seeds* three to five. Common in China. Profeſſor Martyn juſtly remarks, that this plant ſeems ſpecifically diſtinct from the preceding. 20. C. *minor*, Mart. 21. Lour. Cochinch. 345. "Leaves quinate; leaflets conical, three-nerved; peduncles very long." *Stem* ſomewhat ſhrubby, not very long, cylindrical, ſlender, climbing, branched. *Leaflets* ſmall, bluntiſh at the end, quite entire, ſmooth. *Flowers* white, axillary, ſeveral together; petals oblong, ſtriated; ſtamens about forty, unequal; ſtyles four, hairy, a little longer than the corolla. A native of the ſuburbs of Canton in China. 21. C. *vitalba*, Linn. Sp. Pl. 8. Mart. 11. Lam. 1. Willd. 17. Gært. tab. 74. fig. 3. Curt. Lond. Faſc. 4. tab. 37. Jacq. Auſt. tab. 308. Eng. Bot. tab. 612. (C. ſylveſtris latifolia, Bauh. Pin. 300. Viorna, Ger. em. 886.) Common virgin's bower, Traveller's joy, or Old man's beard. "Leaves pinnated; leaflets heart-ſhaped; petioles twining." β. C. Canadenſis. "Leaves broader; leaflets growing by threes." *Root* perennial. *Stems* branched, leafy, furrowed, twining round other plants by means of the twiſted petioles of the fallen leaves. *Leaves* oppoſite, unequally pinnated; leaflets growing by fives, petioled, egg-ſhaped, acute, either entire, or irregularly cut, rather ſmooth. *Flowers* white, ſweet-ſcented; panicles axillary, dichotomous, pubeſcent, with ſmall bracteal leaves; petals coriaceous, villous on both ſides. *Seeds* with long plumoſe tails, which adorn the hedges in autumn, and during great part of the winter. Dr. Smith. *Seeds* about twenty, membranous, ſlender, reddiſh; on a ſmall villous, ſomewhat globular receptacle. Gært. The recent leaves, when rubbed on the ſkin, produce bliſters, and are ſaid to be uſed by beggars, to give the appearance of foul ulcers on different parts of the body or limbs, for the ſake of exciting compaſſion. But theſe ulcers, though large, are never deep, and are very little troubleſome, being eaſily removed at pleaſure, by an application of beet-leaves, to preſerve them from the influence of the atmoſpheric air. A native of England, and the ſouth of Europe, chiefly on a calcareous ſoil. Though not enumerated by Meſſrs. Dawſon, Turner, and Dilwyn, among the rare plants in their "Botaniſt's Guide;" it is certainly very local. We have never obſerved it north of Alconbury hill, on the great north road; nor of Northampton, on the middle one. Where it terminates on the Cheſter road, we cannot exactly aſcertain, but ſuppoſe it muſt diſappear nearly in a continuation of the ſame line, not having met with it in Warwickſhire, or any of the counties farther north, on that ſide of England. In the "Botaniſt's Guide through the Counties of Northumberland and Durham," it is mentioned as growing only on the Ballaſt hills of St. Anthony's, and Willington Quay, in Northumberland, where no one will ſuppoſe it indigenous. It is, we believe, a total ſtranger to the great limeſtone tracts in Yorkſhire, and the biſhoprick of Durham; nor was it found by Lightfoot in Scotland. The pith of the ſtems is ſo porous, that if one end of a piece, cut off between the knots, be ſet on fire, ſmoke may be copiouſly drawn into the mouth from the other. This, we well remember, was a favourite amuſement of our boyiſh days, in the neighbourhood of Northampton, when we knew the plant by no other name than that of tobacco-pipe tree. Variety β is a native of Canada. 22. C. *flammula*, Linn. Sp. Pl. 9. Mart. 12. Lam. 4. Willd. 19. (Clematitis ſive flammula repens, Bauh. Pin. 300. Tourn. Inſt. 293. Rai. Hiſt. 621). "Lower leaves pinnated, twining, laciniate; upper ones ſimple, quite entire, lanceolate." Linn. "Leaves twice pinnated; pinnæ generally three-leaved; leaflets ſmall, egg-ſhaped, rarely lobed." Lam. *Root* perennial. *Stems* numerous, about two feet long, rather creeping than climbing, ſlender, ſtriated, leafy. *Flowers* white, ſmall, ſweet-ſcented, in a kind of terminal panicle; peduncles once or oftener divided in a ternate manner; with ſmall, oppoſite, ciliated bractes under their diviſions. *Seeds* few, with a plumoſe tail.

* * *Stems erect.*

23. C. *maritima*, Linn. Sp. 10. Mart. 13. Lam. 3. Willd. 20. (C. maritima repens; Bauh. Pin. 300. Prodr. 135. Tourn. 294. Allion. Nic. 122.) "Leaves pinnated, linear; ſtems ſimple, hexagonal." Linn. *Root* perennial. *Stems* a foot and half high, ſlender, ſtriated, decumbent near the bottom, afterwards aſcending, or quite erect. *Leaves* oppoſite; leaflets linear, narrow, clothed with ſhort hairs, ſomewhat rigid, nearly ſeſſile, generally undivided, ſometimes bifid or trifid. Magnol and Ray make it a variety of C. flammula; but Linnæus thinks it more nearly allied to C. recta, and perhaps only changed by difference of ſituation. A native of the ſea coaſt in the ſouth of France and the neighbourhood of Venice. 24. C. *anguſtiſolia.* Willd. 21. Jacq. Ic. Rar. 1. Tab. 104. (C. hexapetala, Pall. Itin. 3. App. n. 96. tab. Q. fig. 2. Atragene; Gm. Sib. iv. p. 194.) "Leaves pinnated; leaflets lanceolate, obtuſe; lower ones tripartite; ſtems ſimple, ſtriated, erect; corollas polypetalous." Willd. *Root* perennial. *Flowers* white; petals ſix or eight. A native of Siberia and Auſtria. 25. C. *recta*, Linn. Sp. Pl. 11. Mart. 14. Lam. 2. Willd. 22. Jacq. Auſt. tab. 291. Hall. Helv. n. 1144. Wood. 21. Med. Bot. tab. 62. (Flammula recta; Bauh. Pin. 300. Clematitis ſive flammula ſurrecta alba, Tourn. Inſt. 294.) "Leaves pinnated; leaflets ovate-lanceolate, quite entire; ſtem erect; flower pentapetalous and tetrapetalous." Linn. *Stems* three feet high, leafy, ſtriated, herbaceous, greeniſh or reddiſh. *Leaves* large, oppoſite; leaflets from five to nine, pubeſcent underneath, petioled. *Flowers* white; in upright, ſtiff, terminal umbels; peduncles ſeveral times ternate; petals oblong, obtuſe, ſomewhat villous, a little longer than the ſtamens. *Seeds* few, dark brown, ſmooth, orbicular, much compreſſed; tails long, yellowiſh, plumoſe. A native of uncultivated hills in the ſouth of France, Spain, Switzerland, Auſtria, Hungary, and Tartary. This, like ſome of the other ſpecies of this genus, is extremely acrid, on which account it was called flammula by the old botaniſts, and has obtained a place in the Edinburgh diſpenſatory. It had long been mentioned as an external remedy, but was firſt recommended by baron Stoerck of Vienna in 1769, as an uſeful internal medicine in inveterate ſyphilitic diſeaſes, and ulcers proceeding from other cauſes, cancers, &c. He employed the leaves and flowers, as well as an extract made from the former; but he chiefly uſed an infuſion of two or three drams of the leaves in a pint of boiling water, of which he gave four ounces three times a day, and applied the powdered leaves as an eſcharotic to the ulcers. Unhappily the phyſicians of this country have not found it equally efficacious. See Woodville's Medical Botany. 26. C. *ochroleuca*, Mart. 19. Willd. 23. Hort. Kew. 2. p. 260. Pluk. Mant. tab. 379. fig. 5. "Leaves ſimple, egg-ſhaped, pubeſcent, quite entire; flowers erect." A low unbranched ſhrub. *Stem* pubeſcent. *Leaves* oppoſite, ſeſſile, ſtrongly nerved. *Flower* terminating, ſingle, pale yellow. A native of North America. 27. C. *integriſolia*, Linn. Sp. Pl. 12. Mart. 15. Lam. 15. Willd. 24. Jacq. Auſt. tab. 363. Bot. Mag. 65. (C. nutans, Crantz. Auſt. p. 124. C. inclinata, Scop. Carn. p. 668. Clematitis cærulea erecta. Bauh. Pin. 300. Tourn. Inſt. 294.) "Leaves ſimple, ſeſſile, ovate-lanceolate, flowers drooping." Linn. *Root* perennial. *Stems* a foot and half or two feet high, annual, erect, ſimple, ſometimes with two branches near the top, angular, ſtriated, almoſt ſmooth, leafy. *Leaves* oppoſite, quite entire, pubeſcent at their edges. *Flowers* blue, large, ſolitary, terminal, ſcentleſs; petals large, lanceolate, acute, waved, thick, ſpreading very much. (half open, Lam.); filaments very pale yellow; villous, twice the length of the petals. *Seeds* roundiſh, compreſſed, ſomewhat villous, with a long plumoſe tail. A native of Germany, Auſtria, Carniola, Hungary, and Tartary, flowering from June to Auguſt. Cultivated by Gerard in 1596; and now not uncommon in the nurſeries about London. Forſter, Flor. Auſt. n. 231. has given the ſame name to a very different plant from New Zealand with ternate leaves; the leaflets ovate, entire, mucronate; the peduncles axillary, panicled, two-leaved.

C. *alpina*, Lam. —— *geranifolia*, Bauh. Pin. —— Pluk. —— Moriſ. —— Mill. Ic. tab. 284. See Atragene *alpina*.

C. *zeylanica*, Herm. See Atragene *zeylanica*.

C. *indica ſpinoſa foliis luteis*, Bauh. Pin. See Strichnos *colubrina*.

C. *minor et major*, Bauh. Pin. See Vinca *major et minor*.

C. *arborea americana*, Pluk. See Plumeria *alba*.

C. *pentaphylla, pediculis alatis*, Plum. See Paullinia *alata*.

C. *indica, folio bifido, arbores tranſcendens*, Rai. Supp. See Bauhinia *ſcandeus*.

C. *anguloſo folio, aceris fructu*, Plum. Rai. Supp. See Banisteria *anguloſa*.

C. *quadrifolia flore digitalis luteo*, Plum. —— *myrſinites Americana tetraphyllos*, Pluk. See Bignonia *unguis*.

C. *americana ſiliquoſa tetraphyllos*, Dod. —— *tetraphylla Americana*, Bocc. Lan. Rai. See Bignonia *capreolata*.

C. *peruana*, Pluk. See Bignonia *peruviana*.

C. *indica alia*, Plum. —— *murucuia*, Moriſ. See Passiflora *pallida*.

C. *indica latifolia*, Plum. Rai. See Passiflora *maliformis*.

C. *indica, fructu citriformi*, Plum. Rai. See Passiflora *laurifolia*.

C. *indica polyanthus*, Plum. Rai. See Passiflora *multiflora*.

C. *indica, flore clavato ſuaverubente*, Plum. Rai. See Passiflora *rubra*.

C. *indica, flore puniceo*, Plum. Rai. See Passiflora *murucuia*.

C. *paſſionalis triphyllos*, Mor. See Passiflora *lutea*.

C. *indica, folio hederaceo major, et folio anguſto trifido*, Plum. See Passiflora *ſuberoſa*.

C. *indica, flore minimo pallido*, Plum. See Passiflora *hirſuta*.

C. *indica hirſuta fœtida*, Plum. See Passiflora *fœtida*.

C. *trifolia*, Bauh. Pin. Moriſ. See Passiflora *incarnata.*

C. *quinquefolia*, Rob. See Passiflora *cærulea.*

C. *indica polyphylla major*, Plum. Rai. See Passiflora *ſerrata.*

C. *indica polyphylla, flore criſpato*, Plum. Rai. See Passiflora *pedata.*

C. *baccifera glabra et villoſa*, Plum. Sloan. See Cissampelos *pareira.*

C. *indica perſicæ foliis*, Bauh. Pin. 304. See Ophioxylon *ſerpentinum.*

Clematis, in *Gardening*, comprehends plants of the flowery, perennial, and ſhrubby kinds of hardy growth; of which the ſpecies chiefly cultivated are; the purple virgin's bower, (C. *viticella*); the leathery-flowered virgin's bower, (C. *viorna*); the oriental virgin's bower, (C. *orientalis*); the virginian virgin's bower, (C. *virginiana*); the curled-leaved virgin's bower, (C. *criſpa*); the evergreen virgin's bower, (C. *cirrhoſa*); the ſweet-ſcented virgin's bower, (C. *flammula*); the upright virgin's bower, (C. *erecta*); the entire-leaved virgin's bower, (C. *integrifolia*). They have all climbing ſlender ſtems and branches, except the two laſt, in which they are upright with numerous flowers. Of the firſt ſort there are varieties with ſingle blue, ſingle purple, ſingle red, and double purple flowers, in cultivation.

And of the eighth ſort there is a variety with only two or three pairs of leaflets, which are narrower and ſtand farther aſunder, having ſhorter ſtalks and larger flowers.

Method of Culture.—The firſt or purple virgin's bower, and the different varieties, as well as the ſix following ſorts, are capable of being readily increaſed by layers, and ſome of them even by cuttings of the young ſhoots, planted out in the ſpring or ſummer months, but the firſt is the moſt uſual method.

In this the layers ſhould be made from the ſhoots of the preceding or the ſame year, and be laid down in the ſummer before they become woody, as in this way they ſucceed with greater certainty. The branches ſhould have their tops left a few inches out of the earth, a little water being given at the time. When they are become well rooted, as in the following autumn or ſpring, they may be taken off and planted out where they are to remain, or in the nurſery, to remain till they have attained ſome growth.

The ſhoots of the evergreen ſort may however be laid down at any ſeaſon, but the above is the beſt. It is alſo capable of being raiſed from cuttings of the young ſhoots planted out in either the ſpring or ſummer months in pots of good earth, plunging them in a very moderate hot-bed. The ſuckers from the roots may likewiſe be taken off and be planted out in the ſame manner as the layers, when they will often produce good plants, and in a ſhort time. The two laſt ſorts are capable of being readily increaſed by parting the roots, and planting them out either in the autumn or the early ſpring months, in a bed of good mould. In this way every part which has fibres preſerved at the bottom, and a bud in the upper part, will readily take root and become a plant. And theſe ſorts, as well as ſome of the others, may alſo be propagated by ſowing the ſeeds either where the plants are to remain, or in a ſpot of good mould in the early autumn or ſpring ſeaſon, in the latter caſe removing the plants into their proper ſituations, when of ſufficient growth. In this mode the plants are, however, longer in arriving at the flowering ſtate. The roots may be divided every two or three years, according to the number of diviſions that are to be made. Where the ſoil is dry the plants ſhould be new planted in the autumn; but in the contrary circumſtances, in the ſpring, in order to make them flower ſtrong and in a perfect manner. All theſe plants are of a hardy growth; and capable of ſucceeding in almoſt any ſort of ſoil. The climbing ſorts require proper ſupport, to prevent their trailing upon the ground, and are well adapted for ornamenting naked walls, arbours or other ſimilar places, as well as for running upon trees or ſhrubs in particular ſituations. And the two laſt ſorts are well ſuited for ornament in the clumps and borders of pleaſure-grounds, to be ſet out ſingly or in aſſemblage with other plants of ſimilar growths.

CLEMATITIS, in *Botany*, Bauh. Pin. Tourn. See Clematis.

Clematitis *novum genus*, Pluk. See Eupatorium *ſcandens.* The older botaniſts were accuſtomed to call almoſt every climber either clematis or clematitis.

CLEMENCY, in *Antiquity*, a deified perſonage, to whom an altar was erected at Athens, by the kindred of Hercules, and to whom a temple was dedicated by order of the Roman ſenate, after the death of Julius Cæſar, on ſome of whoſe denarii this goddeſs appears. She is deſcribed by the poets as the guardian of the world, and exhibited, holding a branch of laurel or olive, and alſo a ſpear, ſhewing that gentleneſs and pity ought principally to diſtinguiſh victorious warriors. The Greeks and Romans gave the name of Aſylum to the temples that were erected to this goddeſs. According to Mr. Spence, "the diſtinguiſhing character of Clemency, both in her ſtatues and in the poets is, the mildneſs of her countenance; ſhe has an olive branch in her hand as a mark of her peaceful and gentle temper." The term "clemency" in common language, denotes a remiſſion of ſeverity towards offenders, and particularly on the part of princes or perſons inveſted with high authority. In praiſe of clemency joined with power, it is obſerved, that the exerciſe of it is not only the privilege, the honour, and the duty of a prince, but that it alſo contributes to his perſonal ſecurity and that of his dominions more effectually than all his garriſons, forts, and guards; that the prince is truly royal who maſters himſelf, looks upon all injuries as below him, and governs by equity and reaſon, and not by paſſion and caprice. Many remarkable inſtances occur both in the Grecian and Roman hiſtory, in which clemency was exerciſed with great honour and correſponding advantage.

The council of Thirty, eſtabliſhed at Athens by Lyſander, committed the moſt execrable cruelties; but they were overthrown by Thraſybulus, who, after the recall of the exiles propoſed the celebrated amneſty, by which the citizens engaged upon oath that all paſt tranſactions ſhould be buried in oblivion. The government was re-eſtabliſhed upon its ancient foundation, the laws reſtored to their priſtine vigour, and magiſtrates elected with the uſual forms. This, ſays Rollin, (Anc. Hiſt. vol. iii. p. 309.) is one of the fineſt events in ancient hiſtory, worthy of the Athenian lenity and benevolence, and has ſerved as a model to ſucceſſive ages in good government. Never had tyranny been more cruel and bloody than that from which the Athenians had been reſcued. Every houſe was in mourning; every family bewailed the loſs of ſome relation. It had been a ſeries of public robbery and rapine, in which licence and impunity had authoriſed all manner of crimes. The people ſeemed to have a right to demand the blood of all accomplices in ſuch notorious malverſations, and even the intereſt of the ſtate to authoriſe ſuch a claim, that by exemplary ſeverities ſuch enormous crimes might be prevented for the future. But Thraſybulus riſing above thoſe ſentiments, from the ſuperiority of his more extenſive genius, and the views of a more diſcerning and profound policy, foreſaw, that by giving way to the puniſhment of the guilty eternal ſeeds of diſcord and enmity would remain, to weaken the republic by domeſtic diviſions, which it was neceſſary to unite againſt the common enemy, and occaſion the loſs to the ſtate of a great number of citizens, who might render it important ſervices from the view itſelf of making amends for paſt miſbehaviour. Such a conduct, continues Rollin, after great troubles in a ſtate, has always ſeemed, with the ableſt politicians, the moſt certain and ready means to reſtore the public peace and tranquillity. Another inſtance occurs in the hiſtory of Pauſanias, one of the kings of Sparta, when at the head of the Grecian army. After the victory of Platæa, as Herodotus relates the fact, (Lib. v.) one of the principal citizens of Ægina adviſed him to revenge upon the body of Mardonius the death of ſo many brave Spartans as were ſlain at Thermopylæ, and the unworthy treatment which his uncle Leonidas had met with from Xerxes and Mardonius, who fixed his body to a gibbet. "Would you adviſe me then, ſays he, to imitate the barbarians in the the thing we hate? If the eſteem of the people of Ægina is to be bought at ſo dear a rate, I ſhall be content with pleaſing the Lacedæmonians, who ſet a value upon virtue and merit. As to Leonidas and his companions, they are without doubt ſufficiently revenged by the blood of ſo many thouſand Perſians as have been ſlain in the battle." In this battle out of 300,000 men commanded by Mardonius, ſcarcely 40,000 eſcaped.

When two patricians, adverting to the hiſtory of Rome, conſpired againſt Titus the Roman emperor, (Suet. c. 9.) they were diſcovered, convicted, and ſentenced to death by the ſenate. But the clemency of Titus dictated a very different conduct. Having ſent for them, he privately admoniſhed them, that in vain they aſpired to the empire, which was given by deſtiny; exhorting them to be ſatisfied with the rank in which Providence had placed them, and offering them any thing elſe which it was in his power to beſtow. At the ſame time he diſpatched a meſſenger to the mother of one of them, who was then at a great diſtance, and deeply concerned about the fate of her ſon, to aſſure her, that her ſon was not only alive, but forgiven. Another inſtance is recorded by Zoſimus (ii. 674). When Licinius had raiſed an army of 130,000 men, he endeavoured to wreſt the government out of the hands of his brother-in-law, Conſtantine, the emperor. But his army having been defeated, he fled to Nicomedia, whither he was purſued by Conſtantine, who immediately inveſted the place. On the ſecond day of the ſiege, the emperor's ſiſter intreated him with tears to forgive her huſband, and grant him at leaſt his life. Conſtantine was prevailed upon to comply with her requeſt; and the next day, Licinius, finding no way of eſcape, preſented himſelf before the conqueror, and throwing himſelf at his feet, yielded to him the purple and the other enſigns of ſovereignty. Conſtantine received him in a friendly manner, entertained him at his table, and afterwards ſent him to Theſſalonica, aſſuring him, that he ſhould live unmoleſted as long as he raiſed no new diſturbances. Another inſtance occurs in the conduct of Cicero, when Rome was divided into two factions upon the occaſion of the death of Cæſar, who had been killed by the conſpirators; recollecting the celebrated amneſty of Thraſybulus above-mentioned, he propoſed, after the example of the Athenians, to bury all that had paſſed in eternal oblivion.

In a manner ſomewhat ſimilar, cardinal Mazarine obſerved to don Lewis De Haro, prime miniſter of Spain, that this gentle and humane conduct in France had prevented the troubles and revolts of that kingdom from having any fatal conſequences, and "that the king had not loſt a foot of land by them to that day;" whereas "the inflexible ſeverity of the Spaniards was the occaſion that the ſubjects of that monarchy, whenever they threw off the maſk, never returned to their obedience but by force of arms; which ſufficiently appears, (ſays he) in the example of the Hollanders, who are in the peaceable poſſeſſion of many provinces, that not an age ago were the patrimony of the king of Spain."

Monteſquieu obſerves (Spirit of Laws, vol. i. p. 134.) that clemency is the peculiar characteriſtic of monarchs. In monarchies great men are governed by honour, which frequently requires what the law forbids, and they are ſo much puniſhed by diſgrace, by the loſs (though often imaginary) of their fortune, credit, acquaintances, and pleaſures, that rigour in reſpect to them is needleſs. It can lead only to diveſt the ſubjects of the affection they have for the perſon of their prince, and of the reſpect they ought to have for public poſts and employments. So many are the advantages which monarchs gain by clemency, ſuch love, ſuch glory attend it, that it is generally a point of happineſs with them to have an opportunity of exerciſing it.

However, when there is danger in the exerciſe of clemency, the danger is viſible: it is an eaſy matter to diſtinguiſh it from that imbecility which expoſes the princes to contempt, and to the very incapacity of puniſhing. The emperor Maurice formed a reſolution never to ſpill the blood of his ſubjects. Anaſtaſius puniſhed no crimes at all. Iſaac Angelus made an oath that no one ſhould be put to death during his reign. Theſe Greek emperors had forgotten that it was not for nothing that they were entruſted with the ſword.

CLEMENS non Papa, in *Biography*, an excellent Netherlandiſh muſical compoſer, principal maeſtro di cappella to the emperor Charles V. Ludovico Guicciardine tells us, that this muſician was dead when he wrote his "Deſcription of the Low Countries," 1556. Seven books of his motets in four parts ("Cantionum Sacrarum") were publiſhed after his deceaſe, at Louvain, 1567, as was his "Miſſa Defunctorum," 1580. We have found no better muſic of the kind, than that of this compoſer; his ſtyle is clear, his harmony pure, and every ſubject of fugue or imitation ſimple and natural. In each of the great number of his works that we have ſcored, there is always ſome excellence; the laſt, however, that is ſeen, always appears the beſt. The ſeveral parts, in his French ſongs, ſing better, and the compoſition is, in general, more pleaſing, and like the beſt productions of a much better period, than any of the ſongs in the collections to which he was a contributor, that were publiſhed at Louvain about the middle of the ſixteeth century, under the title of "Livres des Chanſons a 4 Parties."

Clemens *Romanus*, *St.* **Clement**, one of the apoſtolical fathers, and firſt biſhop of Rome of that name, was a native of that city, as ſome have ſaid; on mount Coelius, his father's name being Fauſtinus and his mother's Mattidia; but theſe particulars are uncertain. Some have aſſerted, that he was a Jew, or of Jewiſh extraction, alleging a paſſage in his epiſtle to the Corinthians, in which he calls Jacob our father; but ſuch an expreſſion, it has been ſaid, is not unuſual even among thoſe who had been converted from Paganiſm to Chriſtianity. Nothing is more natural than for Chriſtians to ſpeak as if they were Abraham's children; as if the law, and the prophets, and the patriarchs, belonged to them as well as to the Jews. (See Jortin's Remarks on Eccl. Hiſt. vol. i. p. 336, &c.). It is generally allowed, that he had been acquainted with apoſtles and apoſtolical men; and that he was the Clement, to whom St. Paul bears teſtimony (Phil. iv. 3.), and whom he mentions among others of his "fellow-labourers, whoſe names are in the book of life." Some, indeed, ſuch are Mr. Wolff of Hamburgh, and Dr. Wall, have thought, that the Clement mentioned in this paſſage was a different perſon, and that he was a Philippian and not a Roman. To the arguments alleged by theſe writers, Dr. Lardner replies, that Clement, biſhop of Rome, was well acquainted with ſome of our Lord's apoſtles, whether he be the perſon mentioned by St. Paul or not. This learned writer, whoſe judgment in every caſe of this kind challenges great deference, ſays, that he ſees no proof that Clement mentioned by the apoſtle was a Philippian; and if Paul's calling Clement his helper or "fellow-labourer," in his epiſtle to the Philippians, is a proof that Clement had laboured with him at Philippi, his ſalutation of Aquila and Priſcilla, in the epiſtle to the Romans (xvi. 3.), would prove that they had been the apoſtle's "helpers" at Rome, before he had been there. He adds, Dr. Wall's argument from the age of Clement has no weight at all; becauſe there is no great diſtance between the ſuppoſed times of his and St. John's death; and yet St. John had been an apoſtle of Chriſt ſome while before Paul was converted. Clement therefore, biſhop of Rome, without any inconſiſtency, may be ſuppoſed to have been a companion and fellow-labourer of Paul at ſeveral places, and yet live to about the end of the firſt century. Some difference of opinion has prevailed concerning the time when Clement obtained the biſhopric of Rome. Biſhop Pearſon ſuppoſes, that Clement was biſhop of Rome from the year of our Lord 69 or 70 to the year 83, the ſecond of Domitian. Pagi is of opinion, that Clement ſucceeded Linus in 61, and occupied the ſee of Rome till 77, when he abdicated, and died long after a martyr in the year 100. Thoſe learned men, who place the biſhopric of Clement ſo early, or who ſuppoſe that he might have written his epiſtle to the Corinthians before he was biſhop, (as Dodwell,) uſually place it before the deſtruction of Jeruſalem. Others ſuppoſe, that this epiſtle was written ſhortly after the end of the perſecution under Nero, between the 64th and 70th year of Chriſt. Le Clerc places it in the year 69, and Dodwell in 64. Du Pin, Tillemont, and others think, that he was not biſhop till the year 91 or 93. This was the opinion of Dr. Cave, when he wrote his Apoſtolici (*vid.* Life of St. Clement, § 4.) but he altered it afterwards. This, ſays Dr. Lardner, is the more common opinion, and is agreeable to the ſentiments of Irenæus, Euſebius, and others, the moſt ancient Chriſtian writers. Irenæus makes Clement the third in ſucceſſion after the apoſtles. Euſebius alſo ſays, that in the 2d year of Titus, A. D. 79, Linus, biſhop of the church of Rome, when he had governed it 12 years, delivered it to Anencletus; and in the 12th year of the reign of Domitian, A.D. 92, Anencletus, having been biſhop of the church of Rome 12 years, was ſucceeded by Clement, whom the apoſtle mentions in his epiſtle to the Philippians. In another place Euſebius ſays, that in the beginning of Trajan's reign Clement ſtill governed the church of Rome, who was the third in that ſucceſſion, after Paul and Peter; for Linus was the firſt, and after him Anencletus; and he afterwards ſays, that Clement died in the 3d year of Trajan, (that is, A.D. 100); having been biſhop 9 years. St. Jerom agrees with Euſebius; and he obſerves, that it was indeed the more common opinion of the Latins, that Clement was next after Peter, but he does not follow them. Tertullian, the moſt ancient Latin father remaining, though not ſo ancient as Irenæus, ſays, that Clement was ordained by Peter. But in this particular Tertullian might be miſtaken; and the teſtimony of Irenæus, confirmed by Euſebius, is much more valuable than his. Dr. Lardner has ſuggeſted ſeveral methods of reconciling Tertullian with others. According to the moſt credible teſtimonies, Clement's biſhopric of Rome muſt have commenced in the year 91 or 92. Some have ſuppoſed that our Clement was of the family of the Cæſars and that he ſuffered matyrdom. But both theſe ſuppoſitions ſeem to be originally owing to his having been confounded with "Flavius Clemens," the conſul; who was a near relation of Domitian, and was put to death by him on account of his attachment to Chriſtianity. That Clement was no martyr is fairly concluded from the ſilence of Irenæus, Tertullian, Euſebius, and others; who could not have omitted this circumſtance, if there had been any ground for it.

The "Epiſtle" of Clement, ſtill extant, appears to have been written in the name of the whole church of Rome to the church of Corinth, and therefore it is called at one time the epiſtle of Clement, and at another the epiſtle of the Romans, to the Corinthians.

The main deſign of it is to compoſe ſome diſſenſions, which ſubſiſted in the church of Corinth about their ſpiritual guides and governors; which diſſenſions had been excited by a few turbulent and ſelfiſh perſons Clement recommends not only concord and harmony, but love in general, humility, and all the virtues of a good life, and ſeveral of the great articles and principles of religion. The ſtyle of it is clear and ſimple. It is called by the ancients an excellent and uſeful, or great and admirable epiſtle; and though Photius, upon the whole, commends it, yet he ſays that it contains ſeveral things liable to cenſure, or, in modern language, that it is a Socinian epiſtle. It ſhould be recollected, however, that Photius is apt to cenſure the writers, who did not come up to the orthodoxy of his time. Neverthele ſs, the epiſtle deſerves the commendations that have been beſtowed upon it. It is not indeed entire, ſome pages being deficient in the MS. of it; and as we have only one MS. of it remaining, it cannot be altogether ſo correct, as if we had a number of copies to compare together.

As to the preciſe time when it was written, there has been ſome difference of opinion. It appears from expreſſions that occur in it, to have been written after ſome perſecution, or at the concluſion of it; either the perſecution of Nero about 64, or that of Domitian in 94, or 95. Several paſſages ſeem to intimate, that it was written after the latter, and not ſo ſoon as that of Nero. Irenæus ſays, that in the time of Clement, when many were alive, who had been taught by the apoſtles and when there was no ſmall diſſenſion among the brethren of Corinth, the church at Rome ſent a moſt excellent letter to the Corinthians, perſuading them to peace among themſelves, &c. Euſebius alſo bears teſtimony to the excellence of this epiſtle, and to the diſſenſion at Corinth which occaſioned it; and he adds, that this epiſtle has been formerly, and is ſtill publicly read in many churches. St. Jerom alſo ſays, that Clement wrote a very uſeful epiſtle in the name of the church of Rome to the church of Corinth, which in ſome places is read publicly. Upon the whole we may conclude, with Dr. Lardner, that this epiſtle was written at the latter end of the reign of Domitian, in the year 95, or rather 96. In this epiſtle there is but one book of the New Teſtament expreſsly named, which is the firſt epiſtle of St. Paul to the Corinthians, and which, it is ſaid, was written by the apoſtle Paul. It contains frequent references and alluſions to the Scriptures both of the Old and New Teſtament. Words of our bleſſed Lord, found in the goſpels of Matthew, Mark, and Luke, are recommended with a high degree of reſpect, though without the names of the Evangeliſts. There are alſo ſuppoſed alluſions to the Acts of the Apoſtles, the epiſtle of Paul to the Romans, both the epiſtles to the Corinthians, the epiſtles to the Galatians, Epheſians, Philippians, Coloſſians, the firſt to the Theſſalonians, firſt and ſecond to Timothy; the epiſtle to Titus, the epiſtle to the Hebrews, the epiſtle of James, and the firſt and ſecond of Peter ; but all without any name, or ſo much as a mark of citation. Mill allows, that it appears from this epiſtle, that Clement had in his hands not only our firſt three goſpels, but alſo the Acts of the Apoſtles, and the epiſtle to the Romans, both the epiſtles to the Corinthians, and the epiſtle to the Hebrews: and the teſtimony thus given to the antiquity, genuineneſs, or authority, of the books of the New Teſtament, is to be eſteemed not only the teſtimony of Clement, but likewiſe of the church of Rome in his time. Moreover, it ought to be allowed, that the Corinthians likewiſe, to whom this epiſtle was ſent, were acquainted with, and highly reſpected, the books quoted, or alluded to. In this epiſtle there are not any quotations or references to any of the apocryphal goſpels, as they are called. "Nor do I remember," ſays Dr. Lardner, "that any of the paſſages of the goſpel according to the Hebrews, or that according to the Egyptians, which have been collected by learned men from the writings of the ancient Chriſtians, are taken out of this epiſtle."

The epiſtle of which we have given the above account, is the only piece of Clement, which can be relied on as genuine. The ſecond epiſtle, which ſome have been inclined to own as ſuch, is expreſsly rejected by Photius ; and Grabe has obſerved, that Dionyſius, biſhop of Corinth, in the ſecond century, mentions only one epiſtle of Clement ; that Clement of Alexandria and Origen, who have quoted the firſt, never take any notice of the ſecond ; nor yet Irenæus, who has particularly mentioned the firſt, and could not well have omitted to mention the other alſo, if he had known any thing of it. From all theſe circumſtances Grabe concludes with great probability, that this piece was not written before the middle of the third century. As to the Conſtitutions, and Recognitions, aſcribed to Clement ; ſee theſe articles. Cave's Hiſt. Lit. t. i. p. 28. Jones's Canon, vol. i. Lardner's Works, vol. ii.

Clemens, Titus Flavius, Clemens Alexandrinus, or St. Clement *of Alexandria*, was born and educated, as ſome ſay, at Athens, or, according to others, at Alexandria, where he reſided a conſiderable time, after his return from his travels through Greece, Calabria, Italy, the Eaſt, Paleſtine, and Egypt. Euſebius intimates that he was originally a heathen. He flouriſhed in the latter part of the ſecond, and the beginning of the third century, in the reign of Severus and his ſon Antoninus Caracalla ; that is, between the years 192 and 217. Du Pin ſuppoſes, that he lived to the time of Heliogabalus, and that he did not die before the year 220 ; but it is the more general opinion, that he died ſooner. Several of the ancients give him the title of Preſbyter ; and he was likewiſe preſident of the catechetical ſchool of Alexandria, having ſucceeded Pantænus in this office, when he went to Ethiopia, about the year 190. Sidetes, indeed, is of a different opinion, and ſays that Pantænus was the ſucceſſor of Clement, and that Clement was the ſucceſſor and diſciple of Athenagoras. Dodwell has adopted this opinion, though it is contradicted by the more credible teſtimonies of Euſebius, Jerom, and Photius. It is very probable, however, that upon the publication of the edicts of Severus againſt the Chriſtians, in the 10th year of his reign, A.D. 202, Clement was obliged to reſign this office and to retire from Alexandria. The place and time of his death are not aſcertained ; but he probably died at Alexandria, whither he returned from his peregrinations to Jeruſalem, Antioch, &c. in the reign of Antoninus Caracalla. Among the eminent men who proceeded from the ſchool of Clement, we may mention Origen, Alexander, biſhop of Jeruſalem, and Hippolytus. Clement wrote a great number of books, of which Euſebius and Jerom have given catalogues, and they are alſo enumerated by Fabricius and Cave. The works which now remain, are "Protrepticum," or an Exhortation to the Gentiles ; "Pædagogus," or the Inſtructor, in three books ; the "Stromata," or Various Diſcourſes, in eight books ; and a ſmall treatiſe entitled, "Who is the rich Man that may be ſaved." The Stromata were written after the death of Commodus, in the reign of Severus, as Euſebius has obſerved from a paſſage in the work itſelf. Dodwell was of opinion, that all the works of Clement, which are remaining, were written between the beginning of the year 193 and the year 195. Beſide theſe, Euſebius frequently mentions another book of Clement, called "Hypotupoſes," or Inſtitutions, which is loſt. But we have in Greek two ſmall pieces, one called "an Epitome of the Writings of Theodotus and the Oriental Doctrine ;" the other "Extracts from the Prophets ;" both which are generally ſuppoſed to be collected out of the loſt book of Inſtitutions, or to be fragments of it. There is likewiſe in Latin a ſmall treatiſe or fragment, called "Adumbrations" on ſome of the Catholic epiſtles, which, if it be Clement's, was probably traſlated from the ſame work called "Inſtitutions," as we learn from Euſebius and others, containing ſhort explications of many books both of the Old and New Teſtament. Many of the ancients ſpeak in high terms of the excellent character and diſtinguiſhed learning of Clement. Many teſtimonies to this purpoſe, collected from Euſebius, Alexander biſhop of Jeruſalem, St. Jerom, &c. may be ſeen prefixed to the Oxford or Potter's edition of St. Clement's works, in 2 vols. folio, 1715.

In the writings of Clement we have a very valuable teſtimony to the four goſpels of St. Matthew, St. Mark, St. Luke, and St. John, all which were owned and received by him ; and he has alſo preſerved a tradition concerning the order in which they were written, which he had received from proſelytes of more ancient times. We have alſo an aſſurance of the genuineneſs of the genealogies in the firſt chapter of St. Matthew and the third chapter of St. Luke ; which he had alſo received from more ancient preſbyters. "This teſtimony to the firſt chapter of St. Matthew's goſpel is ſo ſtrong," ſays Dr. Lardner, "that it ſeems to put the antiquity and genuineneſs of it out of queſtion." Clement's account of the occaſion of writing St. Mark's goſpel agrees with that of Papias and Irenæus, which informs us that this goſpel contains the ſubſtance of Peter's preaching, and that it was compoſed by one who had been long a companion and follower of Peter, and who retained in his memory the things that had been ſpoken by that apoſtle. Clement ſuppoſes that St. John, who wrote laſt, had ſeen and approved the other three goſpels. He owns the Acts of the Apoſtles, and aſcribes it to Luke as the author, who is ſaid to have likewiſe tranſlated the epiſtle to the Hebrews. He alſo admits all the fourteen epiſtles of Paul, except the epiſtle of Philemon ; but his omitting to mention this epiſtle might be owing to its brevity. He alſo quotes the firſt epiſtle of Peter, the firſt and ſecond epiſtles of John, the epiſtle of Jude, and the book of Revelation ; but we have in Clement no quotations from the epiſtle of James, the ſecond of Peter, or the third of John, nor any evidence that theſe were owned by him. The epiſtle of Barnabas, that of Clement of Rome, and the ſhepherd of Hermas, are quoted by Clement with higher marks of reſpect than others, as they are deſerving of it on account of their early age, and their authors' acquaintance with the apoſtles or apoſtolical men. But he affords us no evidence that he had the ſame reſpect for them which he had for the goſpels and the epiſtles of the apoſtles. There are alſo other books, called apocryphal, which are cited by Clement ; ſuch are the Goſpels according to the

Hebrews, and according to the Egyptians; the Preaching of Peter, the Revelation of Peter, and the Acts of Peter, and the Traditions of Matthias. But there is no ſufficient reaſon for ſuppoſing, that St. Clement received as "Scripture," in the higheſt ſenſe of the word, any Chriſtian writings, beſides the books of the New Teſtament, now commonly received by us. Cave's Hiſt. Lit, t. i. p. 88, &c. Fab. Bib. Græc. t. v. p. 102, &c. Lardner's Works, vol. ii. p. 206 – 243.

CLEMENT, a name aſſumed by ſeveral of the biſhops of Rome. Of *Clement* I. we have already given an account under the article Clemens Romanus.

Clement II. was the name aſſumed by Suiger, a native of Saxony, and biſhop of Bamberg, upon his elevation to the pontifical throne, in 1046, in order to ſupply the vacancy occaſioned by the death of Gregory VI. On the day of his election he crowned Henry emperor, and his queen Agnes empreſs; and in a council ſpeedily aſſembled at Rome, he iſſued ſeveral canons againſt ſimony, which had prevailed almoſt univerſally all over the Weſt. In this council he ſettled a diſpute between the archbiſhops of Ravenna and Milan concerning precedency; determining, by his apoſtolical authority, in favour of the former, whom he ordered always to ſit on his right hand, unleſs the emperor ſhould be preſent, and, in that caſe, to ſit at his left. This pope died at Rome on the 9th of October 1047, after a pontificate of 9 months and 15 days; and his remains were interred at Bamberg. St. Wiborada, a virgin martyred by the Hungarians in 925, was canonized by this pope, and the day of her death appointed as an annual feſtival.

Clement III. was Paul, cardinal biſhop of Paleſtrina, and a native of Rome, who, being elected at Piſa on the 19th of December, 1187, as ſucceſſor to Gregory VIII. was crowned the next day under this name. Soon after his election, he exerted himſelf in terminating a conteſt that had ſubſiſted for 50 years between the pope and the Roman people. Accordingly an agreement was concluded, in 1188, after ſeveral previous conferences, upon the following terms: *viz.* that the pope ſhould be inveſted with the ſovereignty of Rome:—that the office of patrician ſhould be aboliſhed, and a prefect with more limited power appointed in his room:—that ſenators ſhould be created annually, with the approbation and by the authority of the pope, who ſhould take an oath of allegiance to his holineſs, and promiſe to aſſiſt him when required:—that St. Peter's church and its revenues ſhould be reſtored to the apoſtolic ſee:—that the tolls and all other public revenues ſhould be at the diſpoſal of the pope, on condition that he expended one-third of them for the uſe of the Roman people:—that the ſenate and the people ſhould reverence the majeſty and maintain the honour and dignity of the high pontiff:—that the Roman pontiff ſhould beſtow the uſual gifts and largeſſes upon the ſenators, judges, advocates, and other officers of the ſenate:—that he ſhould pay yearly a certain ſum for the reparation of the walls of the city:—and that he ſhould allow the walls of Tuſculum to be razed to the ground, and aſſiſt the Romans in that undertaking. The papal dominion over Rome being thus eſtabliſhed, Clement ſet out from Piſa for Rome without delay, and was cordially received by the ſenate, the nobility, and the people. The pope, having ſecured his ſovereignty, zealouſly engaged in the proſecution of the holy war, and left no attempt untried for inducing all Chriſtian princes to unite in a new cruſade. His active efforts were crowned with ſingular ſucceſs not only in Italy but in Germany, France, and England; and heavy taxes were impoſed in order to defray the expence of the intended expedition. In England, particularly, a tenth was exacted of all revenues, of all moveables and chattels. Having thus provided a large ſum of money, a war in the eaſt was carried on, though with little ſucceſs, by Richard, the ſon and ſucceſſor of Henry II., after the death of his father in 1189. Clement, having compromiſed the difference that ſubſiſted between William king of Scotland and the apoſtolic ſee, and exempted the church of Scotland from all ſubmiſſion to the Engliſh church, and having enjoyed the ſatisfaction of hearing that the kings of France and England had departed for the Holy Land at the head of two numerous armies, was humbled and grieved by the unexpected news of the death of the emperor Frederic, who, after having adjuſted all his differences with the apoſtolic ſee, had taken the croſs, and obtained many ſignal advantages over the infidels. Whilſt he was purſuing theſe advantages, he fell from his horſe in croſſing a river, and loſt his life before his aſſiſtants could afford him any aſſiſtance. The pope did not long ſurvive this diſtreſſing intelligence. He died on the 27th of March in the following year, *viz.* 1191, and, being greatly beloved by the Romans, was buried with extraordinary pomp in the Lateran church. Before his death, he canonized Otto, biſhop of Bamberg, the firſt who preached the goſpel to the Pomeranians, and Stephen de Mureto, founder of the order of the Grandimontenſes.

Clement IV. ſucceeded Urban IV. in 1265. His family name was Guido, and he was a native of St. Gilles on the Rhone, in the province of Narbonne. In his youth he followed the military profeſſion, and afterwards applied himſelf to the ſtudy of the law, with ſuch aſſiduity and ſucceſs, that he was reckoned one of the beſt civilians of his time. Upon the death of his wife he entered into holy orders; and after ſeveral gradations of eccleſiaſtical preferment, he was created by Urban IV. in 1261, cardinal biſhop of Sabina; and in 1263, he was ſent, under the character of the pope's legate *à latere*, into England, to mediate a reconciliation between the king and his barons, who were then at open war. But, being forbidden to enter the kingdom, he ſtopped at Boulogne, and, ſummoning thither ſome of the Engliſh biſhops, he ſolemnly excommunicated, in their preſence, all who ſhould thenceforth diſturb the public peace of the kingdom, and ordered the biſhops to publiſh that ſentence, and to ſee it executed. In his return to Italy, he received the news of his election to the papacy; and having arrived ſafe at Perugia, he was there, or, as ſome ſay, at Viterbo, conſecrated and crowned, aſſuming the name of Clement, becauſe he was born on St. Clement's day. Inſtead of following the example of other popes, who had enriched and aggrandized their families at the expence of the church, he gave his relations to underſtand, that they muſt expect nothing from him as pope, but content themſelves with the wealth and the rank which they poſſeſſed before his promotion. Clement is ſaid to have abhorred plurality of benefices, as a moſt ſcandalous abuſe; and he obliged even his own nephew, who had three, to reſign two of them, allowing him to chooſe which of the three he pleaſed. The character of Clement was, in many reſpects, unexceptionable; nevertheleſs, in conformity to the conduct of his predeceſſors, he made it the whole buſineſs of his pontificate, utterly to extirpate the family of Frederic, to drive Manfred from the kingdom of Sicily, and ſettle Charles of Anjou upon the throne. Charles was accordingly inveſted with the kingdom of Sicily by four cardinals appointed by the pope; but under ſo many conditions annexed to the inveſtiture, that he became, in effect, a tributary of the apoſtolic ſee. On the 6th of January, 1266, Charles was ſolemnly crowned in the church of St. Peter, as king of Sicily on this and the other ſide of the Pharos, or the ſtraits of Meſſina; and hence probably originated the modern title of king of both Sicilies. His wife, Beatrix, who had long panted for a crown, received it at the ſame time. Charles, however, was obliged to conteſt the poſſeſſion of the kingdom, firſt againſt Manfred, who was defeated and ſlain in battle, and afterwards againſt Conrad, or Conradin, who was invited by the diſcontented barons to poſſeſs himſelf of his paternal and hereditary kingdom, which the pope had unjuſtly wreſted from him, and conferred upon one who had not the leaſt ſhadow of right to it. Conradin, in defiance of the citations and menaces of the pope, entered Italy; and at Rome he was received by the ſenate, the nobility, and the people, with the greateſt demonſtrations of joy. Theſe meaſures ſo enraged the pope, that he thundered out the ſentence of excommunication againſt Conradin, and all who ſhould aſſiſt him, accompanied with menaced forfeitures, and with a declaration, that Conradin himſelf was incapable of holding any kingdom, fief, or dignity whatever. The Romans, however, protected Conradin, and ſupplied his army, as long as he remained in their city, with all neceſſaries, at their own expence. One of his generals having gained a victory in Sicily, Conradin was proclaimed king in all the chief cities of the iſland, and the Sicilians every where declared for him. However, Conradin having heard of the victory, left Rome in order to engage Charles; and the two armies having met at the lake of Celano, engaged in a combat, which proved diſaſtrous to Conradin, and terminated in a complete victory on the part of Charles. The conſequence of this event was an order iſſued by Charles, that all the cities which had declared for Conradin, ſhould be given up to be plundered, and then laid in aſhes. The citizens who had taken part with the rebels, as they were called, were either put to a cruel death, or confined for life. Conradin himſelf was publicly executed, and ſeveral of his partizans, of diſtinguiſhed rank, ſhared the ſame fate. Clement, however, did not live to hear of theſe barbarous executions. He died at Viterbo, in the latter end of November 1268; whereas Conradin was not beheaded till October 1269. Clement, excluſively of his conduct in the events above related, and his implacable and unprovoked enmity to Conradin and his family, purſued a conduct that merited commendation. He relieved poverty and diſtreſs, rewarded virtue and merit, and left his relations at his death in the ſame rank and condition they were in when he firſt aſcended the pontifical throne. Several learned treatiſes upon the canons, and canon law, are aſcribed to Clement. But ſome of theſe were undoubtedly written by one Guido Papa, who has been miſtaken for pope Clement, whoſe name, before his promotion, was Guido. The life of Clement has been elegantly written by the Jeſuit, Claudius Clemens, and was printed at Lyons in 1629.

Clement V. was elected the ſucceſſor of Benedict XI., after a conteſt in the conclave of cardinals which laſted near a year, in the year 1305. He was the ſon of Berald de Got, a nobleman of Aquitain, and, by favour of Boniface VIII. preferred in 1299 to the archbiſhopric of Bourdeaux. The ceremony of his coronation was performed at Lyons, whither he ſummoned the cardinals; and, on his return from the church of St. Juſtus to his palace, with the crown on his head, his horſe was led part of the way by the king of France on foot, and afterwards by Charles de Valois and the duke of Brittany, likewiſe on foot. But the fall of a wall during the proceſſion, which killed ſeveral perſons of diſtinction, and cauſed the crown to fall from the head of the pope, excited a great alarm among the people, and gave occaſion to the Italian writers to obſerve, that ſuch were the auſpices under which the holy ſee was tranſlated from Italy to France, from Rome to Avignon, where it remained for an interval of more than 70 years. The firſt and chief care of Clement, after his elevation, was to fulfil his engagements to the French king, thus recompenſing him for the effectual ſervice which he had rendered in promoting his election. Beſides the creation of 10 cardinals, all of whom were Frenchmen, and the reſtoration of the two Colonnas to the cardinalate, from which they had been degraded; he granted to the king the tenths of all the eccleſiaſtical revenues in his kingdom, for the ſpace of 5 years; and he revoked and annulled a law, which declared, that the kingdom of France, and of courſe all other kingdoms, are ſubject to the ſee of Rome in temporals, as well as ſpirituals. In the year 1309, the pope transferred his ſee to Avignon, which was at that time ſubject to Charles, king of Sicily; and in 1311 he ſummoned a general council at Vienne, in order to determine with regard to the knights templars, who were charged with many enormous crimes, to procure immediate relief and ſupply for the Chriſtians in the Holy Land, to reform the manners of the eccleſiaſtics, and to reſtore the decayed diſcipline of the church. The proſecution againſt the knights templars was carried on in different countries under the authority of the pope, and the order was ſuppreſſed by him in a private conſiſtory in the year 1312. See KNIGHTS TEMPLARS. At the third ſeſſion of this council, an order was iſſued for preaching a new cruſade through all Chriſtian countries, and great indulgences were granted to all who ſhould engage in it. In the ſame ſeſſion, the doctrines of the Beguardi and Beguines were condemned; and the conſtitution of Gregory X. relating to the conclave, confirmed by Celeſtine V. and Boniface VIII., was confirmed anew by this council; and it was further ordained, that no cardinal, under any pretence of excommunication, ſuſpenſion, or interdict whatever, ſhould be excluded from the election. In the year 1313, after the breaking up of this council, Celeſtine V. was canonized by the pope. Among the laſt acts of his pontificate, were the coronation of Henry VII. as emperor, and the creation of Robert king of Sicily, a ſenator of Rome, and a vicar of the empire. Soon after theſe events Clement died, at a place called Roquemaure, in the dioceſe of Niſmes, in his way to Bourdeaux, his native place, on the 20th of April 1314, (or as others ſay, 1316) when he had held the ſee from the day of his election, on the 5th of June 1305, 8 years, 10 months, and 15 days. The ambition of this pontiff was unbounded; and he acted during his whole pontificate as a mere tool of the French king, to whom he had owed his promotion. Clement wrote many conſtitutions relating to different ſubjects, and ordered them to be diſtinguiſhed by the title of "The Seventh book of the Decretals." Since his time they have been known by the name of "The Clementines;" they were approved by the council of Vienne, and publiſhed by Clement at Montil, not long before his death, that is, on the 21ſt of March, 1314. As he was prevented by his illneſs and death, that ſoon enſued, from ſending them to the univerſities; they remained in a manner ſuſpended till the year 1317, when his ſucceſſor, John XXII, ſent authentic copies of them to all the univerſities, ordering them not only to be taught in the ſchools, but to be quoted, as ſtanding laws, in the courts of juſtice. See CANON *Law*.

Clement VI. ſucceeded Benedict XII. and was crowned on the 19th of May 1342. His family name was Peter Roger. He was born in 1292, in the dioceſe of Limoges, and embraced a religious life among the Benedictines at the age of 10 years; having ſtudied at Paris, and being admitted by the univerſity of that city, at the age of 30, to the degree of maſter or doctor in divinity, he roſe through ſeveral ſubordinate gradations of preferment to that of cardinal preſbyter of St. Nereus and Achilleus, to which rank he was advanced in 1338 by pope Benedict XII. Soon after his election he created 10 new cardinals, among whom was his brother Hugh Roger, who refuſed the pontificate upon the death of Innocent VI. The Romans congratulated him on his elevation to the papal ſee by a ſolemn embaſſy, and requeſted that he would reſide at Rome, and order the jubilee to be celebrated every 50th year. They alſo conferred upon him, as Peter Roger, the ſupreme magiſtracy, but not as pope, leaſt his predeceſſors ſhould claim it. One of the deputies on this occaſion was the celebrated Petrarch, who was very favourably received. Although he declined for the preſent complying with their requeſt of reſidence at Rome, he ordered a jubilee according to their deſire. Differences having ſubſiſted for a long time between the emperor Lewis and the apoſtolic ſee, an embaſſy was ſent by the emperor to the pope in the ſecond year of his pontificate, propoſing an accommodation and requeſting abſolution. Clement received the embaſſadors in a very haughty manner, and having adviſed with his cardinals, propoſed, as the only terms of abſolution, that he ſhould own himſelf guilty of the hereſies, with which he was charged, and abjure them all; that he ſhould ſurrender the title of king or emperor, reſign the government of the empire, and not reſume it without the permiſſion of the apoſtolic ſee; that he ſhould ſubmit to the abſolute diſpoſal of the pope himſelf, his children, and all his hereditary dominions and eſtates; and that he ſhould acknowledge the empire to be in the gift of the apoſtolic ſee. Theſe articles, however humiliating to the emperor, were agreed to by the ambaſſadors; and the emperor, aſtoniſhed at the extravagant demands of the pope, reſolved to improve them to his own advantage. Accordingly he ſent copies of them to all the princes and ſtates of the empire, and convoked a diet at Frankfort for the purpoſe of deliberating, concerning the moſt proper means of defeating the ambitious views and effectually reſiſting the encroachments of the pope. At this diet it was agreed, that theſe terms of conciliation ſhould be rejected by the German ſtates and princes. The pope, incenſed at their refuſal, confirmed all the ſentences that had been pronounced againſt the emperor by his predeceſſor pope John, or himſelf, and ordered the electors to proceed immediately to the election of a new king of the Romans: Lewis of Bavaria having forfeited, "as an avowed and impenitent heretic," all right to that title and to the imperial crown, and to every other kind of dignity. This order was accompanied with the recommendation of Charles duke of Moravia, the ſon of John king of Bohemia, after he had previouſly ſtipulated the conditions on which his intereſt was to be employed in advancing the duke to the Imperial throne. The electors complied: Charles was elected; and the election was ratified by the pope's bull, iſſued Nov. 6th, 1346. About this time a revolution happened in the kingdom of Naples, which was occaſioned by the murder of the king, in conſequence of which the kingdom was invaded by the king of Hungary, the brother of the deceaſed ſovereign. Upon this invaſion queen Joan retired from the kingdom and repaired to Avignon in order to plead her cauſe before the pope and the cardinals. This ſhe did with ſuch effect, that Clement diſpatched an apoſtolic legate into Hungary to negotiate a reconciliation between Joan and her huſband, Lewis of Taranto, and the Hungarian king. In the meanwhile the Neapolitan nobility, who had become weary of the government of the Hungarians, invited Joan back to her own kingdom; who, in order to furniſh herſelf with money for defraying the charges of her expedition, ſold Avignon to the pope for 80 thouſand florins of gold. The bargain was confirmed by Charles, who had been lately elected king of the Romans, and alſo renounced all the right claimed by the empire over that city and its territory. The bull containing this renunciation is dated Nov. 1, 1348. In this year a very dreadful plague raged over all Europe; and in this general calamity Clement was liberal and active in affording the ſufferers neceſſary and ſeaſonable relief. In 1349, a new ſect aroſe called the "Flagellants;" but, being threatened excommunication by the pope, they were very ſoon extirpated. On occaſion of the jubilee, which took place in the year 1350, Rome was crowded with pilgrims; and the number that thronged thither was ſo great, that one would have thought, ſays Petrarch, who was preſent, that the plague which had almoſt unpeopled the world, had not ſo much as thinned it. The pope diſtinguiſhed himſelf by his active endeavours in reſtraining the exactions and oppreſſions which the pilgrims ſuffered from the cruelty and avarice of the Romans. In Germany many of the princes and cities refuſed to acknowledge Charles, who had been impoſed upon them by the interference and influence of the pope; and actually proceeded to elect another emperor in his room. After ſome unſucceſsful efforts for this purpoſe, the Germans, tired out with a long war, choſe rather to ſubmit to Charles than to involve their country in new troubles by new elections. In 1351, Clement undertook the defence of the mendicant friars, that had been eminently uſeful during the plague, and to whom many had left their eſtates in recompence of their ſervices, againſt the ſecular clergy, who complained to the pope of their having degenerated from their original inſtitution. and demanded the entire ſuppreſſion of that order. At the cloſe of this year Clement was taken dangerouſly ill, and the cardinals, apprehending the event of his death, prevailed upon him to mitigate the rigour of the conſtitution of Gregory X. with reſpect to the conclave. (See CONCLAVE.) During the ſame malady he iſſued another conſtitution, importing that if in diſputing, preaching or teaching, either before or ſince his promotion to the apoſtolic ſee, he had advanced any thing contrary to the catholic doctrine, as to good morals, he retracted it, and ſubmitted the whole to the judgment of his predeceſſors; and hence we perceive that he entertained but an indifferent opinion of his own infallibility. Having in the following year diſpatched a legate into Sicily to crown Joan queen of Jeruſalem and Sicily, and her huſband Lewis king, Clement, towards the cloſe of the year, was ſeized with a fever, which terminated his life on the 6th of December, after he had held the Roman ſee, from the day of his coronation, 10 years ſix months and 18 days. This pope was fond of pomp and grandeur, and lived more like a monarch than a biſhop. It was his favourite object to aggrandize his family, and enrich his relations, ſeveral of whom he furniſhed with eſtates in France, and others of them he made cardinals, though they were under the ſtipulated age, or led ſcandalous lives. In his promotions, it is ſaid, that he paid little reſpect to learning or virtue. Petrarch ſpeaks of him as poſſeſſing an uncommon memory, ſo that he never forgot any thing he had read or heard, as a perſon of very great learning, and as no leſs eloquent than learned. He is ſaid, by ſome of his biographers, to have preached frequently, and to have compoſed many excellent ſermons. The only writings of Clement, extant in print, are a treatiſe on eccleſiaſtical power, ſome ſpeeches, letters, decretals, and a book upon the canonization of St. Ivo, which took place in 1347. Among other acts of his pontificate he granted to the kings of France the privilege of receiving the ſacrament in both kinds, whenever they pleaſed; he appointed Lewis, earl of Clermont, deſcended from the royal families of France and Caſtile, king of the Fortunate iſlands, now the Canaries, which were diſcovered in his time, for which grant he obliged Lewis and his heirs to pay yearly 400 florins of gold to him and his ſucceſſors, as an acknowledgement of their holding their kingdom of the apoſtolic ſee; he diſpoſed of ſome rich benefices in England to foreigners, which in 1343 occaſioned a quarrel between him and Edward III.; he embelliſhed, at a great expence, the pontifical palace at Avignon; and, excluſively of other charities, he founded at Rouen, and richly endowed a college, called the "Pope's College," or the college of "Clementine Prieſts."

Clement VII. was the name aſſumed by the cardinal de Medici, who ſucceeded Adrian VI., Nov. 28, in the year 1523. This choice, after a conteſt in the conclave which laſted fifty days, was univerſally approved. High expectations were formed of a pope, whoſe great talents, and long experience in buſineſs, ſeemed to qualify him no leſs for defending the ſpiritual intereſts of the church, expoſed to imminent dangers by the progreſs of Luther's opinions, than for conducting its political operations with the prudence requiſite at ſuch a difficult juncture; and who, beſides theſe advantages, rendered the eccleſiaſtical ſtate more reſpectable by having in his hands the government of Florence, together with the wealth of the family of Medici. By this election the ambitious views of cardinal Wolſey, who aſpired to the papal throne, were a ſecond time diſappointed; notwithſtanding the intereſt employed in his favour by Henry VIII. with the emperor Charles V., and the activity of Wolſey himſelf, who inſtructed his agents at Rome to ſpare neither promiſes nor bribes in order to gain his end. The cardinal, after all his expectations and endeavours, had the mortification to ſee a pope elected of ſuch an age, and of ſo vigorous a conſtitution, that he could derive little comfort from the chance of ſucceeding him. Wolſey was extremely indignant on the occaſion; and though Clement endeavoured to ſoothe his vindictive nature by granting him a commiſſion to be legate in England during life, with ſuch ample powers as veſted in him almoſt the whole papal juriſdiction in that kingdom, the injury he had received entirely diſſolved the tie, which had united him to Charles, and from that moment he meditated revenge. However he had art enough to diſguiſe his reſentment; and he abounded on every occaſion, private as well as public, in declarations of his high ſatisfaction with Clement's promotion. Clement had ſcarcely taken ſecure poſſeſſion of the pontifical chair, before ambaſſadors were ſent to him both by the emperor and the king of France, then at war in the Milaneſe, to engage him in their intereſt. The pope, however, inſtead of taking a deciſive part with either of the contending parties, laboured with the zeal which became his character, to bring about a reconciliation; but his endeavours were ineffectual. The war was purſued with greater vigour than ever, and the French were expelled both out of the Milaneſe and the republic of Genoa; but Francis, the king of France, having gained conſiderable advantages over the Imperialiſts, who had invaded Provence and laid ſiege to Marſeilles both by ſea and land, and compelled them to abandon his dominions, croſſed the Alps at mount Cenis, and advancing rapidly into the duchy of Milan, made himſelf maſter of that capital, and laid ſiege to Pavia. The pope, who already conſidered the French as ſuperior in Italy, became impatient to diſengage himſelf from his connections with the emperor, of whoſe deſigns he was extremely jealous, and to enter into terms of friendſhip with Francis. He laboured hard to bring about a peace that would ſecure Francis in poſſeſſion of his new conqueſts; and as Charles, who was always inflexible in the proſecution of his ſchemes, rejected the propoſition with diſdain, and with bitter exclamations againſt the pope, by whoſe perſuaſion, while cardinal de Medici, he had been induced to invade the Milaneſe; Clement immediately concluded a treaty of neutrality with the king of France, in which the republic of Florence was included. Whilſt the ſiege of Pavia was ſlowly carried on, the Imperialiſts attacked the French with a very powerful force, defeated them in what is called the battle of Pavia (Feb. 24, 1525) with great ſlaughter, and took the king priſoner. This victory excited the greateſt alarm among the Italian ſtates, and Clement, inſtead of purſuing the meaſures which he had concerted with the Venetians for ſecuring the liberty of Italy, either intimidated by threats or allured by promiſes, entered into a ſeparate treaty with Charles, binding himſelf to advance a conſiderable ſum in return for certain emoluments which he was to receive. The money was inſtantly paid; Charles afterwards refuſed to ratify the treaty; and the pope remained expoſed at once to infamy and ridicule; to the former, becauſe he had deſerted the public cauſe for his private intereſt; to the latter, becauſe he had been a loſer by that unworthy action. In the year 1526, an alliance was concluded between the pope, the Venetians, and Sforza, duke of Milan, for the ſecurity and liberty of Italy. The king of France, who had been releaſed from captivity, and Henry VIII., king of England, acceded to it. The latter was declared protector of this league, which they dignified with the name of "holy," becauſe the pope was at the head of it; and in order to allure them more effectually, a principality in the kingdom of Naples, of 30,000 ducats yearly revenue, was to be ſettled on him, and lands to the value of 10,000 ducats on his favourite Wolſey. Clement, as ſoon as this league was concluded, by the plenitude of his papal power, abſolved Francis from the oath which he had taken to obſerve the treaty of Madrid, which had been the ſtipulated condition of his releaſe; but the diſcovery of Francis's intentions to elude this treaty filled the emperor with a variety of diſquieting thoughts, and he determined to inſiſt on the ſtrict execution of it. As ſoon alſo as he had received an account of the holy league, he exclaimed againſt Francis, as a prince void of faith and of honour; nor did he leſs complain of Clement, whom he ſolicited in vain to abandon his new allies. He, moreover, threatened him not only with all the vengeance which the power of an emperor could inflict, but by appealing to a general council, called up before him all the terrors ariſing from the authority of theſe aſſemblies, ſo formidable to the papal ſee. At the ſame time he exerted himſelf with unuſual vigour, in order to ſend ſupplies not only of men, but of money, which was ſtill more needed, into Italy. The Colonnas, who retained their attachment to the Imperial intereſt, and who, by placing themſelves under the protection of the emperor, preſerved the quiet poſſeſſion of their own territories and privileges, took an active part againſt the confederacy, and particularly againſt the pope; and after for ſome time amuſing and deluding him, marched to Rome, and made themſelves maſters of the city. Clement, terrified at the danger that threatened him, aſhamed of his own credulity, and deſerted by almoſt every perſon, fled with precipitation into the caſtle of St. Angelo, which was immediately inveſted. After a general plunder of the Vatican, the church of St. Peter, and the houſes of the pope's miniſters and ſervants, Clement, deprived of every thing neceſſary for ſubſiſtence or defence, was ſoon obliged to demand a capitulation; and the Imperial ambaſſador, Moncada, with the haughtineſs of a conqueror, preſcribed conditions, which it was not in his power to reject. The chief of theſe was, that Clement ſhould not only grant a full pardon to the Colonnas, but receive them into favour, and immediately withdraw all the troops in his pay from the army of the confederates in Lombardy.

The Colonnas, who talked of nothing leſs than depoſing Clement, and of placing Pompeo, their kinſman, in the vacant chair of St. Peter, exclaimed loudly againſt a treaty, which left them at the mercy of a pontiff juſtly incenſed againſt them. But Moncada, attentive merely to his maſter's intereſt, paid little regard to their complaints, and by this fortunate meaſure, broke intirely the power of the confederates. Clement, regardleſs of the treaty with Moncada, degraded the cardinal Colonna, excommunicated the reſt of the family, ſeized their places of ſtrength, and waſted their lands with all the cruelty excited by a recent injury. After this he turned his arms againſt Naples, and as his operations were aided by the French fleet, he made ſome progreſs towards the conqueſt of that kingdom; the viceroy being no leſs deſtitute than the other Imperial generals of the money requiſite for a vigorous defence. The Colonnas and the other friends of the emperor ſoon retaliated on the pope; for the duke of Bourbon who commanded the Imperial army, wanting money to pay his troops and to purchaſe proviſions for their ſubſiſtence, determined to force his way into the State of the Church, and to let his army live upon plunder. However, he concealed his intentions ſo ſucceſsfully, that Clement, though alarmed, could not diſcover whether Rome or Florence would be the firſt object of his depredation; and he was therefore kept for ſome time in a ſtate of diſquieting ſuſpence. Thus circumſtanced, the pope concludes an agreement with Lannoy, viceroy of Naples, March 15, 1527, comprehending the following principal articles, *viz.* that a ſuſpenſion of arms ſhould take place between the pontifical and Imperial troops for eight months; that Clement ſhould advance 60,000 crowns towards ſatisfying the demands of the Imperial army; that the Colonnas ſhould be abſolved from cenſure, and their former dignities and poſſeſſions be reſtored to them; and that the viceroy ſhould come to Rome, and prevent Bourbon from approaching nearer to that city, or to Florence. On this treaty Clement fixed his reliance; a reliance which Guicciardini aſcribes wholly to an infatuation which thoſe who are doomed to ruin cannot avoid. Lannoy having thus detached Clement from the confederacy, wiſhed to turn Bourbon's arms againſt the Venetians; but Bourbon had other ſchemes to accompliſh. Although he received a meſſage from the viceroy he paid no regard to it, but continued to ravage the eccleſiaſtical territories, and to advance towards Florence. Upon this Clement renewed his application to Lannoy, and intreated and conjured him to put a ſtop to Bourbon's progreſs. Lannoy made ſome ineffectual efforts for this purpoſe; but Bourbon's ſoldiers, having heard of the truce, raged and threatened, demanding the accompliſhment of the promiſes in which they had confided. Whilſt every perſon in Rome perceived the approaching and irreſiſtible ſtorm, Clement alone, relying on ſome ambiguous and deceitful profeſſions which Bourbon made of his inclination towards peace, ſunk back into his former ſecurity. Bourbon being under a neceſſity of changing his rout towards Florence by the arrival of the duke d'Urbino's army, determined to attack and plunder Rome. The reſolution was bold, and the execution of it no leſs rapid. Clement was rouzed from his ſecurity; and though, under his feeble conduct, all was conſternation, diſorder, and irreſolution, yet he collected ſuch of his diſbanded ſoldiers as ſtill remained in the city; he armed the artificers of Rome, and the footmen and train-bearers of the cardinals; he repaired the breaches in the walls; he began to erect new works; he excommunicated Bourbon and all his troops, branding the Germans with the name of Lutherans, and the Spaniards with that of Moors. Thus prepared, he determined to wait the approach of an enemy whom he might eaſily have avoided by a timely retreat. Bourbon advanced with ſpeed, and encamped in the plains of Rome on the evening of the 5th of May. Having animated his ſoldiers by preſenting to their view the palaces and churches of the capital of the Chriſtian commonwealth, into which the wealth of all Europe had flowed during many centuries, without having been violated by any hoſtile hand, he commenced the aſſault early on the next morning, and at the head of his troops he led them to ſcale the walls. They were at firſt received with a fortitude equal to their own; and whilſt Bourbon's troops were ready to give way, their leader threw himſelf from his horſe, ſeized a ſcaling ladder from one of the ſoldiers, and as he began to mount it, a muſket ball from the ramparts gave him a deadly wound, which, at the moment of expiring, he endeavoured to conceal from his troops. As ſoon as this fatal event was known to the army, it ſeemed to animate them with new valour; the name of Bourbon reſounded along the line, accompanied with the cry of blood and revenge. The veterans on the walls were overpowered, the enemy ruſhed on with incredible violence, and the city was taken. During the combat, Clement was employed at the altar of St. Peter's in offering up to heaven unavailing prayers for victory. But as ſoon as he heard that his troops began to give way, he fled with precipitation; and inſtead of making his eſcape, ſuch was his infatuation, he ſhut himſelf up, with thirteen cardinals and others, in the caſtle of St. Angelo, which he had before found to be an inſecure retreat. The miſery and horror of the ſcene that followed may be more eaſily conceived than deſcribed. The pillage and cruelty that were exerciſed on this occaſion exceeded thoſe of the Huns, Vandals, or Goths, in the 5th and 6th centuries. The booty in ready money alone amounted to a million of ducats; and what they raiſed by ranſoms and exactions far exceeded that ſum. Clement himſelf, deprived of every reſource, and reduced to ſuch extremity of famine as to feed on aſſes' fleſh, was obliged to capitulate on ſuch conditions as the conquerors were pleaſed to preſcribe. He agreed to pay 400,000 ducats to the army; to ſurrender to the emperor all the places of ſtrength belonging to the church; and, beſides giving hoſtages, to remain a priſoner himſelf until the chief articles were performed. The emperor feigned grief for the plunder of Rome, and the captivity of the pontiff; but it was, without doubt, mere hypocriſy. The concern felt by the kings of France and England on this occaſion was more ſincere; though perhaps not altogether diſintereſted. Francis and Henry, alarmed at the progreſs of the Imperial arms in Italy, had, even before the taking of Rome, entered into a cloſer alliance; this alliance was now cemented by the common deſire of reſcuing the pope out of the emperor's hands, a meaſure no leſs political than it appeared to be pious. With this view they perceived the neceſſity of abandoning their deſigns in the Low Countries, and of rendering Italy the ſeat of war, that they might thus deliver Rome and ſet Clement at liberty. Wolſey neglected no meaſure that could incenſe his maſter againſt the emperor. Beſides theſe conſiderations of a public nature, Henry was influenced by a more private and ſelfiſh motive; becauſe he had begun about this time to form his ſcheme of divorcing Catharine of Arragon, towards the execution of which he knew that the ſanction of papal authority would be neceſſary; and he was therefore deſirous of acquiring as much merit as poſſible with Clement, by appearing to be the chief inſtrument of his deliverance.

In the mean while, whilſt the two kings were negociating their new alliance, the pope, unable to fulfil the conditions of his capitulation, remained a priſoner. The Florentines, as ſoon as they heard of his captivity, ran to arms in a tumultuous manner; expelled the cardinal de' Cortona, who governed their city in the pope's name; defaced the arms of the Medici; demoliſhed the ſtatues of Leo and Clement; and declaring themſelves a free ſtate, re-eſtabliſhed their ancient popular government. The Venetians, taking advantage of the calamity of their ally the pope, ſeized Ravenna, and other places belonging to the church, under pretext of keeping them in depoſit. The dukes of Urbino and Ferrara likewiſe laid hold on part of the ſpoils of the unfortunate pontiff, whom they conſidered as irretrievably ruined. At length, however, the progreſs of the confederates in Italy and other political conſiderations induced the emperor to concert meaſures for ſetting the pope at liberty. As he wanted a large ſupply of money, he thought of the reſource which preſented itſelf in the ranſom of Clement. The pope himſelf had contrived to diſarm the reſentment of cardinal Colonna, and he had alſo by favours and promiſes gained Moroné, chancellor of Milan; and by the addreſs and influence of theſe two men the treaty for his liberty was the more ſpeedily concluded, upon the following conditions. He was obliged to advance 100,000 crowns for the uſe of the army, to pay the ſame ſum at the diſtance of a fortnight, and at the end of three months 150,000 more. He engaged not to take part in the war againſt Charles, either in Lombardy or Naples; he granted him a cruſade, and a tenth of eccleſiaſtical revenues in Spain; and he not only gave hoſtages, but put the emperor in poſſeſſion of ſeveral towns, as a ſecurity for the performance of theſe articles. Having raiſed the firſt moiety by a ſale of eccleſiaſtical dignities and benefices, and other expedients equally uncanonical, a day was fixed for his releaſe. But Clement, impatient to be free, after a confinement of ſix months, and indulging the ſuſpicion and diſtruſt natural to the unfortunate, was ſo fearful of freſh obſtacles on the part of the Imperialiſts, that he diſguiſed himſelf the preceding night in the habit of a merchant, and made his eſcape undiſcovered. Before next morning he arrived at Orvieto, and from thence wrote a letter of thanks to Lautrec, the commander of the French troops, as the chief inſtrument of procuring him liberty. Afterwards Clement, though he always acknowledged his being indebted to Francis for the recovery of his liberty, and often complained of the emperor's cruel treatment, was not influenced by gratitude, nor was he ſwayed by the deſire of revenge. Whilſt he amuſed Francis with promiſes, he ſecretly negociated with Charles; and in June 1529, he had the addreſs and diligence to get the ſtart of his allies, by concluding, at Barcelona, a particular treaty for himſelf. The terms were more favourable than Clement could have reaſon to expect. Among other articles, the emperor engaged to reſtore all the territories belonging to the eccleſiaſtical ſtates; to re-eſtabliſh the dominion of the Medici in Florence; to give his natural daughter in marriage to Alexander, the head of that family; and to put it in the pope's power to decide concerning the fate of Sforza, and the poſſeſſion of the Milaneſe. In return for theſe ample conceſſions, Clement gave the emperor the inveſtiture of Naples, without the reſerve of any tribute, but the preſent of a white ſteed in acknowledgment of his ſovereignty; abſolved all who had been concerned in aſſaulting and plundering Rome; and permitted Charles and his brother Ferdinand to levy the fourth of the eccleſiaſtical revenues throughout their dominions. The diſſenſions already mentioned between the pope and the emperor proved extremely favourable to the progreſs of Lutheraniſm. Charles, exaſperated by the conduct of Clement, and fully employed in oppoſing the league which he had formed againſt them, had little inclination and leſs leiſure to take any meaſures for ſuppreſſing the new opinions in Germany. In a diet of the empire held at Spires, June 25, 1526, the ſtate of religion came to be conſidered, and all that the emperor required of the princes was, that they would wait patiently, and without encouraging innovations, for the meeting of a general council which he had demanded of the pope. They acquieſced; but to his advice, concerning the diſcouragement of innovations, they paid ſo little regard, that even during the meeting of the diet at Spires, the divines who attended the elector of Saxony and landgrave of Heſſe-Caſſel thither, preached publicly, and adminiſtered the ſacraments, according to the rites of the reformed church. The emperor's own example emboldened the Germans to treat the papal authority with little reverence. A manifeſto againſt the pope, little inferior in virulence to the invectives of Luther himſelf, was induſtriouſly diſperſed over Germany; and being eagerly read by perſons of all ranks, much more than counterbalanced the effect of all Charles's declarations againſt the new opinions. (See LUTHER and REFORMATION.) Soon after the concluſion of the pope's treaty with Charles, they had an interview at Bologna. On this occaſion the emperor, at the head of 20,000 veteran ſoldiers, able to give law to all Italy, kneeled down to kiſs the feet of that very pope whom he had ſo lately detained a priſoner. After the re-eſtabliſhment of the authority of the Medici at Florence in 1530, the publication of the peace at Bologna, and the ceremony of his coronation as king of Lombardy and emperor of the Romans, which the pope performed with the accuſtomed formalities, Charles prepared for his journey into Germany. During the long reſidence of the emperor and pope at Bologna, they held many conferences concerning the moſt effectual means of extirpating the hereſies which had ſprung up in Germany. Clement diſſuaded the emperor from convening a general council; Charles, on the contrary, thought the convocation of a council no improper expedient for reconciling the Proteſtants; but promiſed, that if theſe gentler arts failed of ſucceſs, he then would exert himſelf with vigour in reducing thoſe ſtubborn enemies of the Catholic faith. For the meaſures which he purſued, ſee REFORMATION, AUGUSTAN *Confeſſion*, and AUGSBURG.

Charles, in his way to Spain in 1532, had another interview with the pope at Bologna. On this occaſion they differed with regard to the expediency of calling a general council. Charles urged the ſalutary effects of ſuch a meaſure, whilſt Clement, by all the artifices in his power, attempted to delay, in hopes of thus entirely defeating, the convocation of ſuch an aſſembly. Beſides the negotiation with Clement about calling a council, the emperor carried on another, of greater importance in his eſtimation, for ſecuring the peace eſtabliſhed in Italy. With this view he propoſed that the Italian ſtates ſhould enter into a league of defence againſt all invaders, and that, when danger occurred, an army ſhould be raiſed and maintained at the common charge. The propoſal was not unacceptable to Clement; accordingly a league was concluded; and all the Italian ſtates, the Venetians excepted, acceded to it. At this interview the emperor is ſaid to have propoſed a match between Sforza, the duke of Milan, and Catharine de Medici the daughter of the pope's couſin Laurence de Medici; but this match was rejected by the pope; and another was negotiated by Francis and Clement between Henry, the king of France's ſecond ſon, duke of Orleans, and Catharine. Clement was ſo highly pleaſed with an honour which added ſuch luſtre and dignity to the houſe of Medici, that he offered to grant Catharine the inveſtiture of conſiderable territories in Italy by way of portion; he ſeemed ready to ſupport Francis in proſecuting his ancient claims in that country; and conſented to a perſonal interview with that monarch. Charles's jealouſy was excited by this propoſed interview, and he could not bear that Clement, after he had twice condeſcended to viſit him in his own territories, ſhould confer ſuch a diſtinction on his rival, as to venture on a voyage by ſea, at an unfavourable ſeaſon, in order to pay court to Francis in the French dominions. But the pope's raſhneſs to accompliſh the match overcame all ſcruples of pride, or fear, or jealouſy, by which he was likely to be influenced on any other occaſion. The interview, notwithſtanding ſeveral artifices of the emperor to prevent it, took place at Marſeilles with extraordinary pomp, and demonſtrations of mutual confidence; and the marriage, which the ambition and abilities of Catharine (See CATHARINE) rendered in the ſequel as fatal to France, as it was then thought diſhonourable, was conſummated. The pope and Francis, however, were ſo careful to avoid giving any cauſe of offence to the emperor, that no treaty was concluded between them; and even in the marriage-articles Catharine renounced all claims and pretenſions in Italy, except to the duchy of Urbino. Whilſt Clement was carrying on theſe negotiations and forming a connection with Francis, which gave ſo great offence to the emperor, ſuch were the artifice and duplicity of his character, that he ſuffered the latter to direct all his proceedings with regard to the king of England. Henry's ſuit for a divorce from Catharine of Arragon (See that article), had now continued ſix years, during which period the pope negotiated, promiſed, retracted, and concluded nothing. Cranmer's ſentence annulled the king's marriage with Catharine; her daughter was declared illegitimate; and Anne Boleyn acknowledged queen of England. Henry, diſpleaſed with the conduct of Clement, began to make innovations in the church, of which he had formerly been ſuch a zealous defender. Clement, who had already ſeen ſo many provinces and kingdoms revolt from the holy ſee, became apprehenſive leſt England ſhould follow their example, and partly from his ſolicitude to prevent that evil, and partly in compliance with the French king's ſolicitations, he determined to give Henry ſuch ſatisfaction as might ſtill retain him within the boſom of the church. But the violence of the cardinals, devoted to the emperor, did not allow the pope leiſure for executing this prudent reſolution, and hurried him, with a precipitation fatal to the Roman ſee, to iſſue a bull, reſcinding Cranmer's ſentence, enforcing Henry's marriage with Catharine, and declaring him excommunicated, if, within a time ſpecified, de did not abandon the wife he had taken, and return to her whom he had deſerted. The conſequence of this meaſure is well known. Henry was enraged; his ſubjects concurred in his indignation; an act of parliament was paſſed, aboliſhing the papal power and juriſdiction in England; by another act, the king was declared ſupreme head of the church; and all the authority of which the popes were deprived was veſted in him. A ſhort delay might have prevented the unhappy conſequences to the ſee of Rome of Clement's precipitance. Soon after his ſentence againſt Henry, he fell into a languiſhing diſtemper; which terminated his life after he had lived 56 years 4 months, on the 25th of September, 1534, and his pontificate, after a duration of 10 years, 10 months, and 7 days; the moſt unfortunate, both whilſt it continued and in its effects, that the church had known for many ages. He died hated by the court, ſuſpected by the princes, and generally reputed a man of no faith, and naturally averſe from doing any man a good office. He was grave, circumſpect in all his actions, much maſter of himſelf, a great diſſembler, and endowed with excellent parts, and uncommon penetration. But the extreme timidity to which he was ſubject after his impriſonment ſeldom allowed him to make a free uſe of his own judgment. During his pontificate he created 31 cardinals; but none, his nephew Hyppolitus de Medici excepted, of his own choice; the reſt he raiſed to that dignity, againſt his will, to gratify thoſe, who recommended them, eſpecially the emperor and the king of France. Bower's Hiſt. of the Popes, vol. vii. Robertſon's Hiſt. ch. v. vols. ii. and iii.

Clement VIII. was the name aſſumed by Hippolito Aldobrandini, cardinal of St. Pancras, a Florentine, when he ſucceeded Innocent IX. in the ſee of Rome. He was choſen Jan. 30, 1592, and crowned on the 2d of February following. His pontificate is chiefly remarkable for the three following events; the converſion, abſolution, and reconciliation of Henry IV. of France in 1595; the reverſion of the duchy of Ferrara to the apoſtolic ſee, upon the death of duke Alphonſus II. in 1597; and the peace, concluded at Vervins in 1598, between France and Spain, by the mediation of Clement. The famous controverſy between the Jeſuits and Dominicans, concerning grace, free-will, and predeſtination, aroſe in the time of this pope, and was likely to produce fatal diviſions in the church. This controverſy was carried on with great aſperity and violence till the year 1594, when Clement impoſed ſilence on the contending parties, promiſing to examine the points in diſpute. For this purpoſe he appointed a particular congregation, called "De Auxiliis" or of aids; but as nothing had been determined by this body in 1602, the pope reſolved to preſide at it in perſon, and he accordingly heard both parties with the greateſt attention and patience. But as each ably defended the cauſe with great zeal and dexterity, Clement, not chuſing to exerciſe his infallibility, leſt he ſhould diſoblige one or other of the two moſt learned orders of the church, left the final deciſion of the points in diſpute to his ſucceſſor. He died March 3, 1605, after having preſided in the ſee 13 years, one month, and three days. This pope has been repreſented by cotemporary writers as a man of uncommon abilities and of great prudence. It was by the urgent interference of this pope, that the Jeſuits, who had been expelled France upon the murder of Henry III. were reſtored in 1603 by his ſucceſſor Henry IV. Bower vol. vii. Moſheim E. H. vol. v.

Clement IX. and *Clement* X. were elected ſucceſſively to the papacy in the years 1667 and 1670; but they were concerned in few tranſactions that deſerve to be tranſmitted to poſterity. The former was of the family of Roſpiglioſi, and ſeveral inſtances of his conduct are recorded that do him honour, and prove his diſlike of nepotiſm, and his love of peace and juſtice. His pontificate commenced in 1667 and terminated in 1670; that of his ſucceſſor cloſed in 1676. Moſheim.

Clement XI. was the name aſſumed by John Francis Albani, when he was raiſed to the head of the Roman church in the year 1700. He ſurpaſſed in learning the whole college of cardinals, and was inferior to none of the preceding pontiffs in ſagacity, lenity, and a deſire, at leaſt, to govern well; but he was very far from oppoſing, with a proper degree of vigour and reſolution, the inveterate corruptions and ſuperſtitious obſervances of the church over which he preſided; on the contrary, he inconſiderately aimed at, what he thought, the honour and advantage of the church (that is, the glory and intereſt of its pontiff), by meaſures that proved detrimental to both, and thus ſhewed, by a ſtriking example, that popes, even of the beſt ſort, may fall imperceptibly into the greateſt miſtakes, and commit the moſt pernicious blunders, through an imprudent zeal for extending their juriſdiction, and augmenting the influence and luſtre of their ſtation. His pontificate cloſed in 1721. Moſheim.

Clement XII. began his pontificate in 1730, and terminated it in 1740.

Clement XIII. was elevated to the papacy in 1758, and held it till the year 1765.

Clement XIV. commenced his pontifical office in 1769, and cloſed it in 1775.

CLEMENT, JOHN, received his education at Oxford, where he made ſuch progreſs in the knowledge of the Greek and Latin languages, as to attract the notice of ſir Thomas More, who took him into his family to inſtruct his children. By the recommendation of ſir Thomas, he was invited to ſettle in Corpus Chriſti college, Oxford, and appointed profeſſor in rhetoric, in the year 1519, and ſoon after, to ſucceed to Linacre in the Greek profeſſorſhip. It may not be improper to mention, that the firſt two public teachers of the Greek language at Oxford were phyſicians, for Clement, probably incited by the fame acquired by his predeceſſor, applied himſelf diligently to the ſtudy of medicine, which he practiſed with ſucceſs. He was ſoon after made fellow of the Royal College of phyſicians, lately eſtabliſhed in London. In 1529, he was ordered by his ſovereign, Henry VIII. to attend cardinal Wolſey, who was dangerouſly ill at Eſher; but the malady of that great ſtateſman was not removeable by medicine. On the acceſſion of king Edward VI., Clement, with a few other catholics, was excepted from the general pardon granted by that prince; he therefore went to Mechlin. What drew on him this ſevere treatment is not known, unleſs it was his rigid attachment to the Romiſh religion, which he imbibed while reſiding in the houſe of his patron ſir Thomas More. On the death of Edward he returned to England, and reſumed the practice of medicine in a part of Eſſex, near London. In this place he continued during the reign of queen Mary. On her demiſe he again migrated to Mechlin, where he died July 1, 1572. Of his medical knowledge he has left no memorial, his only works being ſome tranſlations of pieces of divinity, and a book of Latin epigrams and other verſes, now little known. Aikin's Biog. Sketches of Medicine.

CLEMENT, JULIAN, a celebrated accoucheur, who contributed largely towards the improvement of the art of midwifery, was a native of Arles, in the department of the Rhone. It was there he received the rudiments of his education; but he was at an early age ſent to Paris, and placed under the direction of James la Fevre, who then enjoyed conſiderable reputation for his ſkill in the practice of ſurgery, particularly that branch of it which teaches the method of delivering women in difficult labours. In time he ſucceeded to the practice of Le Fevre, whoſe daughter he had married. In December, 1663, he was called to aſſiſt the ducheſs de la Valiere; but as it was not uſual at that time to employ men in this office, except in caſes of difficulty or danger, the ducheſs is ſaid to have removed to a private houſe, and even to have received him in a maſk, ſo that he was not appriſed of the quality of the lady he was attending. His ſucceſs in this caſe was ſo agreeable to the king, Lewis XIV., that he was appointed accoucheur to the princeſſes of France, with a conſiderable penſion. This circumſtance, and his being employed in the ſubſequent labours of the ducheſs, and of many of the principal ladies about the court, added greatly to his popularity, and had a powerful influence in introducing the cuſtom, which ſoon became general, of employing men to attend women in child-birth, inſtead of one of their own ſex. Clement ſoon ſaw the abſurdity of treating lying-in women as diſeaſed perſons, and introduced ſeveral ſalutary regulations for the women and children, particularly thoſe of abridging the time of confinement of the women, and allowing a freer introduction of air into the room than had been before permitted. He alſo ſimplified and improved the method of turning the fœtus, in certain caſes of wrong preſentation, and firſt ſuggeſted the propriety of breaking the membranes early in labour, in caſes of hæmorrhage, which was afterwards ſo ſucceſsfully practiſed by his pupil and aſſiſtant, Puzos. The reputation of Clement became by theſe means, and by the general ſucceſs of his practice, ſo great, that he was ſent for to Madrid, to attend the queen of Spain, in three ſucceſſive pregnancies, the laſt in the year 1720. About the year 1684, he was honoured by his ſovereign and patron with letters of nobleſſe, with the condition attached to them, that he ſhould continue to practiſe midwifery as long as his health and age ſhould permit. He died on the 7th of October, 1729, being 80 years of age. Eſſais Hiſtoriques ſur l'Art des Accouchmens, par M. Sue le jeune.

CLEMENT, *Conſtitutions of.* See *Apoſtolical* CONSTITUTIONS, and CLEMENS *Romanus.*

CLEMENT, *Recognitions of.* See RECOGNITIONS, and CLEMENS *Romanus.*

CLEMENTS' *ſtrait*, in *Geography*, a branch of the great ſtrait, that lies between Banca and Billiton in the Eaſt Indian ocean, being the "Eaſt Paſſage," between Middle or Paſſage iſland and Billiton. It is ſo called from captain Clements, the commander of a fleet of Indiamen, who is the firſt known navigator who attempted this paſſage in 1781, and ſtruck out this new track to the ſhips of his own nation. The name of "Clements' Strait" diſtinguiſhes it from the "Weſt Paſſage," or "Gaſpar's Strait." See BANCA.

CLEMENTS' DANES, ST. a pariſh in the liberties of Weſtminſter and county of Middleſex, which adjoins to the city of London: the ſituation of its church ſteeple, in the Strand, was determined in the government "Trigonometrical Survey," in 1788, by an obſervation from Argyle Street obſervatory, diſtant 6,074 feet; and another from Primroſe-hill ſtation, diſtant 14,391 feet: whence is deduced its bearing from the croſs on the dome of St. Paul's cathedral 85° 57′ 37″ W. of the ſouth meridian, and diſtance 3,592 feet. This ſteeple contains a ſingular clock with four dials, which ſtrikes the hours, firſt on one of the great bells, and then repeats the ſame on a ſmaller bell; it repeats the quarters, and chimes the old hundredth pſalm at 12, 5, and 9 o'clock.

CLEMENTE, PROSPERO, in *Biography*, a Modeneſe ſculptor, who, according to Vaſari, poſſeſſed conſiderable talents. In the Duomo of Reggio is a monument of white marble by this maſter, erected to the memory of biſhop Rangone, who is repreſented in a ſitting poſture as large as life, with the accompaniment of two little angels beautifully executed. There is another monument by him at the Duomo of Parma, raiſed in 1548 to the memory of Bernardo degli Uberli of Florence, who was a cardinal, and biſhop of Parma. Vaſari ediz. di Bologna, tom. iii. p. 11. Orlandi.

CLEMENTE, SAN, DON BARTOLOMEO DI. See LELLA GATTA.

CLEMENTI, in *Geography*, a town of European

Turkey, in the province of Albania; 44 miles N. of Dulcigno.

CLEMENTINA, or CLEMENTINE HOMILIES, in *Eccleſiaſtical Hiſtory*, are 19 homilies in Greek, publiſhed by Cotelerius, with two letters prefixed; one of them written in the name of Peter, the other in the name of Clement, to James biſhop of Jeruſalem; in which laſt letter they are entitled "Clement's Epitome of the Preaching and Travels of Peter." But it may be queſtioned, ſays Dr. Lardner, whether one or both of theſe letters do not belong to the "Recognitions." Photius ſeems to favour this ſuppoſition; at leaſt, in his time, they were both prefixed to ſome editions of the "Recognitions." The 19th Homily is imperfect at the end; and there is wanting another whole homily to complete the number of twenty. Le Clerc thinks theſe Clementine Homilies were compoſed by an Ebionite in the ſecond century. Montfaucon ſuppoſes that they were forged at a much later period, and that they were not mentioned by any author, till long after the age of St. Athanaſius. This is one of his arguments, *viz.* that the Synopſis, in which the Clementines are mentioned, was not compoſed by that father. Grabe ſays, that the Clementines ſpoken of in that Synopſis, are not the ſame with our Clementine Homilies, which is very probable;—thoſe Clementines mentioned in the Synopſis not being the Clementine Homilies, but the Clementine Epitome, publiſhed by Cotelerius at the end of the Homilies. Although theſe Clementine Homilies are ancient, they were not cited by the name of Clementines; but were reckoned either another edition of the Recognitions, or called the "Travels of Peter," or the "Diſputation of Peter and Appion." There is a great agreement between theſe Homilies and the Recognitions, in ſeveral particulars. Dr. Lardner inclines to the opinion, that the Clementine Homilies were the original or firſt edition, and the Recognitions an improvement of them, becauſe they appear more finiſhed and artificial. This work is not improbably the ſame with that cenſured by Euſebius under the title of "Dialogues of Peter and Appion." The whole work is prolix; and in the 4th, 5th, and 6th Homilies is a hiſtory of Appion, and of a diſpute with him. If this be the work of an Ebionite, as is generally ſuppoſed, and ſeems not improbable, it may be argued, that when the author wrote, the four goſpels were owned by that ſect, or at leaſt by ſome branch of it; for though there may be ſome interpolations in theſe Homilies, there is no reaſon to think that any texts have been added. Although neither of theſe books, *viz.* the Homilies and Recognitions, be of any ſacred authority, they may both be of ſome uſe; and deſerve to be particularly examined. From what has been ſaid it is probable, that the Clementine Homilies, and alſo the book of Recognitions, which Mr Whiſton has recommended to us "as certainly to be eſteemed in the next degree to that of the really ſacred books of the New Teſtament," are the work of an Ebionite; and therefore if there is in it (ſays Dr. Lardner) any Arianiſm, it has been interpolated. As to the "Clementine Epitome," already mentioned, it ſeems to be the work of a later age; and to have been compoſed out of the Recognitions and Homilies, and perhaps ſome other works, leaving out ſome things, and adding others. To this Clementine Epitome, or ſome ſimilar piece, the author of the Synopſis, aſcribed to Athanaſius, refers, when, among the contradicted or apocryphal books of the New Teſtament, ſuch as the Travels of St. Peter, the Goſpel according to St. Thomas, and ſome others, he mentions the "Clementines," "out of which," he ſays, "thoſe things have been ſelected which are true and divinely inſpired." This is probably the book of which Nicephorus ſpeaks, as being in his time approved by the church. But in the compoſition of it, not only thoſe things were ſelected which are true and right in the ancient Clementines, but ſeveral other things were added. The hand of an Ebionite in the Clementine Homilies is generally acknowledged by learned moderns. But that there was no good foundation, in the moſt early antiquity, for ſuppoſing St. Clement to be the author of any of thoſe pieces, may be concluded from Euſebius. Moreover, it is notorious that the Clementine Epitome was compoſed by an orthodox chriſtian. But it may be ſaid in favour of the Catholics, that none of them appear to have had any hand in any of theſe Clementines during the firſt three centuries. It may be alſo added, that it was known the Clementine Epitome was not an original piece; and that it was not pretended to be really written by Clement, but was allowed to conſiſt of things ſelected out of ſome other work or works. Lardner's works, vol. ii.

CLEMENTINE, a term uſed among the Auguſtins, who apply it to a perſon, who, after having been nine years a ſuperior, ceaſes to be ſo, and becomes a private monk, under the command of a ſuperior.

The word has its riſe hence, that pope Clement, by a bull, prohibited any ſuperior among the Auguſtins from continuing above nine years in his office.

CLEMENTINES, the name of a party which took its riſe in Europe in the 14th century on the following occaſion. After the pope had reſided many years at Avignon, Gregory XI. was perſuaded to return to Rome; and upon his death, which happened in 1380, the Romans, reſolute to fix, for the future, the ſeat of the papacy in Italy, beſieged the cardinals in the conclave, and compelled them, though they were moſtly Frenchmen, to elect Urban VI., an Italian, into that high dignity. The French cardinals, as ſoon as they recovered their liberty, fled from Rome, and proteſting againſt the forced election, choſe Robert, ſon of the count of Geneva, who took the name of Clement VII. and reſided at Avignon. All the kingdoms of Chriſtendom, according to their ſeveral intereſts and inclinations, were divided between theſe two pontiffs. The court of France adhered to Clement, and was followed by its allies, the king of Caſtile, and the king of Scotland: England, of courſe, was thrown into the other party, and declared for Urban. Thus the appellations of "Clementines" and "Urbaniſts" diſtracted Europe for ſeveral years; and each party damned the other as Schiſmatics, and as rebels to the true vicar of Chriſt. This circumſtance contributed in ſome degree to weaken the papal authority; but had not ſo great an effect as might naturally be imagined. Though any king could eaſily at firſt make his kingdom embrace the party of one pope or the other, or even keep it ſome time in ſuſpence between them, he could not ſo eaſily transfer his obedience at pleaſure. The people attached themſelves to their own party, as to a religious opinion, and conceived an extreme abhorrence to thoſe of the oppoſite party, whom they regarded as little better than Saracens or infidels. Cruſades were even undertaken in this quarrel; and the zealous biſhop of Norwich in particular led over, in 1382, near 60,000 bigots into Flanders, againſt the Clementines; but, after loſing a great part of his followers, he returned with diſgrace into England.

CLEMENTINES, in the *Canon Law*, are the conſtitutions of pope Clement V. and the canons of the council of Vienne. See CANON *law*, and CLEMENT V.

CLEMENTINES, in *Geography*, a tribe of Hungarians, ſo called from their leader, who emigrated in 1463, from Albania, hania, and arrived in 1737, through Servia at Sclavonia. They are diſperſed in two villages.

CLEMENTINUS, Clement, in *Biography*, a learned phyſician of Amelia, near Spoleto in Italy, was in great credit towards the end of the 13th and the beginning of the 14th centuries. He was one of the reſtorers of medicine, and was well verſed in the works of Hippocrates, and the reſt of the fathers in that ſcience. He taught philoſophy and mathematics for ſome years at Padua, and appears to have imbibed the principles of aſtrology, with which his medical works are tinged. From Padua he was called to Rome, where he was appointed phyſician to Pope Leo X. whom he outlived only a ſhort time. The work by which he is known is intitled, "Clementia Medicinæ, ſive de Præceptis Medicinæ, et de Arte Medica, Romæ 1512, fol." Aſtruc ſays there was an earlier edition of this work, *viz.* in 1505. It was reprinted in 1535. He treats of temperaments and humours, of the pulſe and urine, as indicating diſeaſe; of fevers, the plague, &c. He ſuppoſed the lues venerea, which made its firſt appearance in his time, was occaſioned by the predominance of the conſtellation Scorpio, Haller. Bib. Med. Eloy. Dict. Hiſt.

CLEMONT, in *Geography*, a town of France, in the department of the Loiret, 9 leagues S.W. of Gieno. See alſo Clefmont.

CLENCH-*nails*. See Nails.

CLENCHING, in *Sea Language*, denotes making faſt the point of a bolt or nail, on a ring or rove of iron, by battering the point and making it ſpread. The cable is faſtened or clenched to the ring of the anchor.

CLENZE, Lower, in *Geography*, a town of Germany, in the circle of Lower Saxony, and principality of Luneburg-Zell; 8 miles S.W. of Luckow.

CLEOBULUS, in *Biography*, one of the ſeven wiſe men of Greece, or, as ſome have called him, tyrant of Rhodes, was born at Lindus, in the iſle of Rhodes, or, as ſome will have it, in Caria. He invited Solon to come and live with him, when Piſiſtratus had uſurped the ſovereignty of Athens. He flouriſhed in the 54th Olympiad, about 564 years B.C.

CLEOBURY Mortimer, or Cleebury, in *Geography*, a ſmall market-town of Shropſhire, England, is ſituated at the baſe of a mountain, called the Clee-hills. Theſe abound with iron-ore, lime, and coal, the latter of which is found in a vein 5 feet thick. The church is a large, handſome building; and near it is the ſite of an ancient caſtle, which was built by Hugh de Mortimer, and deſtroyed in the time of Henry II. Here is a free ſchool, founded by ſir Lacon William Child.

On Cleebury hill is an ancient encampment, another at Titterſtone Clee, and another on the Urchin.

Here are a ſmall weekly market on Thurſday, and three annual fairs. Cleobury is 137 miles N.W. from London, and about 17 S. of Shrewſbury. Camden's Britannia, vol. ii. 1789.

CLEOFANTE, in *Biography*, an ancient painter, a native of Corinth, where he is ſaid, by Pliny, to have firſt attempted to imitate in his figures the colour of the fleſh, by means of bricks pounded. He flouriſhed before the 40th Olympiad, and accompanied Demeratus, the father of Tarquinius Priſcus, to Rome; when flying from the anger of Cipſelus, prince of Corinth, he took refuge in Italy.

There exiſted at Lanuvio, in the time of Pliny, a picture of Atalanta, and another of Helen, by this maſter, both of which were well drawn. Winkelman. Orlandi.

CLEOME, in *Botany*, (from Κλειω, *claudo*, a name adopted by Linnæus, from Theod. Priſcianus, called alſo Octavius, or Octavianus Priſcianus, a medical writer of the fourth century). Linn. Gen. 826. Schreb. 1099. Willd. 1249. Gært. 479. Juſſ. 243. Vent. 3. 118. (Sinapiſtrum, Tourn. 116.) Claſs and order, *tedradynamia ſiliquoſa*. Nat. Ord. uncertain, Linn. Philoſ. Botan. *Putamineæ*, Linn. Prælec. *Capparides*, Juſſ. Vent.

Gen. Ch. *Cal.* Perianth four-leaved, very ſmall, ſpreading, the lower leaf more open than the others, caducous. *Cor.* Petals generally four, aſcending and ſpreading, two intermediate ones ſmaller, and nearer together. *Stam.* Filaments varying in number, in different ſpecies, from ſix to more than twenty; awl-ſhaped, declining; in ſome ſpecies placed near the petals, on the common receptacle; in others attached to a pedicel which ſupports the germ; anthers lateral, aſcending. *Piſt.* Germ either ſeſſile, or ſupported by a pedicel, differing very much in length in different ſpecies, generally ſurrounded by three nectariferous glands, one under each of three upper calyx leaves; ſtyle, in moſt ſpecies, none; ſtigma capitate. *Peric.* Silique pedicelled, or nearly ſeſſile, oblong, cylindrical, one-celled, two-valved. *Seeds* numerous, kidney-ſhaped; attached to the inner ſide of a filiform, circular, or elliptic receptacle placed between the valves.

Eſſ. Ch. Three nectariferous glands; one under each diviſion of the valves. Petals all aſcending. Silique one-celled, two-valved.

This is a very anomalous genus, and imperfectly accords with the other genera of the Linnæan claſs tetradynamia, which form a completely natural family. Tournefort had before claſſed it among his plants with cruciform flowers, under the generic name of ſinapiſtrum; but had placed it with chelidonium and epimedium, as having, like them, a one-celled capſule or ſilique. Linnæus, though he could not find a better ſtation for it than at the tail of his claſs, tetradynamia, did not venture to pronounce it of the ſame natural family. In the "Philoſophia Botanica," it appears among the vagæ, or plantæ incertæ ſedis; in the "Prælections," publiſhed after his death by Giſecke, it ſtands in the natural order of putamineæ, which correſponds with the capparides of Juſſieu and Ventenat. A few of the ſpecies at preſent admitted into the genus, are equally at variance with the eſſential character, nor is it, perhaps, poſſible to form one, which will include all of them. In the general character, we have thought it expedient to make conſiderable alterations.

Species. 1. C. *juncea*, Linn. jun. Supp. 300. Mart. 5. Poiſet. 22. Willd. 1. Sparm. in Act. Upſal. Nov. vol. iii. p. 192. "Stem ſhrubby, leafleſs; flowers in lateral corymbs, eight-ſtamened, gynandrous; ſtamens and pedicel elongated; ſilique linear, tomentous." *Stem* from one to two feet high, ſcarcely the thickneſs of a gooſe-quill. *Branches* rigid, like ſpines, generally acute, greeniſh, cylindrical, ſpreading, ſmoothiſh. *Leaves* none; but, inſtead of them, minute ſcales, coming out here and there on the ſtem and branches. *Flowers* dirty yellow; common peduncle very ſhort; partial ones from half an inch to an inch long, filiform, ſomewhat woolly, yellowiſh. *Calyx-leaves* rather ſpreading, ſomewhat orbicular, concave; two outer ones a little larger than the others, ſmooth within, ſomewhat rough, with crowded glands on the outſide, and edged with others which are ſupported by pedicels; corolla none. *Nectary* ſhort, tubular, two-lipped, faſtened by the ſide to the baſe of the pedicel; upper lip very ſhort, ſomewhat helmet-ſhaped, ſometimes entire, ſometimes toothed; lower lip more prominent, aſcending, either ſharpiſh and entire, or truncate-toothed; tube with a depreſſion or channel on the outſide, and at the top; pedicel lengthened out to an inch and half, the whole tubular, a third of its upper part ſtaminiferous; ſtigma oblong. *Seeds* blackiſh, orbicular, ſomewhat

what compreſſed, and each, as it were, in its proper cell. Sparm. A native of the Cape of Good Hope, found near the Black river by Dr. Sparman. 2. C. *heptaphylla*, Linn. Sp. Pl. 2. Mart. 2. Poir. 1. Willd 2. (Sinapiſtrum, Tourn. Burm. Zeyl. 215. 3. Herm. Lugd. 564. Sloan. Jam. 1. 194. 4. Pentaphyllum, Moris. hiſt. 2. 288. 2.) "Flowers gynandrous; leaves with about ſeven leaflets; ſtem prickly." *Root* annual. *Stem* from three to five feet high, herbaceous, upright, angularly grooved, branched; branches ſpreading, grooved, viſcid, villous. *Leaves* alternate, ſcattered, ſpreading, digitate; common petioles erect, cylindrical, ſtreaked, hirſute, viſcid: leaflets lanceolate, acuminate, nerved, pubeſcent, ſpringing from a centre at their baſe; prickles in pairs at the baſe of the petioles, oppoſite, thick, ſhort, yellow, very pungent. *Flowers* white, or fleſh-coloured, in long looſe terminal ſpikes; peduncles two inches long, pubeſcent, cylindrical; bracte, one at the baſe of each peduncle, and half ſurrounding it, heart or almoſt creſcent-ſhaped, ſeſſile, entire, pubeſcent, white; calyx-leaves linear-lanceolate, acute, ſpreading, convex, pubeſcent; two of them a little longer than the others; petals with claws, oblong, concave, entire; filaments ſix, longer than the corolla, patulous, attached to the pedicel of the germ, red-purple; anthers long, erect, linear, brown; germ linear, quadrangular, green; ſtigma obtuſe, black. *Silique* five inches long, thick, tapering, pendulous. A native of Jamaica, whence it was ſent to Miller by Dr. Houſton. It is ſuppoſed to be a native alſo of Egypt and the Eaſt Indies. 3. C. *pentaphylla*, Linn. Sp. Pl. 3. Mart. 3. Poir. 2. Willd. 3. Jacq. Hort. tab. 24. Lam. Ill. tab. 576. fig. 1. Loureiro Cochin. 482. (Laganſa rubra, Rumph. Amb. tab. 96. fig. 2. Sinapiſtrum, Herm. Lugd. 564. Sloan. Jam. 80. Hiſt. 1. 294. Rai. Hiſt. 899. Papaver, Pluk. Alm. 280. Quinquefolium lupini folio, Bauh. Pin. 326. Capa-veela, Rheed. Mal. 9 tab. 24.) "Flowers gynandrous; leaves quinate; ſtem without prickles." *Root* annual. *Stem* about two feet high, herbaceous, upright; branches ſpreading, villous. *Leaves* on long, ſlender, villous petioles; leaflets roundiſh, acute, finely ſerrated, on ſhort petioles; floral leaves ternate, inverſely egg-ſhaped, obtuſe, quite entire; the loweſt on ſhort petioles, the reſt ſeſſile. *Flowers* white or fleſh-coloured, in a long terminal raceme or ſpike; peduncles axillary, ſolitary, one-flowered, ſpreading; calyx-leaves lanceolate; petals rounded, open, with long filiform claws; ſtamens ſix, attached to the pedicel of the germ about the middle, equal, ſpreading; pedicel of the germ long, ſlender, purple. *Siliques* three inches long, rough with rigid, blunt, very ſhort hairs, wrinkled or dotted. *Seeds* kidney-ſhaped, in ſix rows. We have blended the deſcription of Jacquin and Loureiro, as there ſeems no doubt with reſpect to the identity of their reſpective plants. A native of the Eaſt and Weſt Indies, Cochinchina, Guinea, and Syria. 4. C. *triphylla*, Linn. Sp. Pl. 2. Mart. 4. Poir. 3. Willd. 4. (Sinapiſtrum, Herm. Lugd. tab. 565.). "Flowers gynandrous; leaves ternate; ſtem without prickles." *Root* annual. *Stem* about two feet high, herbaceous, upright, almoſt ſmooth, branched. *Leaves* on long petioles; leaflets almoſt ſeſſile, oval, lanceolate; the middle one larger than the two others. *Flowers* fleſh-coloured, in a ſhort terminal ſpike; peduncles long, ſolitary; floral leaves lanceolate, acute, terminated by a ſhort point, ſlightly ciliated at their edges: filaments ſhort, ſtraight; ſtigma flattened. *Siliques* four inches long, oblong, obtuſe at the ſummit. A native of the Eaſt and Weſt Indies. *Obſ.* Linnæus, judging from a ſimilarity of habit, and a conformity in ſeveral ſtriking characters, was inclined to think that the laſt three are rather varieties than diſtinct ſpecies. He alſo calls them gynandrous, conſidering the pedicel of the germ as a proper ſtyle, and founding his opinion, we preſume, on the analogy of paſſiflora; but we cannot think that either one or the other has a right to be termed gynandrous. The pedicel does not appear to us to perform the office of a ſtyle in any reſpect whatever, any more than that which ſupports the germ in the genus euphorbia. 5. C. *pungens*, Willd. Hort. Berol. Annals of Botany. 1. 567. "Leaves quinate; ſtem prickly." *Leaves* viſcid. *Flowers* fleſh-coloured. A native of South America. 6. C. *polygama*, Linn. Sp. Pl. 8. Mart. 6. Poir. 4. Willd. 5. (Sinapiſtrum, Sloan. Jam. 80. Hiſt. 1. tab. 124. fig. 1). "Upper flowers maſculine, tetrandrous; leaves ternate; leaflets ſeſſile, ſomewhat prickly at the edges." *Stem* not above twenty or twenty-five inches high, a little branched, erect, almoſt ſmooth. *Leaves* on long petioles; leaflets ovate-lanceolate, a little rough at their edges. *Flowers* in a long raceme; the loweſt fertile; the reſt minute, male germ ſeſſile within the calyx. A native of Jamaica, in moiſt bottoms. 7. C. *icoſandra*, Linn. Sp. Pl. 5. Mart. 9. Poir. 5. Willd. 6. Lour. Cochin. 483. (Sinapiſtrum, Burm. Zeyl. tab. 99. Laganſa alba, Rumph. Amb. tab. 96. fig. 3.) "Flowers icoſi-tetrandrous; leaves quinate." *Root* annual. *Stem* two feet high, herbaceous, erect, ſtriated, viſcid villous, without prickles; branches aſcending. *Leaflets* ovate-lanceolate, ſeſſile, quite entire, a little rough. *Flowers* yellowiſh, in ſolitary axillary ſpikes along the branches; calyx campanulate; leaves four, lanceolate, caducous; petals twice the length of the calyx, ſpreading, ovate-oblong, almoſt equal; ſtamens from eighteen to twenty-two; filaments ſhort, awl-ſhaped, equal, placed on a flattiſh receptacle; anthers awl-ſhaped, recurved; germ ſeſſile, oblong, terminated by a ſhort ſtyle and obtuſe ſtigma. *Silique* long, awl-ſhaped, obliquely ſtriated, without nectariferous glands at its baſe. *Seeds* kidney-ſhaped. A native of cultivated ground in China and Cochinchina. The whole plant, except the petals and ſtamens, is cloathed with viſcid hairs. It has an acrid, hottiſh taſte, ſimilar to that of muſtard, and is eaten by the natives in ſallads mixed with other herbs. 8. C. *viſcoſa*, Linn. Sp. Pl. 6. Mart. 10. Poir 6. Willd. 7. (Sinapiſtrum, Mart. Cent. tab. 25. Aria-veela, Rheed. Mal. 9. tab. 23?) "Flowers dodecandrous; leaves quinate and ternate." *Root* annual. *Stem* two or three feet high, upright, ſtiff, almoſt woody, angular, cloathed with viſcid hairs, branched. *Leaves* alternate, on long petioles; leaflets oval, ſomewhat rhomboid, ſlightly petioled. *Flowers* yellow, ſmaller than thoſe of the preceding ſpecies, axillary and ſolitary along the branches, with a terminal raceme; calyx-leaves erect at the bottom, ſpreading a little at the top, all expanding regularly, lanceolate, equal; petals lanceolate-ovate; two lower ones more divaricated than the others; ſtamens from eight or nine to thirteen, placed on the receptacle, unequal; germ ſeſſile. *Silique* about two inches long, very villous, viſcid, ſlender, longitudinally ſtriated, terminated by a ſtigma on a ſhort ſtyle. A native of Malabar and the iſland of Ceylon. 9. C. *dodecandria*, Linn. 7. Mart. 11. Poir. 7. Willd. 8. (Sinapiſtrum, Burm. Zeyl. 216. tab. 100. fig. 1.) "Flowers dodecandrous; leaves ternate." *Root* annual, long. *Stem* about half a foot high; ſometimes erect, ſimple; ſometimes almoſt creeping, with decumbent branches, ſlightly villous, ſomewhat viſcid. *Leaves* ſmall, petioled; leaflets ſmooth, elliptical, quite entire, ſeſſile. *Flowers* white, axillary, ſolitary; upper ones abortive; calyx nearly as long as the corolla, purple; petals emarginate; ſtamens from ten to fourteen, placed on the receptacle. *Siliques* ſeſſile, ſmooth, compreſſed, erect, almoſt tranſparent, ſpindle-ſhaped, a little inflated. *Seeds* very ſmall, ſmooth, ſhining, brown, convex on one ſide, concave on the other, nearly kidney-ſhaped. A native of the Eaſt Indies. There is a plant cultivated in the botanic garden at Paris, under the name of C. canadenſis, which greatly reſembles this ſpecies. It is, however, larger in all its parts, and more branched; its ſiliques are alſo villous, at leaſt when young, and all its flowers fertile. It has an unpleaſant bituminous ſmell. In other reſpects it agrees with C. dodecandria. 10. C. *felina*, Linn. jun. Supp. 300. Mart. 8. Poir. 20. Willd. 10. "Polyandrous, hiſpid; leaves ternate, ſtrigoſe, wedge-ſhaped; flowers axillary, ſolitary, peduncled; ſiliques linear, compreſſed." *Leaves* ſomewhat retuſe. *Flowers* red, ſmall, angular. *Siliques* ſhort, ſmooth. This diminutive plant is ſingular in its hiſpid leaves; the hairs much dilated at the baſe, very ſtiff, preſſed cloſe to the leaves, and pointing towards their extremity, ſo as to give it ſomewhat of the roughneſs of a cat's tongue. Found in Ceylon, by Koenig. 11. C. *chelidonii*, Linn. jun. Supp. 300. Mart. 7. Poir. 20. Willd. 10. "Polyandrous, hirſute; leaflets five or ſeven, wedge-ſhaped, ſcabrous; racemes terminal; ſiliques filiform." *Leaves* on long petioles, digitate; leaflets acute. *Flowers* red, reſembling thoſe of chelidonium hybridum; calyx three or five-leaved, ſtrigoſe; petals five; ſtamens yellow. *Silique* quite ſmooth. It has clearly a great affinity to chelidonium. Poiret obſerves, that a more accurate inveſtigation is neceſſary before its real genus can be determined. A native of the Eaſt Indies, found by Koenig near Tanſchaur. 12. C. *gigantea*, Linn. Mant. 430. Mart. 12. Poir. 8. Willd. 11. Jacq. Obſ. 4. p. 1. tab. 76. "Flowers hexandrous; leaflets in ſevens; ſtem without prickles." *Root* perennial. *Stem* from ſix to twelve feet high, erect, pubeſcent, always green; branches ſimple, diffuſe, ſcarred. *Leaves* alternate, petioled; petioles longer than the leaves; leaflets quite entire, lanceolate, pubeſcent, ſilky on the upper ſurface, acute, ſeſſile. *Flowers* greeniſh; raceme terminal, erect, near two feet long; peduncles glutinous, longer than the flowers, without bractes; calyx-leaves linear, ciliated, ſpreading, caducous; petals oblong, obtuſe, undulated, cloſely cohering, except in front, where the ſtamens appear; claws diſtinct, the length of the petals; filaments inclining, longer than the petals, attached to the receptacle; anthers erect, oblong, yellow; germ pedicelled; pedicel the length of the ſtamens; ſtigma ſeſſile, obtuſe; receptacle globular, exuding a ſweet liquor at the baſe of the claws. It is a beautiful plant, but has a ſtrong diſagreeable ſmell, and very cauſtic taſte. A native of Cayenne: introduced into England by Dr. Fothergil in 1774. 13. C. *aculeata*, Linn. Syſt. Nat. iii. p. 232. Mart. 13. Poir. 9. Willd. 12. "Flowers hexandrous; leaves ternate, quite entire; ſtipules ſpineſcent; ſiliques ſeſſile." *Stem* herbaceous. *Leaves* elliptic-lanceolate, on long petioles; leaflets lanceolate, acute, ſomewhat ciliated and thorny at the edges, almoſt ſmooth, on very ſhort petioles; ſtipules two, very ſhort, recurved, citron-coloured, pale yellow, ſmall, ſolitary, peduncled; bractes at the baſe of the peduncles, ſimple; calyx-leaves acute, lanceolate, tomentous, whitiſh, caducous; claws of the petals long, almoſt filiform; ſtamens ſhorter than the corolla, placed on the receptacle; germ ſeſſile. *Silique* cylindrical, beſet with fine white hairs. Obſerved in America by Zoega. 14. C. *ſpinoſa*, Linn. Sp. Pl. 9. Mart. 14. Poir. 10. Willd. 13. Jacq. Amer. 190. 3. Pict. 93. Swartz. Obſ. 252. Brown Jam. 273. n. i. (Tarieraga, Marcgr. Braſ. 33. tab. 34.) "Flowers hexandrous; leaflets ſeven or five; ſtem thorny; ſiliques peduncled." *Root* annual. *Stems* five or ſix feet high, erect, villous, branched. *Leaves* alternate, on long petioles; leaflets entire, lanceolate, nerved, almoſt wrinkled, ſlightly viſcid-pubeſcent, edged with ſhort hairs, only three towards the extremity of the branches; ſpines two at the baſe of each petiole, oppoſite, ſhort, recurved, acute, yellowiſh. *Flowers* white, in a long terminal raceme; peduncles ſolitary, one-flowered; bractes ſhorter than the peduncles; heart-ſhaped, ſeſſile, obtuſe, approximating, nerved, pubeſcent; calyx-leaves linear-lanceolate, acute, ſpreading, concave, as long as the claws of the petals: petals oblong, entire, with elongated claws, and a roundiſh gland at the baſe of each; ſtamens unequally placed on the receptacle; filaments nearly equal, ſpreading, filiform, longer than the corolla, purple; anthers erect, long, two-celled, yellow; pedicel of the germ filiform, twice the length of the corolla. *Silique* three or four inches long, cylindrical, toruloſe, pubeſcent, viſcid, terminated by the obtuſe ſtigma. *Seeds* numerous, oblong. A native of the Weſt Indies. Sent from the Havannah to Miller by Dr. Houſton in 1731. 15. C. *ſerrata*, Linn. Sp. Pl. 10. Mart. 15. Poir. 11. Willd. 14. Jacq. Amer. tab. 190. fig. 43. "Flowers hexandrous; leaves ternate; leaflets linear-lanceolate, ſerrated." *Root* annual. *Stem* two feet high, erect; branches looſe, ſimple. *Leaves* petioled; leaflets almoſt equal; the middle one on a ſhort petiole. *Flowers* white; ſtamens tetradynamous. *Silique* about three inches long, cylindrical. A native of moiſt woods in South America, about Carthagena. 16. C. *ornithopoides*, Linn. Sp. Pl. 12. Mart. 16. Poir. 12. Willd. 15. (Sinapiſtrum, Tourn. Cor. p. 17. Dill. Elth. tab. 266. fig. 345. Buxb. Cent. i. tab. 9. fig. 2.) "Flowers hexandrous; leaves ternate; leaflets oval-lanceolate." *Root* annual. *Stem* about two feet high, pale green, cloathed with ſhort, ſtiffiſh hairs. *Leaves* ſtrong-ſcented, on rough petioles; leaflets of a pale glaucous colour on both ſides, commonly bent back, ſmooth in appearance, but roughiſh to the touch, edged with numerous ſhort hairs, on very ſhort peduncles. *Flowers* pale yellow, ſmall, axillary; calyx-leaves very ſmall, ovate, concave; ſtamens placed on the receptacle, inclining, ſcarcely longer than the petals; anthers ſmall, ſaffron-coloured; germ ſeſſile. *Siliques* two inches long, ſlender, a little hirſute, appearing jointed when ripe, like the legume of ornithopus. Obſerved in the Levant by Tournefort, and at Peru by Buxbaum. Cultivated in England by Dr. James Sherard in 1732. 17. C. *violacea*, Linn. Sp. Pl. 13. Mart. 17. Poir. 13. Willd. 16. Gært. tab. 76. fig. 6. Lam. Ill. tab. 567. fig. 3. "Flowers hexandrous; leaves ternate and ſimple; leaflets lanceolate-linear, quite entire." *Root* annual. *Stem* erect, ſometimes crooked; branches diffuſe. *Leaves* on long petioles; leaflets nearly equal, obtuſe, ciliated at their edges. *Flowers* violet-coloured, ſolitary, in a looſe ſpike; calyx-leaves yellow, with purpliſh tips, ſhort, ovate, concave; the two upper petals purple-violet, with ſmall yellow ſpots; the two others of an uniform colour, heart-ſhaped, clawed, ſlightly crenulate, ſtamens inclining, attached to the receptacle; anthers violet; germ ſeſſile, longer than the ſtamens; receptacle furniſhed, above the inſertion of the ſtamens, with three yellowiſh glands, Poir. *Peric.* a ſiliquoſe capſule on a very ſhort pedicel, oblong, obtuſe, compreſſed, villous. *Seeds* twelve or more, ſomewhat globular, with a ſmall pit on each ſide, acuminate towards the navel, ſmooth, of a ruſty-red colour, Gært. The whole plant is pubeſcent and viſcid. A native of Spain and Portugal. 18. C. *arabica*, Linn. Sp. Pl. 11. Mart. 18. Poir. 14. Willd. 17. Linn. Decad. iii. tab. 8. (Sinapiſtrum, Shaw. Afr. fig. 557.) "Flowers hexandrous; leaves ternate; leaflets lanceolate, obtuſe; ſeeds hirſute." *Root* annual. *Stem* about two feet high, herbaceous, viſcid, rough with hairs; branches diffuſe. *Leaves* alternate petioled; petioles as long as the leaves, hiſpid, viſcid; leaflets ſeſſile, ſcabrous underneath, lanceolate, obtuſe, finely toothed. *Flowers* yellow, tinged with purple at the ſummit, twice as large as the calyx; ſtamens inclining, a little longer than the corolla, placed on the receptacle; germ ſeſſile. *Silique* almoſt tranſparent, a little curved at the ſummit, ſomewhat inflated, obtuſe, ſhort; peduncle inclining. *Seeds* globular, kidney-ſhaped, very hiſpid, with erect whitiſh hairs. A native of Arabia. 19. C. *tenella*, Linn. jun. Supp. 300. Mart. 22. Poir. 22. Willd. 18. Retz. Obſ. 4. 28. n. 91. "Flowers hexandrous; leaves ternate; leaflets filiform, linear." *Root* annual. *Stem* about ſeven inches high, upright, branched. *Leaflets* ſeſſile, the length of the petals. *Siliques* linear, Linn. jun. *Flowers* yellow, on ſolitary peduncles, Retz. A native of the Eaſt Indies. 20. C. *anguſtifolia*, Poir. 19. Forſkal. Flor. Arab. p. 120. (C. filifolia, Mart. 23. Willd. 19.) "Leaflets in ſevens and threes, filiform." *Root* annual. *Stem* a foot high or more, cylindrical branched, Forſk. *Stem* erect, weak, herbaceous, ſtriated; dotted towards the ſummit, with elevated minute, ſcattered points, Vahl. *Leaves* alternate, digitate; petiole two inches long; leaflets ſeven, flat, linear, ſmooth, rather thick; three linear ones at the baſe of the peduncles, ſuſtaining the office of bractes, Forſk. *Leaves* petioled; petioles ſhorter than the leaves; lower leaflets in ſevens, upper ones ternate, Vahl. *Flowers* yellow, with a violet baſe in terminal racemes; peduncles half an inch long, ſtraight, ſpreading, cylindrical, ſolitary, one-flowered; calyx-leaves equal; petals all united in their upper part; outer ones larger, nearly oval; the two inner ones only half the length of the others, oblong, linear; ſtamens ſix; filaments violet-coloured, diminiſhing in ſize by pairs; the two lower pairs taper at the ſummit, with black and yellow erect anthers; the ſtamens of the upper pair yellow, barren, with a club-ſhaped ſummit; rudiment of the anther globular, yellow, ſmall, ſeſſile at the top of the filament. *Silique* two inches long, at firſt erect, afterwards pendulous. *Seeds* ſmooth, Forſk. *Silique* pedicelled, attenuated at the tip, Vahl. A native of Egypt and Arabia. 21. C. *guianenſis*, Poir. 18. Willd. 20. Aubl. Guian. ii. p. 675. tab. 273. "Flowers hexandrous; leaves ſimple, linear-filiform, ſeſſile." *Root* annual. *Stem* a foot high, branched from the bottom. *Leaves* green, alternate, very narrow, acute. *Flowers* yellow, axillary, ſolitary, on long ſlender peduncles; calyx-leaves ſmall, long, acute; petals oval, ending in a point, leaning to one ſide; ſtamens inſerted into the receptacle; filament yellow, ſlender, the length of the piſtil; anthers arrow-ſhaped, attached to the filament by their middle; germ long, inflated, a little curved, green; ſeparated from the petals, and leaning to the oppoſite ſide; ſtigma obtuſe. *Silique* long, ſmooth, a little inflated. *Seeds* ſmall, roundiſh. A native of Guiana, on the ſea-coaſt. 22 C. *monophylla*, Linn. Sp. Pl. 14. Mart. 19. Poir. 15. Willd. 21. (Sinapiſtrum, Burm. Zey. tab. 100. fig. 2. —— tſjeru-vela, Rheed. Mal. 9. p. 63. tab. 34. —— papaver, Pluk. Alm. p. 280.) "Flowers hexandrous; leaves ſimple, ovate-lanceolate, petioled." *Root* annual. *Stem* a foot and half high, herbaceous, erect, ſtriated, villous, branched near the top. *Leaves* alternate, long, narrow, entire, ſomewhat villous, viſcid, ending in a point, finely toothed; petioles ſhorter than the leaves. *Flowers* yellow, ſolitary, peduncled at the extremity of the branches; calyx-leaves ſmall, linear, villous; ſtamens placed on the receptacle, the length of the petals; anthers greeniſh-blue; germ ſeſſile. *Silique* ſlender, cylindrical, ſomewhat villous, ſtriated, ending in a point. A native of the Eaſt Indies. 23. C. *capenſis*, Linn. Sp. Pl. 15. Mart. 20. Poir. 16. Willd. 22. (C. juncea, Berg. Plant. cap. 164?) "Flowers hexandrous; leaves ſimple, ſeſſile, linear-lanceolate; ſtem angular." *Stem* ſimple, ſtiff and upright, reſembling that of an epilobium. *Leaves* like thoſe of the common broom, ſtiff, ſmooth. *Flowers* corymbed, as in epilobium. Linn. Bergius deſcribes his plant thus: *Stem* more than a foot high, herbaceous, erect, cylindrical, ſtriated, ſmooth; branches alternate, ſimple, long, upright. *Leaves* an inch long, alternate, ſmooth, obtuſe, fleſhy. *Flowers* yellow, tinged with purple, in thin racemes; peduncles alternate, one-flowered; calyx-leaves ovate, rather acute, ſmall, equal, permanent; petals wedge-ſhaped, obtuſe, erect, equal, ſeveral times longer than the calyx; claws yellowiſh, ſhort, linear; filaments ſhort, awl-ſhaped; germ ſeſſile, almoſt heart-ſhaped, compreſſed; ſtyle very ſhort, thickened, compreſſed, permanent; ſtigma obtuſe. *Silique*, when young, heart-ſhaped, rough with ſtrong points, two-celled, two-valved. *Seeds* orbicular, flat, one in each cell. Bergius did not ſee the fruit in a ſtate of maturity. The real genus of the plant does not appear to have been ſatisfactorily aſcertained. A native of the Eaſt Indies and the Cape of Good Hope. 24. C. *procumbens*, Linn. Sp. Pl. 16. Mart. 21. Poir. 17. Willd. 23. Jacq. Amer. 189. tab. 120. Swartz. Obſ. p. 254. (Sinapis, Brown Jam. 273. 2. Leucoium, Sloan. Hiſt. 1. tab. 123.) "Flowers hexandrous; leaves ſimple, lanceolate, petioled; ſtems procumbent." *Root* perennial, ſpindle-ſhaped, ſtriking deep into the earth. *Stem* almoſt woody, branched from the bottom; branches ſpreading on the ground, finally aſcending and dividing into ſmaller ones, ſmooth. *Leaves* alternate, ſmooth, quite entire, acute. *Flowers* yellow, turning to orange or red, axillary, ſolitary; peduncles one-flowered, purple; calyx-leaves five, lanceolate, concave, acute, open, equal; petals oblong, expanding, twice the length of the calyx; ſtamens equal, the length of the petals; anthers blackiſh, ovate, revolute, two-celled; germ on a very ſhort pedicel, acuminate, compreſſed; ſtyle awl-ſhaped; ſtigma obtuſe. *Silique* pedicelled, erect, cylindrical, ſomewhat toruloſe. *Seeds* echinate, black. No nectariferous glands have been obſerved. A native of the Weſt Indies.

Propagation and Culture. Moſt of the ſpecies being natives of very warm climates, will not thrive in England without artificial heat. They are raiſed from ſeeds ſown in the ſpring, and require the ſame treatment as other tropical plants.

Cleome *fruticoſa*, Linn. See Cadaba *indica*.

CLEOMENES, in *Biography*, the ſon of Apollodorus the Athenian, is engraved in the Greek characters on the baſe of the celebrated ſtatue of the Venus de Medicis. The name is by many, however, ſuppoſed a ſpurious introduction of the fifteenth or ſixteenth centuries. Carlo Dati. Orlandi.

Cleomenes, the name of ſeveral kings of Lacedæmon. The moſt celebrated of theſe was the laſt or *Cleomenes* III. He aſcended the Spartan throne on the death of his father Leonidas, in the 2d year of the 136th olympiad, 235 years B.C.; and in the commencement of his reign, though he was then very young, he found himſelf obliged to exert both his conduct and his courage. Aratus, at the head of the Achæans, had formed a project of uniting all the ſtates of Peloponneſus in a league; and ſoon after the death of Leonidas, deſpiſing the youth of Cleomenes, he determined to try the diſpoſition of the Spartans, who had not acceded to this league, and with this view he invaded the Arcadians, who were their neighbours and friends, and lived under their protection. When the Ephori heard of this aggreſſion, they ordered Cleomenes to take the field, and to ſeize on a paſs into Laconia, which was then in the hands of the allies of the Achæans. Having performed this ſervice, he afterwards diſappointed Aratus in his deſign of ſeizing Pegæa and Orchemanium. Upon the retreat of the Achæan general, the young king ſent a taunting meſſage to him; but the old ſtateſman, deriding his youth, aſked Democritus, a Spartan exile, who lived with him, "What ſort of a perſon this Cleomenes was?" "Why, my friend," replied the Spartan, "I will anſwer you in few words; if you have any thing to do againſt the Lacedæmonians, let me adviſe you to begin before this young eagle's talons are grown." Such was the diſparity in number between the troops of Cleomenes, which amounted to no more than 5000, and thoſe of the Achæans, conſiſting of 20,000 foot and 1000 horſe, that Cleomenes, having compelled the enemy to retreat, reminded his fellow-citizens of an expreſſion uſed by one of their ancient kings, who ſaid, "That the Lacedæmonians never inquired after the number of their enemies, but where they were." In the courſe of the war, however, Aratus, by his great ſkill, obtained ſome advantages over the Spartans; but the reputation of Cleomenes for courage and military virtues was ſuch, that the people of Sparta ſeemed to acquire a new ſpirit from the martial proweſs of their ſovereign. The Ephori, dreading the riſing fame and correſponding influence of Cleomenes, wiſhed to put an end to the war: the king perceived their deſign; and in order to counteract it, he determined to ſuppreſs the Ephori, and thus to ſecure his own power, and at the ſame time to reſtore the glory of his country. For this purpoſe he contrived, by money, to engage the Ephori in a war, and to give him the command of their army. Cleomenes, having ſucceeded in this meaſure, took with him into the field thoſe perſons whom he had the greateſt reaſon to ſuſpect; and having performed ſeveral acts of valour, he marched his army with a rapidity which haraſſed it, and induced many to be left behind in Arcadia; and with the reſt he advanced ſlowly towards Lacedæmon. As he approached the place, he diſpatched a ſmall party, who, ſurpriſing the Ephori at ſupper, inſtantly killed four of them, and would alſo have ſlain the fifth, if he had not feigned himſelf dead, and thus gained an opportunity of retiring to a temple, where he remained uninjured.

On the next morning Cleomenes went into the forum, and cauſed all the ſeats of the Ephori to be removed, except one, which he reſerved for himſelf, and then artfully apologized to the people for his conduct. He perſuaded them, that it was neceſſary to reſtore the inſtitutions of Lycurgus; and aſſured them, that notwithſtanding the violence to which he had been obliged to recur for the accompliſhment of this purpoſe, he was determined, for the future, to pay a ſtrict regard to the laws, though the preſent occaſion, and his perſonal ſafety, required him to proſcribe 80 citizens. He was the firſt who delivered up his whole ſubſtance to the public ſtock, and his example was followed by his father-in-law, and other friends. In aſſigning the lands, he gave ſhares to all whom he had baniſhed, promiſing to recal them as ſoon as the public ſafety would admit of it; and immediately after he reſtored the old Laconic mode of educating youth, of eating in public, and performing their exerciſes together; he alſo raiſed a conſiderable body of troops, and diſciplined and armed them in a new manner. In order to manifeſt his abhorrence of tyranny, and to prevent any offence from his purſuing theſe meaſures by his own authority, he aſſociated his brother Euclides in the kingdom, declaring, that for the future, there ſhould be always two kings in Sparta, according to ancient cuſtom, and that he would not erect a monarchy, in order to tranſmit it to poſterity. Beſides, in order further to ingratiate himſelf with the people, and to eſtabliſh his own popularity and power, he adopted a courſe of life, which was not in any reſpect more expenſive than that of the meaneſt citizen. In his houſe he had no purple furniture, no canopies, or cloths of ſtate, no ſuperb chairs, nor couches for indulging eaſe, but every thing about him was diſtinguiſhed by its plainneſs and ſimplicity. When any perſon offered petitions, he very readily received them; converſed freely with thoſe that had eaſy acceſs to him; redreſſed all injuries that were committed by others, and did no injury himſelf; and at the ſame time his virtue was altogether free from affectation or auſterity. Having thus eſtabliſhed his intereſt with the people, notwithſtanding the alterations he had introduced, he marched with a body of troops into the territories of the Achæans, and gained ſeveral important advantages over Aratus. Nevertheleſs he did not avail himſelf of his victories, in oppreſſing any of the cities which he acquired, but reſtored their liberty, and, when occaſion offered, recalled their ancient inhabitants. The Achæans, diſcouraged by his ſucceſſes, were diſpoſed to accede to any terms which he propoſed; and Cleomenes, with a generoſity that ſeldom attends very deciſive conqueſts, merely deſired to be acknowledged general of the Greeks, ſtipulating at the ſame time, to deliver up his priſoners without ranſom, and to reſtore the cities which he had taken. Lerna was appointed as the place of treaty, and the Achæans were willing to acquieſce; but in his way thither, Cleomenes fell into a fever, which rendered it neceſſary for him to adjourn the meeting to another time and place. Aratus ſeized the advantage offered to him by this delay, and concerted meaſures for preventing his advancement to the dignity after which he aſpired, and to which his merit gave him a juſt claim. After his recovery, he proceeded towards Argos, where the Achæans held their aſſembly; but, as he approached it, Aratus diſpatched a meſſenger to inform him, that he muſt either enter the city alone, or be content to treat without the place. This meſſage he conſidered as an act of hoſtility, and he ſoon after declared war. Encouraged by the diſcontent and diviſions that prevailed among the Achæans, he took Pellene by ſurpriſe, and expelled the Achæan garriſon; and, after taking poſſeſſion of other places, he ſurpriſed Argos, and raiſed himſelf to a greater degree of power than any of his predeceſſors had poſſeſſed, and his city to a greater pre-eminence than ſhe had ever held in Greece. He wiſhed, however, to treat with Aratus, and to engage his friendſhip; but the Achæan general, having determined to deſtroy the Spartan greatneſs, was invincible. In the courſe of the war, Cleomenes, with a force inferior to that of the enemy, who had called Antigonus to his aſſiſtance, defended the far greater part of Peloponneſus, till Argos was betrayed; even then he exerted himſelf, and, when overpowered by numbers, made a moſt glorious retreat. At this time he received from Sparta the intelligence of the death of his wife, to whom he was affectionately attached; but he bore the afflictive news with fortitude, and reſumed the functions of a monarch and a general, without ſuffering his private concerns to interfere with the conduct of public affairs. Ptolemy offered him his friendſhip; but impoſed a condition which much affected him, and that was his ſending his mother, Crateſiclia, and his ſon, as hoſtages. Whilſt he was unable to communicate this demand to his mother, and heſitating to explain himſelf, ſhe laughingly ſaid, "Well, was it this which you were afraid of imparting? Why do you not put me on ſhip-board, and ſend this carcaſe where it may be ſerviceable to Sparta, before age has waſted it unprofitably here?" Before ſhe embarked, ſhe retired with her ſon into the temple of Neptune, where, while he wept, ſhe tenderly embraced him, and ſaid, "Come, king of Sparta, let us dry our tears, that no ſigns of grief may appear when we go out, nor any token of weakneſs unworthy your dignity, or the honour of our country, ſince our actions are all that are within our power, and events belong wholly to providence." Afterwards writing to Cleomenes from Egypt, ſhe addreſſed him in theſe words: "King of Sparta, do what is worthy of your country, and what may redound to its advantage; nor, for the ſake of an old woman, and a little child, ſtand in fear of what Ptolemy may do." In the proſecution of the war, Cleomenes diſplayed his conduct and valour; and though unequally matched againſt the number and diſcipline of his enemies, he kept the war out of Laconia, took the city of Megalopolis, which was larger than Sparta, in the midſt of the armies of king Antigonus; and then generouſly offered to reſtore it untouched to its citizens; but when they rejected his offer, he abandoned it to the plunder of his ſoldiers. He afterwards haraſſed the territory of Argos, and, as the ſtate of his army required ſpeedy action, he provoked Antigonus to engage, whilſt he had the advantage of the ground; however, this cautious and ſkilful officer declined a conteſt till a more proper opportunity offered. At length the two armies engaged at Sellaſia, where Cleomenes was defeated with very great ſlaughter. After the termination of this diſaſtrous battle, he retired to Sparta; and, after ſome deliberation, in which he manifeſted diſtreſſing anxiety, he determined to retire to Egypt. In the execution of his purpoſe, he embarked at Gythium, and paſſed over to Ptolemy Euergetes, who entertained him honourably while he lived; but his ſon, indulging ſuſpicion of him, deprived him of his liberty; an outrage which Cleomenes after ſome time reſented, ſo that he, with 12 friends, forced the place where he was confined; but afterwards finding it impracticable to eſcape, they ſlew each other. Thus died Cleomenes, in the firſt year of the 140th Olympiad, 220 years B. C. after having reigned 16 years over Sparta. Ptolemy Philopater, actuated by a ſpirit of brutal revenge, cauſed his body to be hanged on a croſs, and ordered his mother, children, and all the women who attended them, to be put to death. When that unhappy princeſs was brought to the place of execution, the only favour ſhe aſked was, that ſhe might die before her children. But they began with them; a torment more grievous to the affectionate parent than death itſelf; after which ſhe preſented her neck to the executioner, merely ſaying, "Ah! my dear children, to what a place did you come!" With Cleomenes ended the Herculean race of Spartan kings, if we except the ſhort reign of Ageſipolis, his ſucceſſor. Plut. in Cleom. apud opera T. i. p. 795. Polyb. lib. ii. Anc. Un. Hiſt. vol. v. Rollin's Anc. Hiſt. vol. v.

CLEON, an Athenian general, who roſe from obſcurity to the command of the armies of the ſtate, by his intrigues and eloquence. He was raſh and obſtinate, and was killed at Amphipolis, in a battle with Braſidas, the Spartan general, B.C. 422.—There was alſo a famous ſtatuary of this name; alſo a poet, who wrote a poem on the Argonauts; alſo an orator of Halicarnaſſus, who compoſed an oration for Lyſander, in which he intimated the propriety of making the kingdom of Sparta elective; and a Magneſian, who wrote ſome commentaries, in which he ſpeaks of portentous events, &c.

CLEONÆ, in *Ancient Geography*, a maritime town of Macedonia, on a peninſula of Mount Athos, between Thyſſus and Acro-Athos, according to Thucydides and Pliny. It was a colony of Chalcidians, according to Heraclides.—Alſo, the laſt town of the Argolide on the ſide of Corinth. In the time of Pauſanias, it had a temple and ſtatue of Minerva. Homer applied to it the epithet of Ευκτιμενας, which ſuggeſts the idea of a fine city.—Alſo, an ancient town of Greece, in the Phocide, near Hyampolis, according to Plutarch.—Alſo, an ancient town of Peloponneſus, in Arcadia, according to Pliny, who diſtinguiſhes it from that of Achaia.

CLEONEO, Cimone, in *Biography*, a very ancient painter of Greece, who is ſaid to have firſt attempted to give a variety to the actions of his figures, by making them look up or down, or fore-ſhortening them as the ſubject required; beſides which he deſcribed the joints and the veins of his figures better than any of his predeceſſors, and imitated the folds of drapery with ſome ſucceſs. Borghini. Della Valle. Vite dei Pitt. Ant.

CLEONIA, in *Botany*, κλεωνιαιαν or κλεωνια, Theophraſt. lib. 7. cap. 4. Dioſc. lib. i. in Append. cap. 27. Cleonæum, Plin. lib. xix. cap. 5.) Linn. Gen. 736. Schreb. 991. Gært. 407. Claſs and order, *didynamia gymnoſpermia.* Nat. Ord. *Verticillatæ*, Linn. *Labiatæ*, Juſſ.

Gen. Ch. *Cal.* perianth one-leafed, tubular, angular, two-lipped; upper lip flattiſh, broad, three-toothed; lower lip two-parted, ſhort. *Cor.* one-petalled, ringent; upper lip ſtraight, bifid, keeled; lower lip trifid, middle ſegment two-lobed; ſide ones ſpreading. *Stam.* Filaments four, forked at the end; the two lower longeſt; anthers ſeated on the lateral branch of one of the filaments, croſſed in pairs. *Piſt.* Germ four-parted; ſtyle filiform, the length of the ſtamens; ſtigmas four; ſetaceous, equal; Linn. Four-cleft, Gært. *Peric.* none, except the permanent calyx cloſed with hairs. *Seeds* four, nearly columnar, ſmooth.

Eſſ. Ch. Filaments forked, with an anther at the end of each lateral branch; ſtigma four-cleft.

Sp. C. *luſitanica*, Linn. Sp. Mart. Willd. Gært. tab. 66. fig. 7. Deſf. Atl. 2. p. 32. (Brunella odorata, Lam. Juſſ. Vent. Prunella odorata luſitanica; Barr. Ic. 561. Clinopodium luſitanicum ſpicatum et verticillatum, Tourn. Inſt. 195.) *Root* annual. *Stem* ſix or eight inches high, erect, very villous, a little branched towards the top. *Leaves* elongated, narrowed at the baſe, obtuſe at the end, ſtrongly toothed; upper ones pinnatifid; bractes deeply laciniated, narrow, acute, ciliated. *Flowers* violet-coloured or bluiſh, large, in a terminal hiſpid ſpike; upper lip of the calyx large, ſlightly three-toothed, each of the teeth bearing a feeble ſpine; lower one narrow, deeply bifid, ſimilarly ſpinous; anthers creſted at the back. La Marck never obſerved the filaments ſpinous as deſcribed by Linnæus. *Seeds* roundiſh, turgidly lenticular, mucronate at the baſe, ruſeſcent, with a white umbilicus, ſhaped like the letter *y*. A native of Spain and Portugal. It differs little from prunella, except in its four-cleft ſtigma, and laciniated bractes; characters which La Marck, Juſſieu, and Ventenat have not thought ſufficient to conſtitute a generic diſtinction.

CLEOPATRA, in *Biography*, the name of ſeveral princeſſes and queens of Egypt. Of theſe we ſhall ſelect

Cleopatra III., queen of Egypt, the eldeſt daughter of Ptolemy Auletes, who gave his crown to her and her brother Ptolemy (Dionyſius II.) and ordered by his will, that they ſhould marry together, according to the cuſtom of that houſe, and govern jointly. And becauſe they were both very young, the daughter, who was the eldeſt, being only 17 years of age, he left them under the tuition of the Roman ſenate. She aſcended the throne in the ſecond year of the 182d olympiad, the 703d year of Rome, and the 51ſt year before Chriſt. Little is known of the beginning of Cleopatra's and her brother's reign. Ptolemy, being a minor, under the tuition of Pothinus, an eunuch, and Achillas, commander in chief of the Egyptian forces, theſe two miniſters engroſſed the whole power to themſelves, and in the king's name, deprived Cleopatra of her ſhare in the ſovereignty left her by the will of her father. Thus injured, ſhe retired into Syria, and having raiſed in that country and in Paleſtine a conſiderable army, led it into Egypt, in order to aſſert her right by military force. Ptolemy alſo, having collected all the forces in his power, took the field and marched againſt his ſiſter. Both armies encamped between Peluſium and Mount Caſius; but declined hazarding an engagement. At this conjuncture of the difference between the brother and ſiſter, Pompey, whom the people had appointed guardian to the young king, after his defeat at Pharſalia, ſought an aſylum in Egypt, but on his arrival off Peluſium, he was baſely murdered by the council of the reigning miniſters and that of Theodotus, a rhetorician, who was the king's preceptor. In the mean time Cæſar, in his purſuit of Pompey, arrived at Alexandria, and there hearing of his death, cauſed him to be interred with all the uſual ſolemnities. During his detention in this city by the Eteſian winds, he ſolicited the payment of the money due to him from Auletes, and took cognizance of the difference ſubſiſting between Ptolemy and his ſiſter Cleopatra. The rigour with which the money was exacted for the payment of Auletes' debt, and the haughty manner in which Cæſar conducted himſelf in arbitrating between Ptolemy and his ſiſter, incenſed the Egyptians againſt him; but their indignation was appeaſed by conceſſion and explanation on the part of the Roman, and the cauſe being brought before his tribunal, advocates were appointed to ſtate the reſpective claims of the brother and ſiſter. Cleopatra, in the mean while, juſtly apprehending that female youth and beauty would make an impreſſion upon Cæſar in her favour, determined on an attempt to attach him firſt to her perſon and then to her cauſe. Having obtained leave to appear before Cæſar, or as Plutarch ſays, having been invited to plead her own cauſe in his preſence, ſhe concerted meaſures for being ſecretly conveyed into his apartment; and for this purpoſe cauſed herſelf to be tied up in a mattraſs, and carried thither through the ſtreets of Alexandria on the back of Apollodorus. Cæſar applauded the ſtratagem, and when Cleopatra preſented herſelf, he was charmed with her perſon and detained her all night. Such was her influence over him, that he next morning ſent for Ptolemy, and preſſed him to receive his ſiſter upon her own terms. When the young prince found that Cæſar, inſtead of being an impartial judge, was become the advocate of Cleopatra, and that ſhe had taken up her abode in that part of the palace where the Roman lodged, his indignation was rouſed, and running through the ſtreets of Alexandria in a frantic manner, he excited an inſurrection of the populace againſt Cæſar. The Roman, however, contrived to repel the attack that was made upon his palace and to appeaſe the tumult, by ſhewing himſelf from a balcony to the enraged multitude, and promiſing to do whatever they ſhould think fit to ſuggeſt. On the following day, he convened a general aſſembly of the people, and as guardian and arbitrator, he decreed that Ptolemy and Cleopatra ſhould reign jointly in Egypt, agreeably to their father's will, which he had cauſed to be publicly read. Cæſar's decree gave general ſatisfaction; but Pothinus, whoſe intereſt and power were likely to be materially affected by it, inſpired the people with new jealouſies, and ſuggeſted to them that it was part of the plan of the Roman dictator, however diſguiſed, to place Cleopatra alone on the throne. The reports to this purpoſe which he induſtriouſly circulated excited a freſh diſturbance among the populace, and meaſures were adopted for expelling Cæſar from the city. The conteſt on both ſides was active and violent; but Cæſar prevailed. Having ſecured the perſon of the king, and cauſed Pothinus to be put to death, he gained ſeveral victories over the Egyptians; and after his laſt victory, on occaſion of which 20,000 Egyptians were ſlain, 12,000 taken priſoners, and Ptolemy drowned in the Nile in his attempt to eſcape, Cæſar returned to Alexandria, and entering the city without oppoſition, beſtowed the crown on Cleopatra, obliging her to marry Ptolemy, her younger brother, at that time no more than 11 years of age. When this object was accompliſhed, Cæſar was rouſed from the lethargy into which he had been lulled by Cleopatra's charms, by the ſucceſs of Pharnaces, king of the Cimmerian Boſphorus, in the recovery of his father's dominions; and accordingly he left part of his forces in Egypt to protect Cleopatra, and with the reſt marched into Syria. Cleopatra remained undiſturbed in the poſſeſſion of the crown, but dreading the interference of her brother, when he attained his 15th year, at which age, according to the laws of the country, he was to ſhare the royal authority as well as the name, ſhe cauſed him to be poiſoned, in the fourth year of his reign, and from that time ſhe became the ſole ſovereign of Egypt. After the death of Cæſar, when the triumvirate was formed, Cleopatra declared herſelf in its favour; and being delivered from all apprehenſions of an invaſion, ſhe ſailed with a numerous fleet to join Antony and Octavianus; but was prevented by illneſs from proſecuting her deſign and obliged to return to Egypt, after having loſt a great number of her ſhips by a ſtorm.

Antony, after the battle of Philippi, having received information that Cleopatra, or ſome of her governors, had ſent ſuccours to Caſſius againſt Dolabella, ſummoned her to appear before him at Tarſus in Cilicia. The queen, confiding in the power of her charms, already experienced, flattered herſelf that, at the age of 25 years, when the improvement of her underſtanding would render her converſation no leſs agreeable than her perſon, ſhe ſhould be able to captivate Antony. Having provided herſelf with rich preſents, large ſums of money, and magnificent habits and ornaments, ſhe embarked in a ſtately galley, attended with the reſt of her fleet, and croſſing the ſea of Pamphylia, and entering the Cydnus, arrived at Tarſus, where Antony waited her arrival. Her galley was all over gilt, the ſails were of purple, and the oars plated with ſilver. The queen appeared under a canopy of cloth of gold, raiſed on the deck, in an attire and attitude reſembling thoſe in which Venus was generally painted, ſurrounded by a great number of comely youths fanning her like Cupids, and beautiful virgins, repreſenting, ſome of them the Nereids, and others the Graces. The dales and hills echoed, as ſhe ſailed up the river, with the melodious ſounds of various inſtruments, with which the oars keeping time, increaſed the harmony. The perfumes, that were burnt on the deck in great abundance, diffuſed their odours on each ſide of the river to a conſiderable diſtance, and filled the air with fragrance. As ſhe drew near the city, curioſity induced crowds of citizens to abandon their houſes and occupations, and to go out to meet her; and Antony, who was diſtributing juſtice in the forum, found himſelf deſerted. Upon her landing, Antony invited her to ſupper; but the queen, obſerving the decorum uſual on theſe occaſions, declined accepting his invitation, and requeſted a viſit from him in the tent, which would be ſoon pitched on the banks of the river. Antony inſtantly complied, and was entertained with a magnificence which no words can adequately deſcribe. At this firſt interview, he was no leſs charmed by her converſation than by her form and features; and ſuch was the aſcendant which ſhe had gained over him, that it was not in his power to refuſe her any thing ſhe aſked, however repugnant to the laws of juſtice, humanity, or religion. At her requeſt aſſaſſins were diſpatched to murder her ſiſter Arſinoe; and in order to increaſe and perpetuate her influence over the deluded Antony, ſhe ſpent immenſe ſums of money in the entertainments ſhe prepared for him and the chief officers of his army. On one occaſion, ſhe preſented him with a vaſt number of gold cups, enriched with jewels, which he admired; and on another, ſhe gave him all the gold and ſilver plate which had been uſed during a ſumptuous banquet. At one of theſe entertainments the queen had ear-rings conſiſting of two of the fineſt and largeſt pearls that ever had been ſeen, each valued at 52.500 *l.* of our money. One of theſe ſhe cauſed to be diſſolved in vinegar, and then ſwallowed it, in order to ſhew in what low eſtimation ſhe held ſuch toys, and how much ſhe could ſpend in one draught. She was alſo preparing to diſpoſe of the other in the ſame way, when Plancus ſtopped her, and ſaved the pearl, which was afterwards carried to Rome by Auguſtus, and being cut in two by his orders, it ſerved for pendants to the Venus of the Julian family. (Pliny, l. xxxiii. cap. 3.) For a further account of the connection between Antony and Cleopatra, ſee the article ANTONY. This connection inſpired her with the hope of becoming one day queen of Rome; for we are told by Dio Caſſius and Eutropius, that her uſual oath was, "as I hope to give law in the capitol." When Antony and Cleopatra ſeparated after the diſaſtrous battle of Actium, the former went to Libya, and the queen ſailed to Alexandria. Fearing, however, that ſhe might not be received by her ſubjects, if her misfortunes were known, ſhe entered the harbour with crowns on the prows of her ſhips, as if ſhe had obtained ſome ſignal victory. This artifice ſucceeded; and having gained admiſſion into her capital, ſhe put to death all who were averſe to her, in order to prevent the tumults, which ſhe apprehended they might occaſion, when the true ſtate of their affairs ſhould be known. Antony, who arrived in Egypt ſoon after the queen, by whom he was infatuated, was aſtoniſhed to hear of a very extraordinary undertaking in which ſhe was engaged. As ſhe expected Octavianus to purſue her into Egypt, in order to avoid falling into his hands, ſhe concerted meaſures for the tranſportation of her ſhips from the Mediterranean into the Red Sea, over the iſthmus, of 70 miles, which lay between them. Theſe ſhips were to be joined to thoſe in the Red Sea, and all her treaſures on board of them, ſhe determined to ſeek ſome place of ſettlement, out of the reach of the enemy. But the Arabians on the coaſt diſconcerted her plan, by burning all her ſhips; and ſhe was, therefore, forced to abandon her enterpriſe. After the death of Antony, Cleopatra was taken, having been prevented from diſpatching herſelf with a dagger, which ſhe always carried about with her for this purpoſe; and being introduced to Octavianus on his arrival at Alexandria, obtained the only favour ſhe aſked, which was leave to bury Antony. She afterwards made an attempt to captivate and delude Octavianus; but her efforts were ineffectual, for after ſhe had done ſpeaking, he returned her this laconic anſwer, "Woman, be of good cheer; no harm ſhall be done you!" Cleopatra obſerved his coldneſs and indifference, but diſſembled the concern which they occaſioned; and expreſſing her gratitude for the favour he had conferred upon her, ſhe put into his hand an inventory of all her moveables, jewels, and revenues, which ſhe deſigned for his uſe. When Seleucus reproached her for having concealed part of her moſt valuable effects, ſhe flew at him in a violent rage, and gave him ſeveral blows in the face. Then turning to Octavianus, ſhe ſaid, "Is it not very hard, ſince you have condeſcended to viſit me in my preſent condition, that one of my own ſervants ſhould thus inſult me in your preſence? I have, it is true, reſerved ſome jewels, not to adorn my own perſon, but as a preſent intended for your ſiſter Octavia, and wife Livia, that by their interceſſion you may be induced to treat an unfortunate priſoner with more favour and kindneſs." Octavianus, apprehending from this converſation that ſhe had no thoughts of deſtroying herſelf, deſired her to diſpoſe of the jewels ſhe had reſerved according to her own wiſhes, and aſſured her that ſhe ſhould be treated with a greater degree of kindneſs and generoſity than ſhe expected. Cleopatra, however, was not deceived by theſe profeſſions. She had no doubt of Octavianus's intention to make her ſerve as an ornament to his triumph; and ſhe determined to avoid that ignominy by a voluntary death. To prevent it ſhe was conſtantly watched by Epaphroditus; but in hopes of obtaining a fit opportunity for executing her purpoſe, ſhe obtained leave to pay her laſt tribute of reſpect to the tomb of Antony. She bathed it with her tears, covered it with flowers, and with many ſighs and lamentations performed the ceremonies that were cuſtomary among the Egyptians on ſuch occaſions. After her return, a meſſenger was deputed by Cornelius Dolabella, who was the intimate friend of Octavianus, and who, nevertheleſs, being in love with Cleopatra, had promiſed to give her timely notice of his deſigns reſpecting her, in order to inform her, that, within three days, ſhe and her children would be put on board a veſſel that was in the harbour, and conveyed by ſea to Rome. Upon this intimation, ſhe ordered a ſplendid entertainment to be prepared, and having invited ſome of her friends appeared more cheerful than uſual during the feaſt. Riſing ſuddenly from table, ſhe delivered to Epaphroditus a ſealed letter for Octavianus, requeſting that it might be immediately conveyed into his own hands. Having thus contrived to get him out of the way, ſhe withdrew to her apartment, attended by two of her women, and having dreſſed herſelf in her royal robes, ſhe lay down on the bed, and aſked for a baſket of figs, which one of her faithful ſervants had brought her in the diſguiſe of a peaſant. Among the figs was concealed an aſp, the poiſon of which was ſuch that thoſe who were bitten by it fell immediately into a kind of lethargy, and died without any pain or uneaſineſs. (On this ſubject ſee the article ASP.) The purport of her letter to Octavianus was that he would permit her to be buried in the ſame tomb with Antony. Conceiving from this requeſt that ſhe meant to lay violent hands on herſelf, he diſpatched ſome of his friends in haſte to prevent it, if poſſible. Upon their entrance into the apartment of Cleopatra, they found her lying dead on a golden bed in her royal robes; one of her maids likewiſe being dead at her feet, and the other ready to expire. Octavianus, as ſoon as he heard the news, loſt no time in uſing all poſſible means for her recovery; but they were altogether ineffectual. Thus deprived of the chief glory and ornament of his triumph, he, however, granted her laſt requeſt, and commanded that ſhe ſhould be buried with all poſſible pomp in the ſame tomb with Antony.

"Auſa et jacentem viſere regiam
Vultu ſereno fortis, et aſperas
Tractare ſerpentes, ut atrum
Corpore combiberet venenum,
Deliberata morte ferocior:
Sævis liburnis ſcilicet invidens,
Privata deduci ſuperbo
Non humilis mulier triumpho."

Hor. Od. 37. l. 1.

> "Not the dark palace of the realms below
> Can awe the furious purpoſe of her ſoul;
> Calmly ſhe looks from her ſuperior woe,
> That can both death, and fear control;
> Provokes the ſerpent's ſting, his rage diſdains,
> And joys to feel the poiſon in her veins.
> Invidious to the victor's fancy'd pride,
> She will not from her own deſcend,
> Diſgrac'd, a vulgar captive, by his ſide,
> His pompous triumph to attend;
> But fiercely flies to death, and bids her ſorrows end."

Thus died Cleopatra, at 39 years of age, after ſhe had reigned, from the death of her father, 22 years. She was a woman of extraordinary talents, and of boundleſs ambition. She is ſaid to have been well acquainted with Greek and Latin, and to have ſpoken with eaſe and readineſs many other languages, converſing with the Ethiopians, Troglodites, Jews, Arabians, Syrians, Medes, and Perſians, without an interpreter. In the midſt of the career of ambition and licentious pleaſure which ſhe purſued, ſhe retained a taſte for polite literature, and erected in the place where the famous library of Alexandria ſtood, a new one, not inferior to the former; enriching it with the 200,000 volumes of the library of Pergamus, with which Antony had preſented her. With her terminated the family of Ptolemy Lagus, the founder of the Egyptian monarchy, after it had ruled over Egypt, from the death of Alexander, 294 years, or as others affirm, 293 years and three months. From this time Egypt was reduced to a Roman province, and governed by a prætor ſent thither from Rome. Anc. Un. Hiſt. vol. viii. Rollin's Anc. Hiſt. vol. vii.

Cleopatra's *Needles*, in *Ancient Architecture*, are two obeliſks towards the eaſtern part of the palace of Alexandria, in Egypt; they are conſtructed of Thebaic ſtone, and covered with hieroglyphics; one is overturned, broken, and lying under the ſand; the other is on its pedeſtal. Theſe two obeliſks, each of them of a ſingle ſtone, are about 60 feet high, by 7 feet ſquare at the baſe.

CLEOPATRIS, in *Ancient Geography*, a town of Egypt, ſeated on the canal which paſſes from the Nile to the Red Sea. See Arsinoe.

CLEOPHORA, in *Botany*, (from κλεος, *ſplendor*, and φορος, *ferens*, denoting a tree with a ſplendid ſpadix), Gært. 701. (Latania, Juſſ. p. 39. Comerſ. MSS.) Nat. Ord. *Palmæ*.

Gen. Ch. Male and female flowers on different plants. *Male. Calyx common*, ſpathe many-leaved; leaves imbricated; ſpadix branched; branches ſomewhat cylindrical, digitate-cleft at the top; clefts having the form of an Amentum, covered with ſmall imbricated one-flowered ſcales. *Cal. proper* ſix-parted; outer ſegments ſmaller. *Stam.* ſixteen, united at the baſe. Fem. Spatha . . . Spadix. *Calyx* ſix-leaved. *Berry* (or drupe) globular, one-celled, containing three pyrenes or ſtones.

Sp. C. *lontaroides*, Gært. tab. 120. fig. 1. "Leaves palmate-pinnatifid; petiole without prickles." *Berry* obſoletely trigonous, ſmooth; rind coriaceous, thin, brittle, and almoſt cruſtaceous when old; pulp ſucculent, fugacious, drying into membranous ſcoriæ, adhering to the pyrenes or ſtones, without any veſtige of fibres or partitions; oſſicles, or ſtones, three, cruſtaceous, thin, convex and obſoletely ſtriated on one ſide, angular, and ſmoothiſh on the other. *Seeds* one in each oſſicle, ſomewhat elliptical, thick, very finely and irregularly ſtriated, pulverulent, ſomewhat convex on one ſide, obſoletely angular on the other, ending beneath in a ſhort point, marked above a little behind the apex, with a ſmall papilla which covers the embryo. Gært. A native of the Iſle of France.

CLEOSTRATUS, in *Biography*, an ancient mathematician and aſtronomer of Tenedos, who flouriſhed about 533 years B.C. and firſt formed, as it is ſaid, the ſigns of the zodiac, and reformed the Grecian calendar.

CLEPSYDRA, in *Ancient Geography*, a fountain of Peloponneſus, in Meſſenia, placed by Pauſanias and Appian in mount Ithome.

Clepsydra, ſo called from κλεπτω, *ſurripio*, and ὑδωρ, *aqua*, was an horological inſtrument of great antiquity, among the Egyptians and other eaſtern nations, probably before ſun-dials were invented; though the name of the original inventor is not handed down to us; the conſtruction has been varied in different ages and countries, according to the variation of the different modes of reckoning time, but one principle is the baſis of all the forms it has undergone, namely, the conſtant dropping, or running of water through a ſmall aperture, out of one veſſel into another. At firſt the indication of time was effected by marks correſponding to either the diminution of the fluid in the containing veſſel, during the time of emptying, or to the increaſe of the fluid in the receiving veſſel during its time of filling; but it was ſoon found, that the eſcape of the water was much more rapid out of the containing veſſel, when it was full, than when it was nearly empty, owing to the difference of preſſures at different heights of the ſurface; this irregularity in the dropping, preſented an obſtacle which required much ingenuity to correct. In our account of the different conſtructions of clepſydræ, we will claſs them under the two heads of *ancient* and *modern*.

Ancient Clepſydræ.—According to M. Vitruvius Pollio, the firſt improver of the ancient clepſydra, or water-clock, was Cteſibius of Alexandria, the ſon of a barber, who, about 245 years before Chriſt, ſpent much time in deviſing mechanical contrivances for removing not only the obſtacle in queſtion, but alſo another equally formidable one, which aroſe from the daily inequality of the Egyptian hours. As one-twelfth part of the time elapſed from ſun-riſe to ſun-ſetting on any day, was called an hour of that day; and as one-twelfth part of the time that paſſed from ſun-ſetting to ſun-riſe, was called an hour of the night; not only did the hours of day differ from the hours of night, but from one another, at all times, except at the vernal and autumnal equinoxes; hence it became neceſſary, either to make the water fall irregularly into a receiving veſſel, with equidiſtant hour-marks, or to have varying hour-marks for a regular efflux; the firſt of theſe methods (which probably preceded that of Cteſibius) was thus effected, *viz.* 1. A conical hollow veſſel, A, was inverted, or placed like a funnel in a frame C C (*Plate* I. *fig.* 1. of *Horology*) there being a very ſmall aperture at the apex of the cone, and another ſolid cone, B, every way ſimilar as to dimenſions, was plunged into the hollow one, when filled with water to a greater or a ſmaller depth, accordingly as the efflux was wanted to be more or leſs rapid, and then adjuſting marks, correſponding to every day and night in the year, were put on a long ſtem D, inſerted into the broad end of the ſolid cone B, and kept in its poſition by the frame, as repreſented in the figure, to ſhow how much the inner cone was to be depreſſed or elevated, to accelerate or retard the iſſue of the fluid for the correſponding time; H was the ſpout which ſupplied a conſtant influx of water, and I the waſte pipe, connected with the top of the conical veſſel, which carried off the ſuperfluous water; hence the conſtant influx of water preſerved an unvarying height of the ſurface from the aperture, which aperture was varied at pleaſure, by the elevation or depreſſion of the inner cone;

if now we ſuppoſe the ſubjacent veſſel to be a cube, cylinder, or any other regular figure, and equidiſtant hour-marks to be properly made on its ſide, the ſurface of the water, or an index borne by it on a piece of cork, would, as it roſe, indicate the hours correſponding to thoſe marks.

The imperfections of this clepſydra were theſe: 1. It required two daily manual adjuſtments, one in the morning, and the other in the evening; and, 2. It made no allowance for the variation of fluidity, in different degrees of temperature, which, it is aſſerted (but perhaps without proof), greatly influenced the iſochroniſm of the drops. As an improvement, or rather appendage, to this conſtruction of the clepſydra, a bar, E E, with rack-work at the upper end, as ſhewn by the dotted lines, was made to float on the ſurface of the lower veſſel by means of an affixed piece of cork, F, ſo that as the cork and its bar roſe in the veſſel, the teeth of the bar turned a ſmall wheel, G, fixed to the upper part of the frame by a cock, on the arbor of which wheel a hand was put, which revolved and indicated the hours on a fixed dial-plate. This addition, however, did not render the inſtrument a more accurate meaſure of time, but only indicated the hours, ſuch as they were, in an improved manner. It may be worthy of remark here, that water was at once the regulator and the maintaining power of the inſtrument before us; the interval between two ſucceſſive drops was to the clepſydra what one vibration of the pendulum is to a clock, or one oſcillation of the balance is to a watch; and the floating of the indented bar was in place of a weight or ſpring to move the wheel to which the hand was attached; conſequently it might be ſaid to be an horological machine of the ſimpleſt conſtruction poſſible. The adjuſtment of the two cones was regulated by the latitude of the place, owing to the manner in which the hours were divided; at Alexandria, for inſtance, the greateſt and leaſt velocity of the drops were required to be to each other as 70 to 50, the longeſt and ſhorteſt hours in that latitude being reſpectively $1^{h}\ 10^{m}$ and 50^{m} of equable time; and in higher latitudes the diſparity is ſtill greater.

2. The next attempt to improve the clepſydra was by conſtructing it ſo that its aperture was adjuſted, as the year advanced, by the putting of an index to the ſun's place in an ecliptic circle; which attempt, of courſe, rendered the inſtrument more complex. Perrault conceives the parts to have been thus adapted, according to the deſcription given of it by M. Vitruvius Pollio, in his book "De Architecturâ" (cap. ix. lib. ix.).

Fig. 2. of *Plate* I. repreſents an ancient clepſydra with an horary circle and a variable aperture: A is a reſervoir, to the top of which is attached a water-pipe, not ſeen in the drawing, to preſerve an equal preſſure by carrying off the ſuperfluous water; B is a pipe projecting from the reſervoir into the upper part of the drum, M N, on the front of which drum the ecliptic circle is marked; O D L is a ſmaller inner drum, which revolves on a tubed arbor, F, and which is repreſented as drawn out of its place; this ſmall drum has a thorough groove, *a b*, varying in breadth all round it, like a hoop tapering throughout from the broadeſt part both ways to its oppoſite point, and is of ſuch a diameter that the middle of the groove juſt reaches to, and coincides with, a perforation under the tube, B, at the upper part of the great drum, ſo that, as the little drum, which carries the diurnal index, L, and nocturnal index, O, oppoſite to the former, is turned round by hand, the variation in the breadth of the groove occaſions a correſponding variation in the velocity of the efflux of water, by making a larger or ſmaller aperture, accordingly as the ſun's place is more or leſs advanced in the ecliptic, the largeſt aperture being when the diurnal index is at the beginning of Capricorn; a little baſon or funnel attached to the upper part of the fixed tube or hollow arbor, F, (not viſible), receives the water in its fall within the drum, and tranſmits it through the ſaid tube by G into the receiving veſſel, H, in which is floated the piece of cork, I; this floating-piece is connected, by a chain, with the counterpoiſe, K, after it is folded round the arbor, P, which carries the hour-hand of the dial-plate; conſequently, as the water riſes in the veſſel, H, the piece, I, is raiſed, and its counterpoiſe, K, at the ſame time falling gives motion to the arbor and hour-hand, and the hours are longer or ſhorter according to the breadth of the groove which is at any time under the perforation of the tube, B, *i. e.* according to the place in the ecliptic to which the proper index is put.

This clepſydra, like the preceding one, compoſed of two cones, requires two manual adjuſtments, one in the morning and the other in the evening, and makes no allowance for the (ſuppoſed) variation of fluidity occaſioned by the different ſtates of the weather; and the variation in the breadth of the groove or ſlit, it is preſumed, was more plauſible in theory, than feaſible in practice; the contrivance, however, was ingenious, and beſpoke the inventor's acquaintance with aſtronomy.

3. The next improvement in the ancient clepſydra was probably that of Cteſibius, which was an automaton, or ſelf-adjuſting machine, and is repreſented by *fig.* 3, which, according to Perrault and Ferd. Berthoud, exhibits the interior conſtruction of this machine; A is the end of a tube over which an image ſtands, which is connected with a full reſervoir, and from the eyes of which, conſidered as invariable apertures, the water continually flows or drops in a regulated manner into it; this tube conveys the water from M towards B into the top of a long regular veſſel, B C D F, which it gradually fills, and raiſes the cork, D, with its attached light pillar, C D; on the top of this pillar is ſurmounted another image holding an index which points to the diviſions on the large column above. Now, when the water riſes in the veſſel that contains the cork it alſo riſes in the ſmall tube, F B, which conſtitutes one leg of a ſyphon, F B E, that is connected with the bottom of the cubic veſſel; conſequently, when the index has mounted to the uppermoſt diviſion on the large column of hour lines, conſiſting of twice twelve, the water flows over the bent part, B, of the ſyphon, and immediately empties the veſſel into one of the ſix troughs or diviſions of the water-wheel, K, which is thus turned one-ſixth part of a revolution, during which time the image falls with its index to the bottom of the column, to be ready for the next day. This portion of the mechaniſm would have been ſufficient to conſtitute the machine, if the hours had been conſidered as of equal length throughout the year, but the Egyptian mode of dividing and reckoning time made it requiſite that the hour lines ſhould ſlope out of an horizontal direction on the ſurface of the column, ſo as to make variable ſpaces, and alſo that the column ſhould revolve once in a year, to preſent all the variations of ſpace to the index. This annual motion of the column is ſaid to be effected by wheel-work in the following manner:—on the arbor of the water-wheel, K, is fixed the pinion, N, of ſix leaves, which impels the contrate-wheel, I, of 60 teeth in $6 \times \frac{60}{6} = 60$ days, then on the perpendicular arbor of I is another pinion, H, of ten leaves, which drives the wheel, G, of 61 teeth round in $60 \times \frac{61}{10} = 366$ days, and along with it the horary column, into which its arbor is inſerted at L. On the bottom of the column is marked an ecliptic circle; and 12 perpendicular lines drawn lengthwiſe down the column divide

it into the reſpective ſigns, which are ſerviceable for aſcertaining the requiſite ſlope of the hour lines in any month. The writer of this article, however, ſuſpects, that the above train of wheel-work is only what Perrault, the tranſlator of Vitruvius, ſuppoſed to be that of Cteſibius; for, on referring to the original account of Vitruvius, the year in which the column revolved is ſtated to be 365 days, a period which might be effected thus:

Let the water-wheel have only five compartments inſtead of ſix, and let an endleſs-ſcrew be cut on its arbor to impel a wheel of 73 teeth, with a perpendicular arbor, to be inſerted into the column of hours, which will, by ſuch a ſimple conſtruction, revolve in $5 \times \frac{73}{1} = 365$ days, agreeably to the original account.

The clepſydra, in one of its earlier forms, was uſed as an aſtronomical inſtrument, by the help of which the equator was divided into twelve equal parts, before the mathematical diviſion of a circle was underſtood; it was deemed of more value than a ſun-dial, on account of its dividing the hours of the night as well as of the day. It was introduced into Greece by Plato, and into Rome by P. Cornelius Scipio Naſica, about 157 years before Chriſt.

Pliny ſays (lib. xxxvii.) that Pompey brought a valuable one among his ſpoils from the Eaſtern nations; and Cæſar is ſaid to have met with an inſtrument of this kind in England, by the help of which he obſerved that the ſummer nights of this climate are ſhorter than they are in Italy. The uſe which Pompey made of his inſtrument was to limit the ſpeeches of the Roman orators; which Cicero alludes to when he ſays "latrare ad clepſydram."

4. Beſides the ancient clepſydra, above deſcribed, F. Berthoud mentions another (Hiſtoire de la Meſure du Temps, tom. I. p. 20.), which was called the *anaphoric*, on the dial-plate of which were projected the circles of the ſphere, including the parallels of the ſun's altitude, with the ſemi-diurnal and ſemi-nocturnal arcs, to which an adjuſtable bead, as the ſun's repreſentative, pointed as an index to ſhew the hours, parallels, &c. as the dial-plate revolved daily by means of wheel-work, which was impelled by water. It does not ſeem certain at what period this inſtrument was invented and uſed; but Berthoud thinks that tables of the ſun's motion muſt have exiſted previouſly to its invention, and alſo a knowledge of projections of the ſphere on a plane ſurface, whence he fixes the date poſterior to the time of Hipparchus, who, according to Pliny, died about 125 years B.C. The name *anaphoric* is evidently derived from *anaphora*, which was the ſecond houſe in the heavens, according to the doctrine of aſtrology, which prevailed about the time here ſpecified.

In Athenæus, lib. iv. p. 174, we have a hiſtory and deſcription of an ancient inſtrument. He tells us that it was invented in the time of the ſecond Ptolemy Euergetes, by Cteſibius, a native of Alexandria, and by profeſſion a barber: or rather, that it was improved by him, for Plato furniſhed the firſt idea of the hydraulic organ, by inventing a night-clock, which was a clepſydra, or water-clock, that played upon flutes the hours of the night at a time when they could not be ſeen on the index.

The anecdote in Athenæus concerning the mechanical amuſements of the great ideal philoſopher, is curious. What a condeſcenſion in the *divine* Plato to ſtoop to the invention of any thing uſeful! This muſical clock muſt have been wholly played by mechaniſm.

In deſcribing it, Athenæus ſays, it reſembled in appearance a round altar; but was not to be ranked with ſtringed but wind inſtruments, compoſed of pipes; the orifices of which being towards the water, when it was agitated, produced from the pipes, by its fall, a ſoft and pleaſing ſound.

Modern Clepſydræ.—The modern method of dividing the natural day into 24 ſolar hours of equal length, has rendered the preceding conſtructions of the clepſydra uſeleſs for ſome centuries back; and, notwithſtanding the ſcience of hydroſtatics is much better underſtood by the modern than it was by the ancient philoſopher, ſo that a ſcale of altitudes correſponding to the variable velocities of the efflux of a fluid out of a given aperture can be aſcertained by calculation for a containing veſſel of any capacity or figure, yet, ſince the happy inventions of the balance and pendulum, as regulators of watches and clocks, horological machines, actuated by the motion of water, have become ſo rare, as to be conſidered as objects only of curioſity.

Beckmann, in his "Hiſtory of Inventions," vol. i. p. 136. attributes the contrivance and introduction of a water-clock to ſome time between 1643 and 1663, and gives nearly the ſame brief account of one as we meet with in "Bion, on Mathematical Inſtruments," and alſo in "Ozanam's Recreations," edited by Dr. Hutton, the laſt of which authors ſaid, in the year 1693, that the firſt water-clock brought to Paris about that time was from Burgundy. He alſo ſays, that father Timothy, a Barnabite, had given the machine all the excellence it was capable of, by conſtructing it ſo as to make it go a month at one winding up, and to exhibit not only the hours on a dial-plate, but alſo the ſun's place, day of the month, and feſtivals throughout the year.

How theſe and ſimilar particulars might be indicated, will be eaſily apprehended from the following deſcription, which is agreeable to the accounts given of a water-clock of the 17th century by the authors already named.

1. In *fig.* 1, of *Plate* II. of *Horology*, A B C D is an oblong frame of wood, to the upper part of which two cords, A *a* and B *b*, are fixed at their ſuperior extremities, and at their inferior, to the metallic arbor, *a b*, of the drum, E, which contains diſtilled water; this water is confined in cells ſo peculiarly conſtructed, that they regulate the velocity with which the drum ſhall deſcend by the force of gravity from the top to the bottom of the frame, and the ends of the arbor indicate the hours marked on the vertical plane of the frame during the time of deſcent. An obſerver, who knows not the nature of the interior cells of the drum, is ſurpriſed to ſee that its weight does not make it run down rapidly, when mounted to the top of the frame by merely folding the ſtrings round the arbor, there being apparently no mechanical impediment to the natural action of gravity. To explain how this phenomenon is produced, we muſt refer to *fig.* 2, which is a ſection of the drum at right angles to its arbor; this circular plane we will ſuppoſe to be ſix inches, which is about the uſual ſize, in diameter, and to repreſent the inner ſurface of either of the two ends of the drum, which may be made of any of the unoxidable metals; then, if we conceive ſeven metallic partitions, F *f*, G *g*, H *h*, I *i*, K *k*, L *l*, and M *m*, to be cloſely ſoldered to both ends of the drum, in the ſloping direction indicated by the figure, where the black lines are equidiſtant tangents to the ſmall dotted circle of an inch and half diameter at the points *f*, *g*, *h*, &c.; it is evident, that any ſmall quantity of water introduced into the drum would fall into two, or at moſt three, of the lower compartments, and would remain there until ſome external force ſhould alter the poſition of the drum, ſuppoſing in this caſe the cords tied faſt to the arbor; but we have ſaid that they are wound round the circumference of an arbor, that has a ſenſible diameter, ſuppoſe one-eighth of an inch; therefore,

they are removed one-ſixteenth of an inch, or upwards, if we take their thickneſs into the account, from the centre of the drum, which would alſo be its centre of gravity, if it were empty, on which account it would, in that caſe, revolve to the left, in the direction F G H downwards, from the cord being at the remote ſide of the centre, as repreſented by N O; but conceive the water to be included now and then, it would be elevated to the right, till its weight became a counterpoiſe to the gravity of the heavier ſide of ths drum, in which ſituation all motion would ceaſe, and the drum would remain, ſuſpended, indeed, by the cords, but in a ſtate of equilibrio. Conceive again a ſmall hole perforated in the partition preſſed upon by the water near the circumference of the large circle, and alſo at the points F, G, H, I, K, L, M, and the conſequence will be, that the water will firſt force its way ſlowly through the perforation at K, from the more elevated to the lower compartment, which effect will diminiſh its power as a counterpoiſe, and give ſuch an advantage to the heavy ſide, F G H, of the drum, conſidered as empty, as will occaſion a ſmall degree of motion towards the left, and conſequently carry the water once more towards the right; but now the water paſſes through the perforation of the next partition alſo at I, and produces again the ſame effect, as has been deſcribed with reſpect to K, and will continue to do ſo, at the ſucceſſive perforations, till all the compartments have been filled and emptied by means of theſe perforations, in ſucceſſion, which kind of motion of the drum, contrary to that of the water, it is now not difficult to conceive will be pretty regular, if all the partitions are perforated exactly alike. The difference of the preſſures of the water in cells, nearly full and nearly empty, will occaſion ſome little deviation from regularity; but theſe will be periodic, and muſt be allowed for in the hour diviſions, which ought to be made by a compariſon of the ſpaces fallen through, with the time indicated by a clock or watch. About nine ounces of diſtilled water will ſuffice for a clepſydra of ſix inches diameter, and two inches depth, and the velocity of the fall may be limited, either by varying the quantity of water, or by hanging a ſmall metallic cup F, to receive weights, by a cord wound in a direction contrary to the cords of ſuſpenſion, to act as a counterpoiſe in aid of the water, if the fall be too rapid, or *vice verſâ*.

It is abſolutely neceſſary that the arbor ſhould fit the central ſquare hole ſo well as to prevent the eſcape of water from the drum, otherwiſe the inſtrument would continue to gain velocity, till at length it would no longer afford a true indication of time.

Sometimes a cord, *c d*, with a weight, P, is made to paſs round a pulley fixed to an arbor at the top of the frame, with a nooſe paſſing over the axis near *a*, as is ſeen in the ſame figure, which arbor, projecting through a dial-plate or face, turns round and carries a hand to indicate the hours like an ordinary clock; when this conſtruction is preferred, it is an indiſpenſable requiſite that the circumference of the pulley's groove be exactly of the ſame dimenſions as the fall of the drum in 12 or 24 hours, accordingly as the dial is divided.

This clepſydra, it is ſaid, goes faſter in ſummer than in winter, which is owing to the drum being relatively heavier in rarefied than in denſe air; we can hardly ſuppoſe that any alteration in the fluidity of the water, as formerly ſuppoſed, would make any difference. The minute hand and alſo the ſtriking part of a common clock might eaſily be ſuperadded to this clepſydra.

2. Another form, and that a very ſimple one, of the modern clepſydra has derived its origin from that law in hydroſtatics by which the efflux of water out of an orifice is influenced under different preſſures, or which is the ſame thing, at different depths from the ſurface, the velocity being directly as the ſquare root of the height of the ſurface from the aperture. If a glaſs veſſel, like that in *fig.* 3, therefore be taken, out of which all the water will flow in exactly 12 hours, from a ſmall aperture in its lower extremity, the whole height muſt be divided, or ſuppoſed to be divided, into the ſquare of 12 or 144 equal parts, of which parts 11 × 11, or 121 meaſured from the bottom, or 23 meaſured from the top, will give the diviſion for the hour 11, 10 × 10 or 100 from the bottom will give the line for 10, 81 for 9, 64 for 8, and ſo on down to the bottom, as repreſented in the figure; which ſcale is in the inverted proportion of that according to which heavy bodies fall in free ſpace by the ſole force of gravity.

If, inſtead of the veſſel itſelf being divided by hour-lines as above directed, the ſtem of a floating piece like an hydrometer were to have a ſimilar ſcale kept in a perpendicular direction, by paſſing through the central hole of a cap or cover of the veſſel, the indication of time would be made on the ſtem at the ſurface of the cap, which conſtruction would admit of the veſſel being of wood or metal.

3. But ſuch a figure might be given to the containing veſſel as would require the dividing marks to be equi-diſtant, which Dr. Hutton, in his recent edition of "Ozanam's Recreations," has aſſerted to be a paraboloid, or veſſel, formed by the circumvolution of a parabola of the fourth degree, the method of deſcribing which, he has given thus:

Let A B S, *Plate* II. *fig.* 4, be a common parabola, the axis of which is P S, and the ſummit S. Draw, in any manner, the line, R *v* T, parallel to that axis, and then draw any ordinate of the parabola A P, interſecting R T in R; make P Q a mean proportional between P R and PA, and let *p q* be a mean proportional alſo between *p r* and *p a*; and ſo on. The curve paſſing through all the points Q *q*, &c. will be the one required, which, being made the mould for a veſſel to be caſt by, will produce an inſtrument, which, when perforated at the apex, will have the ſingular property of equalizing the ſcale, ſo as to correſpond to equal times while the water is running out. Mr. Varignon has given a geometrical and general method of determining the ſcale for a clepſydra, whatever may be the ſhape and magnitude of the veſſel. (See "Memoires de l'Academié Royale des Sciences," p. 78, 1699.)

4. Another method of making a water-clock with equi-diſtant hour lines in any regular veſſel, is effected more ſimply than in the preceding one, by means of the ſyphon fixed faſt in the centre of a broad piece of cork, which is floated in any regular veſſel, as the cylindrical one at *fig.* 5, for as the power of a ſyphon to empty any veſſel filled with water depends upon the difference of atmoſpheric preſſures at the ſurface of the water and at the orifice of the longer leg, it is clear that while the ſhorter leg ſinks with the ſurface of the water in the veſſel during its time of emptying, the relative preſſures, depending on the diſtance from the ſurface of the water to the orifice of the lower leg, will continue unaltered in any ſtate of the atmoſphere; hence equal portions of water will be diſcharged in equal times; and a light cock cemented on the lower orifice would afford a means of adjuſting its aperture to the ſize of any veſſel that may be fixed upon; or otherwiſe a ſecond receiving veſſel may be divided into equal ſpaces for the hours, which would in this caſe be indicated by the ſurface of the riſing water.

Beſides the preceding methods of meaſuring time by means of water, there are others nearly ſimilar, ſuch as the double jet d'eau, which, like the ſand-glaſs that may be claſſed with theſe, requires to be inverted as ſoon as empty, and it is eaſy to conceive a variety of ways of applying any liquid to anſwer the purpoſe of meaſuring pretty nearly a given number of hours, but we do not learn that the moſt accurate of the clepſydra is comparable to an ordinary clock, though it has been aſſerted, that Amontons conſtructed one in ſo accurate a manner, that he hoped to find it uſeful in aſcertaining the longitude at ſea by means of its accuracy; we regret that it is not in our power at preſent to procure the pamphlet in which the account of it was publiſhed. "Remarques & Experiences Phyſiques ſur la Conſtruction d'une nouvelle Clepſydre," &c. Paris. Jombert. 1695.

5. We ſhall conclude our account of theſe horological inſtruments with detailing the conſtruction and action of a clepſydra, publiſhed in the 44th volume of the Philoſophical Tranſactions by the Hon. Mr. Charles Hamilton.

A B and C D are two ſimilar oblong veſſels attached to a frame of wood, which may eaſily be conceived to ſurround figure 6, which ſhews only the interior mechaniſm; *a b* and *c d* are two columns of wood ſo floating in water, that their counterpoiſes, F and G, juſt keep their ſuperior ends equal with the ſurface of the water by means of connecting chains paſſing over the pulley *f*, and another hid by the dial plate; the former of theſe pullies, *f*, has a click which puſhes the ratchet on the barrel, *i*, when the counterpoiſe, F, falls, but ſlips eaſily over the ſlopes of the teeth when the ſaid counterpoiſe riſes; the latter pulley has alſo a ſimilar click acting in like manner, with a ſecond ratchet at the oppoſite end of the barrel, *i*, which ratchet is alſo hid in the drawing, ſo that whichever of the two counterpoiſes ſhall at any time be falling, the barrel, *i*, will move forwards in the ſame direction; and carry the minute hand along with it on the dial-plate; the hour hand goes round by means of dial-work, as in an ordinary clock or watch, where a diminution of velocity is effected by two wheels and two pinions. The action is thus produced by means of five ſyphons and two balances.

The water enters with an unvaried influx, drawn from a reſervoir, by a ſyphon of ſmall bore, the longer leg of which is ſeen at J, into the middle of what may be called a horizontal trough, ſupported like a balance by a fulcrum at K, in ſuch a manner, that either end of the balance may be elevated accordingly as the long veſſels A B and C D require to be alternately filled; near the top of each of theſe veſſels is inſerted a long ſyphon or tantalus, *l* and *m*, the lower legs of which reach down to two ſmall cylindrical veſſels, *n* and *o*, which are poiſed by another balance at the fulcrum *p*; theſe cylindrical veſſels have, in like manner, each a ſmall ſyphon, *q* and *r*; laſtly, a ſilken thread tied to the upper end of the cylinder, *n*, is carried up round a ſmall pulley faſt to the frame at *s*, and is faſtened to the end of the trough under it, and a ſimilar thread is faſtened in like manner to the cylinder *o*, and end of the trough under the ſmall pulley *t*. Now it is eaſy to conceive, that when the veſſel, A B, is filled to nearly the head of the tantalus *l*, the bore of which is larger than of the feeding ſyphon J, the water will be diſcharged into the cylindrical vaſe *n*, which conſequently will preponderate, and by means of the ſilken chord elevate the end of the trough higher than the horizontal line, and make its oppoſite end under the ſmall pulley, *t*, to be depreſſed, which will therefore conduct the water into the other long veſſel C D; during this action the counterpoiſe, F, riſes, and its pulley, *f*, produces no effect on the ratchet by reaſon of the click, *h*, ſliding over the ſloping ſides of its teeth, but the counterpoiſe, G, falls, and the click of its pulley (not ſeen) puſhes the ſecond ratchet forwards in the direction of the figures of the face I. II. III. &c.

When C D is nearly full, the long ſyphon, *m*, begins to diſcharge its water; makes the cylindrical vaſe, *o*, preponderate, and again elevates by means of its ſilken ſtring the end of the trough under the ſmall pulley *t*, and depreſſes the oppoſite end to fill the veſſel, A B, again, during which time the click, *h*, of the pulley, *f*, acts with its ratchet; and thus the alternate increaſe and decreaſe of the water in the two veſſels are continued without interruption, ſo long as the feeding ſyphon continues to ſupply a ſufficient quantity of pure water. We think, however, that the mechaniſm is nearly as complex as that of a clock itſelf, and conſequently ſhould prefer a water-clock, ſuch as that made by Perrault in the year 1699, where a pendulum is uſed as the regulator, and water only as the firſt mover. For the account, ſee "Machines Approuvées," tome i. p. 39.

The ſame Perrault alſo made a water-clock with a balance and ſtriking part, an account of which is given in the volume of "Machines Approuvées," which we have juſt referred to; and in the ſeventh volume of the ſame work, is a deſcription of a regulator going by water, invented by Peronnier, and improved by Le Roy, the ſon, in 1746. (See page 335.)

CLEPSYDRA is alſo uſed for an hour-glaſs of ſand.

CLEPSYDRA is alſo applied to a chemical veſſel perforated in the ſame manner.

CLERAC, in *Geography*. See CLAIRAC.

CLERC, JOHN LE, in *Biography*, an eminent ſcholar and critic, was born at Geneva in the month of March 1657. He was placed at a grammar ſchool when only eight years old, and ſoon diſtinguiſhed himſelf by his abilities and by his cloſe application to his ſtudies; he attracted particular notice by the ſtrength of his memory, and his great facility in Latin poetical compoſition. His talent for poetry he did not however cultivate much beyond the compoſition of ſchool exerciſes. He devoted while young a very large ſhare of attention to the principal writers of Greece and Rome, which he read with much care and critical obſervation. When ſixteen years old he ſtudied philoſophy, natural and moral, under Chouet, who was profeſſor of philoſophy at Geneva, and taught the ſyſtem of Des Cartes. After remaining under the tuition of this maſter for two years he devoted a year to the ſtudy of the Hebrew language, under the inſtruction of the reverend James Gallatin, his maternal uncle. His fondneſs for books kept pace with his improving capacity for reading them with advantage; and he ſeldom ſuffered any to eſcape peruſal that promiſed to repay his time and labour. His diligence and aſſiduity in this particular, at this period, prepared the way for that laborious application and various and extenſive reading which afterwards ſo remarkably diſtinguiſhed him in the annals of literature. At the age of nineteen he entered on a courſe of theological ſtudies, which he continued for two years, under Meſtrezat, Turretin, and Tronchin. He read much on the controverſies then agitated in that part of Europe, and carefully ſtudied the ſcriptures in the original languages, with the aſſiſtance of the beſt commentators then extant, among whom Grotius held a pre-eminent rank. Having loſt his father in 1676 he became deſirous of viſiting France, and accordingly in 1678 he went to Grenoble and there undertook the education of a ſon of M. Saraſin de la Pierre. Here he became acquainted with father Lamy the learned author of the "Apparatus Rituus," and other works of erudition, who was prieſt of the oratory. By the end of the year he returned to Geneva, where he was ordained, after having paſſed the cuſtomary examinations with great applauſe. Not having attached himſelf to any church, he availed himſelf of his liberty to reviſit Grenoble, and thence in 1680 went to Saumur. The works of Curcellæus having been read by him during his firſt reſidence at Grenoble, he now availed himſelf of an opportunity to peruſe attentively the writings of Epiſcopius, which confirmed him in a theological ſyſtem very different from that impoſed upon the belief of candidates for the miniſtry in his native country. He here read alſo the Old Teſtament in the Polyglot Bible, making copious notes as he proceeded, which laid the foundation of the biblical annotations which he afterwards proſecuted with ſo much ſucceſs. The change in his ſentiments having determined him to quit Geneva altogether, he returned in the autumn of 1681 from Saumur to Grenoble; the following year viſited Paris, and thence proceeded to London, where he arrived in the ſpring of 1682. One object he had in view in viſiting England was to acquire a ſufficient knowledge of the language to introduce him to an acquaintance with the literature of the country, which, with his uſual facility, he ſoon accompliſhed During his reſidence in London he preached frequently at the Walloon church, in French, and for ſix months regularly ſerved the Savoy on Sundays. As the climate of England diſagreed with his conſtitution, he paſſed over to Holland in 1683 with the celebrated apoſtate Italian monk Gregorio Leti, whoſe daughter he afterwards married. He took an early opportunity to pay his reſpects to Limborch at Amſterdam, who gave him the information he ſought reſpecting the principles and the condition of the Remonſtrants, with whom he was greatly diſpoſed to unite. Overcome by the importunities of his family he once more viſited Geneva, but on account of his religious opinions, and the freedom with which he avowed and defended them, he returned again in the courſe of the ſame year. He now reſolved to make Holland his permanent reſidence, and aſſociated with the Remonſtrants, occaſionally officiating at their churches; but his popularity exciting the jealouſy of ſome of the Walloon miniſters, they procured an order from the magiſtrates to forbid him any more to preach. In the following year, however, 1684, he preached before a ſynod of the Remonſtrants at Rotterdam, and was by them appointed profeſſor of Hebrew, Belles Lettres, and Philoſophy to their college at Amſterdam, a ſituation which he continued to fill until incapacitated for the diſcharge of its arduous duties by the malady which led to his diſſolution. In 1691 he married the daughter of Gregorio Leti, as noticed above, by whom he had four children, who all died in infancy. The ſubſequent years of his life exhibit a wonderful picture of laborious application and unabating induſtry, devoted to literary purſuits, which is abundantly exemplified in the number of his publications, and the depth and variety of erudition diſplayed in them. We ſhall ſubjoin a brief account of ſuch of them as are moſt entitled to notice. His firſt publication appeared anonymouſly at Saumur in 1679, under the title of "Liberii de Sancto Amore Epiſtolæ Theologicæ," in which he advocated the cauſe of religious toleration and freedom of inquiry, and maintained ſome opinions reſpecting the doctrine of the Trinity, and other articles of faith, which muſt have been deemed highly heretical by the majority of divines in that age. In 1685 he publiſhed his "Sentimens de quelques Theologiens de Hollande ſur l'Hiſtoire critique du Vieux Teſtament, compoſée par M. Rich. Simon." In this work Le Clerc delivers ſome very free thoughts reſpecting the ſcriptures, avowing his opinion that the Pentateuch was not written by Moſes, but compiled from a variety of more ancient writings, and combating the commonly received notion of the inſpiration of the ſacred writers as unfounded and erroneous. The freedom of his remarks having excited much prejudice againſt him, and given riſe to miſrepreſentation, he publiſhed a defence of it in 1686, in which he explains himſelf and ſtates his ſentiments in the moſt clear and explicit language. This year formed a remarkable æra in his life by the commencement of his "Bibliothéques," a ſeries of papers compriſing critical analyſes and reviews of the moſt remarkable publications of the time, interſperſed with a variety of original eſſays and diſquiſitions on ſuch topics as excited the chief attention of literary men. The firſt which appeared was the "Bibliothéque Univerſelle et Hiſtorique." It was continued to the year 1693, and completed in 26 ſmall volumes cloſely printed. In this work Le Clerc was conſiderably indebted to the labours of M. de la Croſe, and M. Bernard, who ſupplied him with a conſiderable proportion of the papers. "Le Bibliothéque Choiſie" followed in 1703, and was publiſhed at intervals until the year 1713, when it was concluded in 28 volumes, correſponding in ſize to the former work. To this ſucceeded "Bibliothéque Ancienne et Moderne," which was publiſhed from 1714 to 1727 in 29 ſimilar volumes. Theſe works contain a great maſs of very valuable materials, of critical diſquiſitions and bibliographical notices and memoirs, and well deſerve a place in the library of every literary man. The public are indebted to them for the documents from which Dr. Jortin principally compoſed his life of Eraſmus. In 1690 Le Clerc publiſhed a letter to Mr. Jurieu on his treatment of Epiſcopius in his "Picture of Socinianiſm," which is a ſpecies of apology for that learned divine. Two years afterwards he publiſhed his "Logica, ſeu Ars Ratiocinandi" and his "Ontologia et Pneumatologia"; to theſe he added in 1695 his "Natural Philoſophy," when he publiſhed them in an uniform edition in four volumes octavo under the general title of "Opera Philoſophica." This publication has been well received, and gone through five editions. In 1693 appeared his verſion of the book of Geneſis with critical notes, which was followed in 1696 by the other books of the Pentateuch. Theſe were afterwards enlarged by additional notes, and in the year 1735 reached a fourth edition in folio. His "Ars Critica," firſt appeared in 1697, in 3 volumes 12mo. and was reprinted in the ſame form in 1712, and 1730. This is a moſt uſeful and valuable publication to all who wiſh to ſtudy ancient writings with critical accuracy and profit. He publiſhed in 1695, and again in 1714 "La Vie de Cardinal du Richelieu;" and in 1696 an excellent work in octavo under the title of "Traité de l'Incredulité," deſigned chiefly to expoſe the folly of infidelity; it was reprinted in 1714. In 1698 he printed a compendium of Univerſal Hiſtory in Latin, in one volume octavo; the ſame year produced his valuable tranſlation into Latin of the New Teſtament, with Hammond's Annotations, in two volumes in folio. He enriched his edition with a great number of additional critical and explanatory notes. "Parrhaſiana," ou Penſées diverſes ſur de Matieres de Critique, d'Hiſtoire, de Morale, et de Politique," appeared anonymouſly in one volume in 1699, and again in two volumes in 1702. Although interſperſed with many good remarks, this has been regarded as a very haſty and incorrect performance. In 1699 he publiſhed alſo his "Harmonia Evangelica," in Greek and Latin, with ſeveral notes and diſſertations, which drew upon him the charge of favouring the opinions of Socinus. This was followed in 1703 by a tranſlation of the New Teſtament into French, in two volumes 4to. with notes, which again expoſed him to the attacks of the Catholic and Calviniſtic clergy. In 1708 he proceeded with his Latin verſion of the Old Teſtament, and printed the Hiſtorical Books from Joſhua to Eſther. "Hiſtoria Literaria II. primorum a Chriſto ſæculorum," publiſhed in 4to. 1716, and "Hiſtoire de Provinces Unies des Pays Bas," in three volumes in folio, from 1560 to 1728, the firſt volume of which appeared in 1723, and the others in 1728, are the laſt we ſhall mention of the original works of Le Clerc. But beſides his own writings, he publiſhed ſeveral other works in the capacity of editor, many of them of conſiderable ſize and extent. Among the principal of them may be mentioned Cotelerius's “Patres Apoſtolici,” two volumes folio; an edition of Moreri's Dictionary, in four volumes folio; the works of Eraſmus in 10 volumes folio, 1707; “Grotius de Veritate Relig. Chriſti,” which he accompanied with ſome valuable notes; the fragments of Menander and Philemon, which had to ſubmit to the formidable ordeal of Bentley; “Livii Hiſt.” in 10 volumes, in octavo, 1710; and “Æſchinis Dial. III.” Gr. & Latin, 8vo. 1711. This catalogue might eaſily be ſwelled out to greater length; we ſhall, however, cloſe it here. The liſt we have given will be read with aſtoniſhment, as preſenting ſuch an example of literary induſtry as occurs hardly once in an age. Le Clerc continued this laborious courſe of writing, connected alſo with regular attention to the duties of his office as a tutor, until the year 1728, when a paralytic attack ſuſpended his purſuits, by materially impairing his intellectual powers. In 1732 a ſecond attack deprived him of ſpeech and reduced him to a ſtate little better than idiocy, in which he continued to the time of his death, which took place in 1736, in the 79th year of his age. Moreri. Gen. Dict. Gen. Biog.

Clerc, Gabriel, Le, phyſician in ordinary to Lewis XIV. and author of ſeveral eſteemed medical works, publiſhed in 1684, in 12mo., “L'Ecole du Chirurgien;” and, in 1694, “La Chirurgie complette,” which was dedicated to M. Fagon. This has been many times reprinted, and is an excellent manual of the art. It contains, in the opinion of Boerhaave and Haller, the completeſt and moſt correct anatomy of the bones that had at that time been publiſhed. He alſo publiſhed, in 1700, “Appareil commode de jeunes Chirurgiens, Paris, avec Figures,” 12mo.; and the following year, “Catalogue des Drogues,” alſo 12mo. “La Medicine aiſee, contenant pluſieurs Remedes faciles et experimentes pour toutes Sortes de Maladies,” 2 vols. 12mo. This has alſo been ſeveral times reprinted. Boerhaave Meth. Studii. Haller Bib. Med.

Clerc, Nicholas, phyſician to the duke of Orleans, which poſt he quitted, on being invited to take the place of inſpector of the hoſpital at Moſcow, where he reſided ſeveral years, and was in great eſtimation. In 1754 he was elected member of the Imperial Academy at Peterſburg, and about the ſame time honorary member of the Academy of Belles Lettres and Arts at Rouen. His works are “Medicus veri Amator ad Apollineæ Artis Alumnos,” Moſchæ, 1764, 8vo.; containing a valuable collection of obſervations on epidemical diſeaſes, particularly on the epidemic that raged in the greater part of the Ruſſian empire in the year 1760. “Eſſai ſur les Maladies contagieuſes du Betail, avec les moyens de les prevenir, et d'y remedier efficacement,” Paris, 1766, 12mo. The only efficacious remedy was found to be ſeparating and killing ſuch animals as were perceived to have taken the infection. “Hiſtoire Naturelle de l'Homme conſideré dans l'Etat de Maladie, ou la Medicine rapellée a ſa premiere Simplicité,” Paris, 1767. His next and laſt work, on contagion, was printed, in 1771, at Peterſburg, ſoon after which he quitted Ruſſia, and retired to Beſançon, where he continued to the time of his death, which happened two or three years after. Eloy. Dict. Hiſt.

Clerc, John Le, a painter and engraver who was born at Nancy, in Lorraine, in 1587; he ſtudied, however, many years in Italy, under the tuition of Carlo Saraceno; and imitated the ſtyle of his maſter with wonderful addreſs.

He made ſeveral excellent etchings from the pictures of Saraceno, and other maſters; and died at the place of his nativity in the year 1633. Felibien. Strutt. Pilkington.

Clerc, Sebastien Le, an artiſt of very conſiderable reputation and ability; well known by the prodigious number of prints (chiefly of ſmall figures), which he etched from his own deſigns. He was born at Metz, in Lorraine, in the year 1637, and was probably of the ſame family with John Le Clerc; it is ſaid that he learned the firſt principles of drawing from his father. His firſt prints were executed entirely with the graver; the earlieſt, a head of Chriſt, is dated 1655. Upon his arrival at Paris, he was much encouraged by Le Brun, and ſometime afterwards obtained a penſion from the king, and an apartment in the Gobelins; in addition to which he received the honour of knigthood from pope Clement XI. He was a member of the Academy of Painters at Paris, and there died, at the age of 77, in the year 1714.

Le Clerc had great fertility of invention, and deſigned all kinds of ſubjects, whether of hiſtory, landſcape, or animals, with equal ſpirit and facility. His manner of etching is neat and at the ſame time free, and often bears great reſemblance to the ſtyle of Callot. The number of the plates which he executed is ſaid to exceed three thouſand. Charles Ant. de Jombert has publiſhed a catalogue of them, together with his life. Strutt. Heinecken.

Clerc, Sebastien Le, ſon of of the preceding artiſt, was born in the year 1677. He ſtudied hiſtorical painting under Bon Boulogne, and became a painter of ſome note, if we can judge from the number of prints engraved from his works. There is an altar picture by him at the abbey-church at Paris, repreſenting the death of Ananias. He was made a member of the Royal Academy of Paris, in 1704, and died, aged 86, in the year 1763.

Heinecken, in his Dictionary, mentions ſeveral other inferior artiſts of the name of Le Clerc. Heinecken. M. Papillon de la Ferté.

CLERCK, Charles, a learned man, and member of the Academy of Sciences, at Upſal, who publiſhed “Icones Inſectorum variorum, &c.” Holmiae, 1750, Gr. in 4to. with 55 plates. Not having been able to find a perſon who could colour theſe inſects to his ſatisfaction, he determined to undertake the laborious taſk himſelf; but he had ſcarcely coloured ten copies of his work when he died. Heinecken.

CLE'RES, in *Geography*, a town of France, in the department of the Lower Seine, and chief place of a canton, in the diſtrict of Rouen. The place contains 455, and the canton 11,123 inhabitants: the territory includes 167½ kiliometres and 33 communes.

CLEREVAUX, a town of France, in the department of the Aveiron, and diſtrict of Rhodez, or Rodés, 8 miles N.W. of it.

CLERFF. See Clervaux.

CLERGOUX, a town of France, in the department of the Correze, and diſtrict of Tulles, 6 miles N.E. of it.

CLERGY, Clerus, the aſſembly or body of clerks, or eccleſiaſtics; in contradiſtinction to the laity. This diſtinction of the whole Chriſtian commonwealth into clergy and laity, which gradually became univerſal, took its riſe among thoſe paſtors, who, at an early period, took care to improve the reſpect of the lower ranks, by widening the diſtance between their own order and the condition of their Chriſtian brethren. Although it had been unknown among the Greeks and Romans, it was familiar to many nations of antiquity;

and the prieſts of India, of Perſia, of Aſſyria, of Judæa, of Ethiopia, of Egypt, and of Gaul, derived, or profeſſed to derive from a celeſtial origin, the temporal power and poſſeſſions which they had acquired. In the Chriſtian world it originated from the circumſtance above mentioned, and ſeems to have kept pace with the progreſs of eccleſiaſtical authority. Some have thought that they can diſcover traces of this diſtinction in a very early age of the Chriſtian church, and that it is ſanctioned by the authority of ſcripture. Others conceive that it had its riſe at a later period, when the deſire of ſpiritual and ſecular pre-eminence and correſponding dominion had perverted the minds of the profeſſors and teachers of Chriſtianity, and when the intereſt of the church was interwoven with that of the ſtate. The terms expreſſing this diſtinction, are derived from two Greek words, *κληρος*, lot or inheritance, and *λαος*, people: and this diſtinction of *clerus* and *laicus*, it is ſaid, was eſtabliſhed before the time of Tertullian, towards the cloſe of the ſecond century. The diſtinction itſelf was intended, as ſome have ſaid, to ſuggeſt, that the former, that is, the paſtors or clergy, for they appropriated the term *κληρος* to themſelves, were ſelected and contradiſtinguiſhed from the multitude, as being, in the preſent world, by way of eminence, God's "peculium", or ſpecial inheritance. In ſupport of this claim they allege, that God is, in the Old Teſtament, ſaid to be the inheritance of the Levites, becauſe a determinate ſhare of the ſacrifices and offerings made to God, was in part to ſerve them inſtead of an eſtate in land, ſuch as was given to each of the other tribes. But it has been argued, on the other hand, that the tribe of Levi is no where called God's inheritance, though that expreſſion is repeatedly uſed, with reſpect to the whole nation. Concerning the whole nation of Iſrael, Moſes, who was himſelf a Levite, ſays, in an addreſs to God, (Deut. ix. 29.) "They are thy people, and thine inheritance, which thou broughteſt out by thy mighty power." The words in the Septuagint, deſerve our particular attention. *Οὑτοι λαος σȣ καὶ κληρος σȣ ὃς εξηγαγες εκ γης. Αιγυπτȣ εν τη ισχυι σȣ τη μεγαλη.* The ſame perſons are, in the ſame ſentence, declared to be both the *λαος* and the *κληρος*. What, ſays the canoniſt, at once laymen and clergy? That is certainly abſurd; the characters are incompatible; yet it did not then appear ſo to Moſes. Nor would it be thought reaſonable or juſt, that what was allowed to be the privilege and the glory of every Iſraelite, under the more ſervile eſtabliſhment of Moſes, ſhould, under the more liberal diſpenſation of the goſpel, be diſclaimed by all thoſe diſciples of Jeſus, who have not been admitted into the ſacred order, which they, for this reaſon, have called clerical. As to the uſe of the term in the New Teſtament, one paſſage, as the perſons to whom we now refer argue, and only one, occurs, in which it is applied to perſons. (See 1 Peter, v. 3.) The words in the original are, *μηδ᾽ ὡς κυριευοντες των κληρων, αλλα τυποι γενομενοι τȣ ποιμνιȣ;* thus rendered in our verſion, "Neither as being lords over God's heritage, but being enſamples to the flock." They are part of a charge given to the preſbyters, or paſtors, relating to their care of the people committed to them, who are called God's flock, which they are commanded to feed, of which they are to take the overſight, not the maſtery, and to which they are to ſerve as patterns. The ſame perſons, therefore, who both in this and in the preceding verſe, are ſtyled *ποιμνιον*, the flock, under the direction of God's miniſters, the ſhepherds, are alſo called *κληροι*, his inheritance, over whom their paſtors are commanded not to domineer. The diſtinction above-mentioned, it is ſaid, ſtands in direct contradiction both to the letter and to the ſenſe of the unerring ſtandard of ſcripture. Some expoſitors, however, render the term *κληροι*, in this paſſage, the church's poſſeſſions; but this explication, as others ſay, ill ſuit the context, and annihilates the contraſt between an imperious manner and an engaging pattern, and ſuppoſes an awkward ellipſis in the words themſelves. Beſides, it is aſked, what were the church's poſſeſſions in thoſe days? Was ſhe ſo early veſted with lands and hereditaments, for it is to ſuch only that the term *κληρος*, when denoting property or poſſeſſion, is applied? Or, have thoſe interpreters been dreaming of the truly golden age of pope Gregory VII., when the patrimonies of ſome metropolitical and patriarchal ſees were indeed like dukedoms and principalities, and the grand hierarch himſelf could diſpoſe of kingdoms and empires? In the apoſtolic times, on the contrary, the church's patrimony conſiſted moſtly, as we may ſay, in perſecution and calumny, hatred and deriſion, agreeably to the prediction of our Lord. Some have aſcribed the origin of the diſtinction we are now conſidering, to Clemens Romanus, who, in his epiſtle to the Corinthians, contradiſtinguiſhes *λαικοι* (the laics), among the Jews, from the high-prieſt, the prieſts, and the Levites. This, however, is introduced by him when ſpeaking of the Jewiſh prieſthood, and not of the Chriſtian miniſtry; nor does it ſtand in oppoſition to any one general term, ſuch as *κληρος*, or *κληρικοι*; but after mentioning theſe different orders, he uſes the term *λαικοι*, to include, under one comprehenſive name, all that were not ſpecially compriſed under any of the former; and, in this reſpect, it exactly correſponds to the application ſometimes made of the Latin word "popularis." Accordingly it may, with equal propriety, be contraſted with men in office of any kind whatever. Thus, in ſpeaking of civil government, it may be oppoſed to *αρχοντες*, to denote the people as diſtinguiſhed from the magiſtrates; or, in ſpeaking of an army, to *στρατηγοι*, to denote the ſoldiers as diſtinguiſhed from the commanders or officers. It is further added, that the way in which Clement employs the term does not imply, that he conſidered it as in itſelf excluſive of the prieſthood and Levitical tribe, to which the term *λαικοι* is oppoſed in that paſſage. They are here indeed excluded, becauſe ſeparately named, but not from the import of the word. Thus in Acts xv. 32, three orders are plainly mentioned and diſtinguiſhed, apoſtles or extraordinary miniſters, elders or fixed paſtors, and the church or chriſtian people. Does this mode of expreſſion imply, that the name church does not properly comprehend the paſtors as well as the people. The import of the expreſſion ſeems to be no more than this. "The apoſtles and elders, with all the Chriſtian brethren, who come not under either of theſe denominations." Thus alſo, in the paſſage cited from the epiſtle of Peter, where the *πρεσβυτεροι* are oppoſed to the *κληροι*, not as though the former conſtituted no part of God's heritage, or in modern phraſe, the clergy; they only do not conſtitute that part, of which they are here commanded to take the charge. In like manner Clement's mention of *λαικοι*, after ſpeaking of the ſeveral orders of the Jewiſh prieſthood, imports neither more nor leſs than if he had ſaid, "And all the Jewiſh people."

The diſtinction of the whole church into clergy and laity, whenſoever it originated, was extended much farther than the original intention of thoſe who adopted it. In the time of Cyprian, about the middle of the third century, we find, that, in general, all things relating to the government and policy of the church were performed by the joint conſent and adminiſtration of the clergy and laity. Thus Cyprian ſays (Epiſt. 6. § 5. cited by the author of the Enquiry into the Conſtitution, &c. of the Primitive Church, p. 106.), "he did nothing without the knowledge and conſent of his people."

people." Again (Epiſt. 55. § 21.), "when any letters came from foreign churches, they were received and read before the whole church, and (Epiſt. 58. § 2.) the whole church agreed upon common letters to be ſent to other churches." In later ages, after the church had been in ſome degree incorporated with the ſtate, or an alliance had been formed between them, with a view to their mutual advantage and ſupport, the diſtinction of clergy and laity became an object of much greater importance; and it has been ſaid, that the former availed themſelves of it, without always conſulting the benefit of the latter. Inſtances to this purpoſe might eaſily be adduced from the church of Rome, in the period of its full ſplendour and power. The laity were not always treated with due attention and reſpect by thoſe of the other denomination. The ſchoolmen, and they belonged to the clerical body, thought it was doing the laymen too much honour to derive the name from λαος, *populus*. It ſuited their notions better to deduce it from λαας, *lapis*, *a ſtone*. The following ſpecimen of the mode of reaſoning adopted by ſome celebrated doctors, and cited by Altensfaig in his "Lexicon Theologicum," may poſſibly amuſe ſome of our readers. "Capitur clericus pro viro docto, ſcientifico, perito, ſcientia pleno, repleto et experto. E contra, laicus capitur pro viro indocto, imperito, inſipiente, et lapideo. Unde laicus dicetur a λααs; Græcè, quod eſt lapis Latinè. Et ſic omnis clericus, in quantum clericus, eſt laudabilis; laicus vero, in quantum laicus, eſt vituperandus. Clerici quoque a toto genere de jure proponuntur, et debent præponi laicis." Cardinal Bona alſo delivers his ſentiments in relation to the care that ought to be taken by the clergy, that laymen may not be allowed to do themſelves harm by ſtudying the profounder parts of ſcripture, which their ſtupidity is utterly incapable of comprehending: and though he does not abſolutely prohibit their reading ſome of the plainer books of ſcripture, he indulges them more freely in the uſe of books containing the hiſtories, lives, and legends of the ſaints, and holy meditations. See on this ſubject Campbell's Eccleſiaſtical Hiſtory, vol. i.

In more modern times, and more eſpecially in countries where the reformation has contributed to enlighten the minds and to meliorate the diſpoſitions both of the clergy and the laity, the diſtinction that ſtill ſubſiſts, for the convenient arrangement and diſtribution of the people, is not likely to produce any of the diſadvantages that reſulted from it in the darker ages.

The clergy in the firſt century were diſtinguiſhed by the title of preſbyters or biſhops; and ſome maintain that they are of equal rank and authority. But towards the cloſe of the ſecond century, a notion prevailing, that the miniſters of the Chriſtian church ſucceeded to the character, rights, and privileges of the Jewiſh prieſthood, this produced a ſubordination of rank among them. The biſhops aſſumed a rank and character ſimilar to thoſe of the Jewiſh high-prieſt, the preſbyters repreſented the prieſts, and the deacons the Levites. This diſtinction was ſtill farther promoted towards the end of the third century, and a new ſet of eccleſiaſtical officers was eſtabliſhed, ſuch as ſub-deacons, acolythi, door-keepers, readers, exorciſts, &c. The powers of the clergy were conſiderably extended under the patronage of Conſtantine the Great, about the cloſe of the fourth century.

The clergy were anciently divided into three orders; *viz.* prieſts, deacons, and inferior clerks; and each order had its chief: the arch-prieſt was the head of the firſt order, the arch-deacon of the ſecond, and the dean of the third.

Under the name of clergy, were alſo formerly compriſed all the officers of juſtice; as being ſuppoſed to be men of letters.

In the Romiſh church there are two kinds of clergy; the one *regular*, comprehending all the religious of both ſexes, as abbots, monks, priors, &c.; the other *ſecular*, comprehending all the eccleſiaſtics that do not make the monaſtic vows. Among the reformed, there are none but thoſe of the latter. The Roman clergy forms a monarchical ſtate, under the pope, as its ſupreme head.

In England, the term clergy comprehends all perſons in holy orders, and alſo in eccleſiaſtical offices; *viz.* arch-biſhops, biſhops, deans and chapters, arch-deacons, rural deans, parſons, who are either rectors or vicars, and curates; to which number we may alſo add, pariſh clerks, who formerly frequently were, and ſtill ſometimes are, in orders. See each of the articles above enumerated.

This venerable body of men, being ſeparated and ſet apart from the reſt of the people, in order to attend the more cloſely to the ſervice of Almighty God, have ſeveral privileges allowed them by our municipal laws, and thoſe privileges were formerly much greater than they have been ſince the reformation, at which time they were abridged on account of the ill uſe which the popiſh clergy had endeavoured to make of them. For as the laws exempted them from almoſt every perſonal duty, they attempted to obtain for themſelves a total exemption from every ſecular tie; and as it has happened in other caſes, by extending their claims too far, they either loſt or ceaſed to enjoy thoſe liberties which of right belonged to them. The perſonal exemptions, however, for the moſt part are ſtill continued. A clergyman cannot be compelled to ſerve on a jury, nor to appear at a court-leet or view of frank-pledge; which almoſt every other perſon is obliged to do. 2 Inſt 4. But if a layman is ſummoned on a jury, and before the trial takes orders, he ſhall, notwithſtanding, appear and be ſworn. 4 Leon. Neither can he be choſen to any temporal office, as bailiff, reeve, conſtable, or the like, in regard of his own continual attendance on the ſacred functions. Finch. L. 88. During his attendance on divine ſervice, he is privileged from arreſts in civil ſuits. Stat. 50 Edw. III. c. 5. 1 Ric. II. c. 26. In caſes alſo of felony, a clerk in orders ſhall have the benefit of his clergy, without being branded in the hand; and may likewiſe have it more than once; in both which particulars he is diſtinguiſhed from a layman. 2 Inſt. 637. Stat. 4 Hen. VII. c. 13. and 1 Edw. VI. c. 12. As they have their peculiar privileges, they have alſo their diſabilities, on account of their ſpiritual avocations. Clergymen, as ſome have maintained, are incapable of ſitting in the Houſe of Commons, (ſee PARLIAMENT); and by ſtat. 21 Hen. VIII. c. 13. they are not (in general) allowed to take any lands or tenements to farm, on pain of 10*l.* per month, and total avoidance of the leaſe; unleſs where they have not ſufficient glebe; and the land is taken for the neceſſary expences of their houſehold. Stat. §. 8.; nor, on the like penalty, are they allowed to keep any tan-houſe or brew-houſe; nor to engage in any manner of trade, nor to ſell any merchandize, under forfeiture of the treble value, which prohibition is conſonant to the canon law. By the ſtatute called "Articuli Cleri," 9 Ed. II. ſt. 1. c. 3., if any perſon lay violent hands on a clerk, the amends for the peace broken (1) ſhall be before the king (that is by indictment), and the aſſailant may (2) alſo be ſued before the biſhop, that excommunication or bodily penance may be impoſed; which if the offender will redeem by money, it may (3) be ſued for before the biſhop. See ARTICLES *of the Clergy* and BATTERY.

Though the clergy formerly claimed an exemption from all ſecular juriſdiction, yet Matt. Paris tells us, that William the Conqueror ſubjected the biſhops and abbeys who held *per baroniam*, and who, till then, had been exempt from all ſecular ſervice; and ordered they ſhould be no longer free from military ſervices. To this purpoſe he preſcribed arbitrarily what number of ſoldiers every abbey and biſhopric ſhould provide, to ſerve him and his ſucceſſors in time of war, and laid up the regiſters of eccleſiaſtical ſervitude in his treaſury. But, in effect, the clergy were not exempt from all ſecular ſervice till then; as being bound by the laws of king Edgar to obey the ſecular magiſtrate in ſome things; *viz.* upon an expedition to the wars, and in contributing to the building and repairing of bridges, &c. See TRINODA *neceſſitas*.

The privileges of the Engliſh clergy, confirmed to them by Magna Charta, and by the ancient ſtatutes, are very conſiderable: their goods are to pay no toll in fairs or markets; they are exempt from all offices but their own; from the king's carriages, poſts, &c. from appearing at ſheriffs' tourns or frank-pledges; and are not to be fined or amerced, according to their ſpiritual, but their temporal means. A clergyman acknowledging a ſtatute, his body is not to be impriſoned; if he be convicted of a crime for which the benefit of clergy is allowed, he ſhall not, as we have before obſerved, be burnt in the hand. See *Benefit of* CLERGY.

The clergy, by common law, are not to be burdened in the general charges with the laity; nor to be troubled or incumbered, unleſs expreſsly named, and charged by the ſtatute; for general words do not affect them. Thus, if a hundred be ſued for a robbery, the miniſter ſhall not contribute; though the words are *gentes demorantes*: neither are they aſſeſſed to the highway, to the watch, &c. But theſe privileges are in a great meaſure loſt; the clergy being included under general words in later ſtatutes: ſo that they are liable to all public charges impoſed by act of parliament, where they are not particularly excepted. Beſides the exemptions and privileges above ſtated, their bodies are not to be taken on ſtatutes-merchant, or ſtaple, &c.; for the writ to take the body of the conuſor is "Si laicus ſit;" and if the ſheriff, or any other officer, arreſt a clergyman upon any ſuch proceſs, it is ſaid that an action of falſe impriſonment lies againſt him that does it; or the clergyman arreſted may have a "ſuperſedeas" out of Chancery. 2 Inſt. 4. In action of treſpaſs, account, &c. againſt a perſon in holy orders, wherein proceſs of "capias" lies, if the ſheriff return that the defendant is "Clericus beneficiatus nullum habens laicum feodum ubi ſummoneri poteſt:" in this caſe the plaintiff cannot have a "capias" to arreſt his body; but a writ ſhould be addreſſed to the biſhop, compelling him to appear: nevertheleſs, when execution is obtained, a ſequeſtration of the profits of his benefice may be had.

The revenues of the clergy were anciently more conſiderable than at preſent. Ethelwolph, in 855, gave them the tythe of all goods, and the tenth of all the lands in England; free from all ſecular ſervices, taxes, &c. The charter whereby this was given them, was confirmed by ſeveral of his ſucceſſors; Edmund, Edgar, Ethelred, Alfred, and William the Conqueror; the laſt of whom, finding the biſhoprics ſo rich, erected them all into baronies; each barony containing thirteen knights' fees at leaſt. But ſince the Reformation, the biſhoprics are much impaired. See BISHOP.

The revenues of the inferior clergy, in the general, are ſmall; a third part of the beſt benefices being anciently, by the pope's grant, appropriated to monaſteries; upon the diſſolution whereof they became lay-fees. Indeed, an addition was made, 2 Annæ; the whole revenue of firſt-fruits and tenths being then granted, to raiſe a fund for the augmentation of the maintenance of the poor clergy: purſuant to which, a corporation was formed, by the name of governors of the bounty of queen Anne, for the augmentation of the maintenance of the poor clergy; to whom the ſaid revenues were conveyed in truſt, &c. See AUGMENTATION. For a ſtatement of the number and revenues of the clergy of the eſtabliſhed churches of England and Scotland; ſee CHURCH *of England*, and CHURCH *of Scotland*.

CLERGY, *articles of the*. See ARTICLES.

CLERGY, *proctors of the*. See PROCTORS.

CLERGY, *Privilegium Clericale*, or *Benefit of Clergy*, denotes an ancient privilege of the church, conſiſting in this, that places conſecrated to religious duties were exempted from criminal arreſts, whence proceeded ſanctuaries; and that the perſons of clergymen were exempted from criminal proceſs before the ſecular judges in particular caſes. This, at firſt, was an indulgence granted by the civil government, or Chriſtian princes, from a pious regard to the church in its infant ſtate; but as the clergy increaſed in wealth, power, honour, number, and intereſt, that which was firſt obtained by favour, was afterwards claimed as an inherent, indefeaſible, and *jure divino* right: and the clergy endeavoured to extend the exemption not only to almoſt all kinds of crimes, but to a variety of perſons, beſides thoſe who were properly of their own order. In England, though this privilege was allowed in ſome capital caſes, it was not univerſally admitted. The method of granting it was ſettled in the reign of Henry VI. which required, that the priſoner ſhould firſt be arraigned, and then claim his benefit of clergy, by way of declinatory plea, or, after conviction, by way of arreſt of judgment; which latter mode is moſt uſually practiſed. This privilege was originally confined to thoſe who had the *habitum & tonſuram clericalem*: but in proceſs of time every one was accounted a clerk, and admitted to this benefit, who could read, though neither initiated in holy orders, nor trimmed with the clerical tonſure; ſo that, after the invention of printing, and the diſſemination of learning, this became a very comprehenſive teſt, including laymen as well as divines; and, therefore, the ſtat. 4 Hen. VII. cap. 13, diſtinguiſhes between lay ſcholars, and clerks in holy orders; and directs that the former ſhould not claim this privilege more than once, and, in order to their being afterwards known, that they ſhould be burnt with a hot iron in the brawn of the left thumb. This diſtinction between learned laymen, and real clerks in orders, was aboliſhed, for a time, by 28 Hen. VIII. cap. 1. and 32 Hen. VIII. cap. 3, but is held (Hob. 294. 2 Hal. P. C. 375.) to have been virtually reſtored by 1 Ed. VI. cap. 12, in conſequence of which ſtatute, peers of the realm, and lords of parliament, having place and voice in parliament, were entitled to the benefit of their peerage, equivalent to that of clergy, for the firſt offence, though they could not read, and for all offences then clergyable to commoners, and alſo for the crimes of houſe-breaking, highway robbery, horſe-ſtealing, and robbing of churches. When thoſe, admitted to the privilege of their clergy, the laity after burning, and before it, the real clergy, were thus diſcharged from the ſentence of the law in the king's court, they were delivered over to the ordinary for canonical purgation. But this purgation having given occaſion to a ſcandalous proſtitution of oaths, and other abuſes, it became neceſſary, when the reformation was thoroughly eſtabliſhed, to aboliſh a ceremony ſo vain and impious. Accordingly, it was enacted by ſtat. 18 Eliz. cap. 7, that all ſuch perſons, inſtead of being committed to the ordinary, ſhould be delivered out of priſon, provided the judge does not think fit to continue them in goal for a limited time, not exceeding a year. Further alterations were made in the law reſpecting this privilege, by 21 Jac. I. cap. 6, which allowed, that women convicted of ſimple larcenies under the value of 10 *s.* ſhould not properly have the benefit of clergy, for they were not called upon to read; but be burned in the hand, and whipped, ſtocked, or impriſoned for any time not exceeding a year. See Branding. And a ſimilar indulgence by 3 and 4 W. and M. cap. 9, and 4 and 5 W. and M. cap. 24, was extended to all women guilty of any clergyable felony; who were allowed once to claim the benefit of the *ſtatute*, in like manner as men might claim the benefit of *clergy*, and to be diſcharged upon being burned in the hand, and impriſoned for any time not exceeding a year. The puniſhment of burning in the hand being found ineffectual, was alſo changed by ſtatute 10 and 11 W. III. c. 23, into burning in the moſt viſible part of the left cheek, neareſt the noſe; but ſuch an indelible ſtigma being found by experience to render offenders deſperate, this proviſion was repealed about ſeven years afterwards, by ſtat. 5 Ann. c. 6.; and till that period, all women, all peers of parliament, and peereſſes, and all male commoners who could read, were diſcharged in all clergyable felonies; the males abſolutely, if clerks in orders; and other commoners, both male and female, upon branding, and peers and peereſſes without branding, for the firſt offence; all, however, except peers and peereſſes, liable to impriſonment, as before mentioned; and thoſe men who could not read, if under the degree of peerage, were hanged. By 5 Anne, cap. 6, the benefit of clergy was indiſcriminately granted to all who had a right to aſk it, without the condition of reading. It was further enacted by the ſame ſtatute, that when any perſon is convicted of any theft or larceny, and burned in the hand for the ſame, according to the ancient law, he ſhall alſo, at the diſcretion of the judge, be committed to the houſe of correction, or public workhouſe, to be there kept to hard labour for any time not leſs than ſix months, and not exceeding two years; with a power of inflicting a double confinement in caſe of the party's eſcape from the firſt. Again, by 4 Geo. I. cap. 11, and 6 Geo. I. cap. 23, it is enacted, that when any perſons ſhall be convicted of larceny, either grand or petit, or any felonious ſtealing or taking of money, or goods and chattels, either from the perſon or the houſe of another, or in any other manner, and who by the law ſhall be entitled to the benefit of clergy, and liable only to the penalties of branding or whipping, the court in their diſcretion may direct ſuch offenders, inſtead of burning or whipping, to be tranſported to America, (or, by ſtat. 19 Geo. III. c. 74, to any other parts beyond the ſeas), for ſeven years; and if they return within that time, it ſhall be felony without beneſit of clergy. For other particulars, ſee Branding, and Transportation.

It appears, from the above account, that the perſons to whom this privilege now extends, are clerks in orders, without branding, and of courſe without any tranſportation, fine, or whipping; lords of parliament and peers of the realm, and alſo peereſſes, for the firſt offence; and all commoners, not in orders, whether male or female, for clergyable felonies, upon being burnt in the hand, whipped, or fined, or impriſoned, at the diſcretion of the judge, in the common gaol, the houſe of correction, one of the penitentiary houſes, or in the places of labour for the benefit of ſome navigation; and in caſe of larceny, on being tranſported for ſeven years, or ſuffering the puniſhment more lately ſubſtituted in the room of tranſportation.

It is a privilege peculiar only to the clergy, that ſentence of death can never be paſſed upon them for any number of man-ſlaughters, bigamies, ſimple larcenies, or other clergyable offences; but a layman, even a peer, may be ouſted of clergy, and will be ſubject to the judgment of death, upon a ſecond conviction of a clergyable offence. Thus, if a layman has been once convicted of man-ſlaughter, upon production of the convicton, he may ſuffer death for bigamy, or any other clergyable felony; which would not therefore be a capital crime to another perſon not ſo circumſtanced.

It hath been ſaid, that Jews, and other infidels and heretics, were not capable of the benefit of clergy, till after the ſtatute 5 Ann. c. 6., as being under a legal incapacity for orders. 2 Hal. P. C. 373. 2 Hawk. P. C. 33. §. 5. Forſt. 306. But judge Blackſtone much queſtions, whether this was ever ruled for law, ſince the re-introduction of the Jews into England, in the time of Oliver Cromwell. For, if that were the caſe, the Jews are ſtill in the ſame predicament, which every day's experience will contradict; the ſtatute of queen Anne having certainly made no alteration in this reſpect; it only diſpenſing with the neceſſity of reading in thoſe perſons, who, in caſe they could read, were before the act entitled to the benefit of their clergy.

A perſon, having once had benefit of clergy, ſhall not be ouſted of his clergy, by the bare mark in his hand, or by a parol averment, without the record teſtifying it, or a tranſcript thereof, according to the following ſtatutes: 2 H. H. 373. By ~~ſtat.~~ 34 and 35 Hen. VIII. cap 14. the clerk of the crown, or of the peace, or of the aſſiſe, ſhall certify a tranſcript briefly of the tenor of the indictment, outlawry, or conviction, and attainder, into the King's Bench in 40 days; and the clerk of the crown, when the judges of aſſiſe, or juſtices of the peace, write to him for the names of ſuch perſons, ſhall certify the ſame, with the cauſes of the conviction or attainder. Another method is given by the ſtat. 3 W. and M. cap. 9. §. 7.; which enacts, that the clerk of the crown, clerk of the peace, or clerk of aſſiſe, where a perſon admitted to clergy under that act ſhall be convicted, ſhall at the requeſt of the proſecutor, or any other on the king's behalf, certify a tranſcript briefly and in few words, containing the effect and tenor of the indictment and conviction, of his having the benefit of clergy, and the addition of the party, and the certainty of the felony and conviction, to the judges where ſuch perſon ſhall be indicted for any ſubſequent offence. It ſeems alſo, that if the party deny that he is the ſame perſon, iſſue muſt be joined upon it, and it muſt be found upon trial that he is the ſame perſon, before he can be ouſted of clergy. 2 H. H. 373. Againſt the defendant's prayer of clergy, the proſecutor may file a "counter-plea;" alleging ſome fact, which in law deprives the defendant of the privilege he claims. It is a good counter-plea to the prayer of clergy, that the offender is not entitled to the benefit of the ſtatute, becauſe he was before convicted of an offence, and thereupon prayed the benefit of the ſtatute, which was allowed to him; alleging the truth of the fact and praying the judgment of the court, that he may die according to law; which fact is to be tried by the record in purſuance of the ſtatute 34 and 35 Hen. VIII. c. 14. Staunf. 135. Divers other counter-pleas, by which an offender may be deprived of clergy, may alſo be framed from a conſideration of the *perſons* to whom it is allowed or denied by the common law; and of the *circumſtances* under which that allowance or denial of it has been placed by divers ſtatutes. Ib. 138. The uſe of this counter-plea has, however, long become obſolete, and out of uſe. But the daring practices of ſome money-coiners occaſioned its revival; and in 1783, on occaſion of the conviction of money-coiners, a counter-plea of record was filed on the part of the proſecution; alleging that the convicts had been before allowed the benefit of the ſtatute, &c.; and they were thereby ouſted of their clergy. Leach's Hawk. P. C. ii. c. 33. §. 19. *n.*

The privilege of clergy was not indulged at the common law, either in high treaſon, or petit larceny, or in any mere miſdemeanors; and therefore it may be laid down as a rule, that it was allowable only in petit treaſon, and in capital felonies; which, for the moſt part, became legally entitled to this indulgence by the ſtatute "de clero," 25 Edw. III. ſt. 3. c. 4., which provides, that clerks convicted for treaſons or felonies, touching other perſons than the king himſelf or his royal majeſty, ſhall have the privilege of holy church. But it was not allowed in all felonies; in ſome of which it was denied even by the common law, *viz.* "inſidiatio viarum," or lying in wait for one on the high-way; "depopulatio agrorum," or deſtroying and ravaging a country (2 Hal. P. C. 333.); and "combuſtio domorum," or arſon, that is, the burning of houſes; all which are a kind of hoſtile acts, and in ſome degree border upon treaſon. Moreover, all theſe crimes, together with petit treaſon, and many other acts of felony, are ouſted of clergy by particular acts of parliament. All the ſtatutes for excluding clergy are merely the reſtoration of the law to the ſame rigour of capital puniſhment in the firſt offence, that was exerted before the "privilegium clericale" was at all indulged; and which it ſtill exerts upon a ſecond offence in almoſt all kinds of felonies, unleſs committed by clerks in actual orders. But ſo tender is the law of inflicting capital puniſhment in the firſt inſtance for any inferior felony, that notwithſtanding by the marine law, declared in ſtatute 28 Hen. VIII. c. 15. the benefit of clergy is not allowed in any caſe whatſoever; yet, when offences are committed within the admiralty-juriſdiction, which would be clergyable if committed by land, the conſtant courſe is to acquit and diſcharge the priſoner. Moor. 756. Foſt. 288. It is not neceſſary, that the ordinary ſhould demand the benefit of the clergy for a clerk; nor is there any neceſſity that the priſoner himſelf ſhould demand it, where it ſufficiently appears to the court, that he hath a right to it, in reſpect of his being in orders, &c. In which caſe, if the priſoner does not demand it, it is left to the diſcretion of the judge, either to allow, or not allow it to him. 2 Hawk. P. C. c. 33. §. 112. Clergy may be demanded after judgment given againſt a perſon, whether of death, &c. and even under the gallows, if a proper judge be there, who has power to allow it. 2 Hawk. P. C. c. 33. §. 111.

Upon the whole we may obſerve in relation to this ſubject: 1. That in all felonies, whether newly created or by common law, clergy is now allowable, unleſs taken away by expreſs words of an act of parliament. 2 Hal. P. C. 330. 2. That, where clergy is taken away from the principal, it is not of courſe taken away from the acceſſory, unleſs he be alſo particularly included in the words of the ſtatute. 2 Hawk. P. C. 342. 3. That, when the benefit of clergy is taken away from the *offence*, (as in caſe of murder, buggery, robbery, rape, and burglary), a principal in the ſecond degree, being preſent, aiding and abetting the crime, is as well excluded from his clergy as he that is principal in the firſt degree .but, 4. That, where it is only taken away from the *perſon committing* the offence, (as in the caſe of ſtabbing, or committing larceny in a dwelling-houſe, or privately from the perſon), his aiders and abettors are not excluded; through the tenderneſs of the law, which hath determined that ſuch ſtatutes ſhall be taken literally. 1 Hal. P. C. 529. Foſter, 356, 357.

As to the conſequences to the party of allowing him this benefit of clergy, they are ſuch as affect his preſent intereſt and future credit and capacity; as having been once a felon, but now purged from that guilt by the privilege of clergy; which operates as a kind of ſtatute-pardon. It may be obſerved, 1. That, by his conviction, he forfeits all his goods to the king; which, being once veſted in the crown, ſhall not afterwards be reſtored to the offender. 2 Hal. P. C. 388. 2. That, after conviction, and till he receives the judgment of the law, by branding or ſome of its ſubſtitutes, or elſe is pardoned by the king, he is to all intents and purpoſes a felon, and ſubject to all the diſabilities and other incidents of a felon. 3 P. Wms. 487. 3. That, after burning, or its ſubſtitute, or pardon, he is diſcharged for ever of that, and all other felonies before committed, within the benefit of clergy; but not of felonies from which ſuch benefit is excluded; and this by ſtatutes 8 Eliz. c. 4. and 18 Eliz. c. 7. 4. That by the burning, or its ſubſtitute, or the pardon of it, he is reſtored to all capacities and credits, and the poſſeſſion of his lands, as if he had never been convicted. 2 Hal. P. C. 389. 5 Rep. 110. 5. That what is ſaid with regard to the advantages of commoners and laymen, ſubſequent to the burning in the hand, is equally applicable to all peers and clergymen, although never branded at all, or ſubjected to other puniſhment in its ſtead. For they have the ſame privileges, without any burning or any ſubſtitute for it, which others are entitled to after it. 2 Hal. P. C. 389, 390. Blackſt. Comm. vol. iv.

Clergy, *Corporation of the Sons of the*, a benevolent inſtitution, which ſeems to have originated in the time of the Uſurpation, when a ſermon was preached at St. Paul's, Nov. 8, 1658, to the ſons of miniſters ſolemnly aſſembled; the deſign of which was to promote charitable contributions in favour of the ſons of the clergy. Whether or not ſermons of this kind were annual before the Reſtoration, we are not able to aſcertain; however, afterwards, a charter was granted, bearing date July 1, 1678 by which a body politic and corporate was conſtituted, under the name of "The Governors of the Charity for the Relief of the poor Widows and Children of Clergymen," with licence to poſſeſs any eſtate, not exceeding the yearly value of 2000 *l.* Upon the acceſſion of a gift by Dr. Thomas Turner, amounting to about 18,000 *l.* the governors obtained, Dec. 16, 1714, an augmentation of the ſaid grant, by a licence to poſſeſs the yearly value of 3000 *l.* over and above all charges and repriſes, as alſo over and above the ſaid 2000 *l. per annum.* To promote the uſeful and laudable purpoſe of this inſtitution, a ſermon was preached at the anniverſary meeting of the ſons of clergymen in the church of St. Mary le Bow, Nov. 7, 1678, by Dr. T. Sprat, afterwards biſhop of Rocheſter, in which it appears, that thoſe ſervices had been cuſtomary before they were encouraged by a royal eſtabliſhment. Theſe ſermons continued to be preached at Bow church till the year 1697, when Dr. George Stanhope preached his ſermon for the benefit of this charity at the cathedral church of St. Paul, at which time it is ſuppoſed the thought was firſt ſuggeſted of a grand muſical performance in aid of the charity. The annual feaſt of the ſons of the clergy appears to be prior to their incorporation; for in the London Gazette of Nov. 22, 1677, the annual feaſt of the ſons of the clergy was advertiſed to be held at Merchant Taylors Hall, on Thurſday the 29th of November following. Since the year 1697, there has been conſtantly an annual ſermon, and alſo a grand muſical ſervice at the cathedral church of St. Paul, for promoting the ends of this charity. The moſt eminent divines of the church have preached on theſe occaſions, and the muſical performance has acquired celebrity from the concurrence of eminent perſons of the profeſſion. For many years paſt it has been the practice of the ſtewards of the corporation, to have at St. Paul's on the Tueſday preceding the day of the ſermon, what is called a rehearſal of the performance, and alſo a collection for the charity. The corporation is under the management of a preſident (the archbiſhop of Canterbury), a vice-preſident, three treaſurers, and a numerous court of aſſiſtants.

The ſociety for maintaining, educating, and apprenticing poor orphan children of clergymen, was inſtituted in 1749, and is under the direction of a preſident (biſhop of London), a vice-preſident, a treaſurer, and ſecretary.

CLERI, in *Ancient Geography*, a people of Aſia Minor, in the Leſſer Myſia, mentioned by Diodorus Siculus.

CLERICAL *Crown*. See Crown.

Clerical *Title*. See Title.

CLERICI, Tommaso, in *Biography*, an hiſtorical painter of Genoa. He was born in 1637, and became the diſciple of Franciſco Merano, called il Paggio; and, though he died of the plague in the 21ſt year of his age, *anno* 1657, yet the progreſs he had made in the art was ſo great, that the four altar pictures remaining of his hand, in the church and ſacriſty of the Nunziata del Guaſtato, at Genoa, have at all times been much admired. One of theſe repreſents the three archangels, Michael, Gabriel, and Raphael; the ſecond, the Virgin Mary, with the image of St. Dominick; the third, a martyrdom of ſaints; and the laſt, a number of Franciſcan friars following Chriſt, who is bearing his croſs. Soprani. Orlandi.

Clerici *non eligantur in officio*. See Quod *Clerici*.

CLERICIS *regis, non-reſidentia pro*. See Non-*reſidentia*.

CLERICO *admittendo*. See Admittendo *Clerico*.

Clerico *capto per ſtatutum mercatorum*, is a writ for the delivery of a clerk out of priſon, who is impriſoned upon the breach of a ſtatute-merchant. Reg. Orig. 147.

Clerico *convicto commiſſo gaolæ in defectu ordinarii deliberando*, is a writ for the delivery of a clerk to his ordinary, that was formerly convicted of felony; by reaſon his ordinary did not challenge him according to the privilege of clerks. Reg. Orig. 69.

Clerico *intra ſacros ordinis conſtituto non eligendo in officium*, is a writ directed to the bailiffs, &c. that have thruſt a bailiwick or beadleſhip upon one in holy orders, charging them to releaſe him. Reg. Orig. 143.

CLERIEUX, in *Geography*, a town of France, in the department of the Drome, and diſtrict of Valence, 5 miles N.W. of Romans.

CLERINCE, a town of Poland, in the palatinate of Braclaw; 44 miles S.S.W. of Braclaw.

CLERISSEAU, Charles Louis, in *Biography*, an artiſt who was born at Paris 1718, and is well known by his beautiful pictures in water colours, repreſenting the ruins and pictureſque views of Italy, where he long ſtudied. He was, upon his return, made a member of the Royal Academy at Paris, and, ſome time after, he received a ſimilar honour in England, the Royal Academy of London being juſt then inſtituted.

Several prints have been engraved from his works, and, amongſt others, an excellent ſet of thirteen large views of ancient buildings, by Domenico Cunego of Rome. Heinecken.

CLERK, Daniel le, a celebrated phyſician, and learned writer on the hiſtory and practice of medicine, was born at Geneva, Feb. the 4th, 1652. He was the ſon of Stephen le Clerk, profeſſor in the Greek language, and from him received the rudiments of his knowledge, as well as his taſte for reſearch into antiquity, by which he became in time ſo famous. Having completed his ſchool education, he went, in ſucceſſion to Montpellier, Paris, and Valence, where he took his degree of doctor in medicine, in 1672. He now returned to Geneva, and ſoon found himſelf in conſiderable practice, which he attended to with zeal, until the year 1704, when, being appointed one of the members of the council of ſtate, he entirely renounced practice, that he might have leiſure to fill the honourable poſt to which he had been raiſed, and to correct and complete the various works in which he had been engaged, and which had given him a diſtinguiſhed rank among the principal literary characters of his age. He died June 8th. 1728, leaving two ſons, James, who had been educated to medicine, and James Theodore, who was miniſter of the goſpel, and profeſſor of the Oriental Languages. He had publiſhed, in conjunction with James Mangets, "Biblioth. Anatomica," 2 vols. folio, in 1685; but the work for which he is principally celebrated, is his "Hiſtoire de la Medicine, ou l'on voit l'Origine et le Progres de cette art de Siecle, en Siecle:" A work of immenſe erudition, in which are depicted the opinions, or theories of medicine, which have prevailed from the earlieſt period to the time of Galen. The firſt part, which brought the hiſtory of medicine only to the time of Hippocrates, was publiſhed in one volume, 8vo. 1696. Finding this approved, he produced the work completed in one volume, 4to. in 1702. This was reprinted in 1723; and again, with additions, and much improved, in 1729. To this edition he added a plan of a continuation of the hiſtory, to the middle of the 17th century, but which his age and avocations prevented his completing. Friend, who pays the author the higheſt compliments on the completion of the work, which it amply deſerves, is very ſevere in his cenſure of this plan. But he would ſurely have ſpared his reproof, if he had attended to the apology made by the author, who was well acquainted with its defects. Friend wrote a continuation of the hiſtory, and in ſo excellent a manner, as to leave little reaſon to regret that it had not been finiſhed by Le Clerk. "Hiſtoria naturalis et medica latorum Lumbricorum intra Hominem et Animalia naſcentium," Genevæ, 1715, 4to. which contains all that is known on the ſubject of thoſe pernicious reptiles. A little before he died, he tranſlated, Senebier ſays, the firſt "Satyr of Perſius" into the French language; but this has not been printed. Haller, Bib. Med. Senebier, Hiſtoire Literaire de Geneve.

Clerk, Clericus, a word formerly uſed to ſignify a learned man, or man of letters. For the etymology of the term, ſee Clergy.

Thus, Paſquier obſerves, the officers of the counts (*comites*) were anciently created under the title of *clerks of accompts*; and ſecretaries of ſtate were called *clerks of the ſecrets*. So, *Clericus domini regis*, in the time of Edward I. was rendered in Engliſh, the *king's ſecretary*, or *clerk of his council*.

The term was applied indifferently to all who made any profeſſion of learning, or who knew how to manage the pen; though, originally, it was appropriated to eccleſiaſtics.

As the nobility and gentry were uſually brought up to the exerciſe of arms; there were none but the clergy left to cultivate the ſciences; hence, as the clergy alone made any profeſſion of letters, a very learned man came to be called a *great clerk*, and a ſtupid ignorant man, a *bad clerk*.

Ronſard, in his old language, uſes the word femininely, *clergeſſe*, for a learned woman. "*Mais trop plus eſt à craindre une feme clergeſſe.*"

Clerk (in general) is uſed as ſynonymous with *clergyman* for all thoſe of the eccleſiaſtical ſtate, who are in holy orders, of any degree, or kind, from the deacon, to the prelate.

Yet, in its utmoſt latitude, the word clerk alſo includes

CHANTORS, ACOLYTHI, EXORCISTÆ, and OSTIARII. The word, however, has been anciently uſed for a ſecular prieſt, in oppoſition to a religious or regular. Paroch. Antiq. 171. The canons excommunicate all thoſe who lay hands on a clerk. A council held in Africa prohibited the appointing any clerk to be a tutor, guardian, or curator, by teſtament. The council of Elvira enjoins continence on all clerks, biſhops, prieſts, or deacons, on pain of being ſtripped of their clericature.

CLERK, *acephalous*, in the ſixth century, was a name given to thoſe clerks who ſeparated from the biſhop, and choſe not to live any longer in community with him; in contradiſtinction to

CLERKS, *canonic*, who continue to live with the biſhop, according to the canons.

CLERK, in the way of trade and buſineſs, is one who exerciſes any function with the pen.

The Clergy, in the early ages, engroſſed almoſt every kind of learning to themſelves; and they were peculiarly remarkable for their proficiency in the ſtudy of the law. Thus William of Malmſbury characteriſes them ſoon after the conqueſt, "Nullus clericus niſi cauſidicus." The judges, therefore, were uſually created out of the ſacred order; and all the inferior offices were ſupplied by the lower clergy, which has occaſioned their ſucceſſors to be denominated clerks to this day. Accordingly, this title is given to ſeveral officers of this kind in the royal palace, the courts of juſtice, revenue, army, navy, &c. The principal of theſe are as follow:

CLERK *of the Acts*, is an officer of the navy, who receives and enters the commiſſions, contracts, warrants, &c. of the lord high admiral; and regiſters the acts and ordinances of the lords commiſſioners of the admiralty, and commiſſioners of the navy. Stat. 22 & 23 Car. II. c. 11.

CLERK *of Aſſidavits*, in the court of chancery, an offirec who files all affidavits made uſe of in court.

CLERK *of Aſſiſe*, is he that writeth all things judicially done by the juſtices of aſſiſe, in their circuits.

This office is aſſociated to the judge in commiſſions of aſſiſe, to take aſſiſes, &c. He ſhall not be counſel with any perſon in the circuit. Stat. 33 Hen. VIII. c. 24. § 5. He certifies the names of felons convict. See *Benefit of* CLERGY. He is puniſhable for concealing, &c. any indictment, recognizance, fine, or forfeiture. See ſtat. 22 & 23 Car. II. c. 22. §. 9. 3 Geo. I. c. 15. §. 12. He is to take only 2*s.* for drawing an indictment, and nothing if defective. 10 & 11 W. III. c. 23. §. 7, 8. The clerk of aſſiſe is fineable for falſely recording appearances of perſons returned on a jury. 3 Geo. II. c. 25. §. 3.

CLERK of *the Bails*. See BAILS, *clerk of the*.

CLERK of *the Check* or *Cheque*. See CHECK.

CLERK *of the Cloſet*, is a divine, otherwiſe called *confeſſor to his Majeſty*; whoſe office is to attend at the king's right hand during divine ſervice, to reſolve all doubts concerning ſpiritual matters, to wait on the king in his private oratory, &c.

CLERK *controller of the king's houſe*, an officer in the king's court, that hath authority to allow or diſallow charges and demands of purſuivants, meſſengers of the green-cloth, &c. He hath likewiſe the overſight of all defects and miſcarriages of any of the inferior officers; and he hath a right to ſit in the counting-houſe with the ſuperior officers, *viz.* the lord-ſteward, treaſurer, controller, and cofferer of the houſhold, for correcting any diſorders. There are two officers of this kind. See ſtat. 33 Hen. VIII. c. 12.

CLERK *of the Crown*, in the king's bench court, an officer whoſe buſineſs is to frame, read, and record all indictments againſt traitors, felons, and other offenders there arraigned or indicted of any public crime.

When divers perſons are jointly indicted, the clerk of the crown ſhall take for them all but one fee, *viz* 2*s.* Stat. 2 Hen. IV. c. 10. He is otherwiſe denominated *clerk of the crown-office*, and exhibits informations, by order of the court, for divers offences. See INFORMATION.

CLERK *of the Crown*, in chancery, is an officer, who, by himſelf, or deputy, is continually to attend the lord-chancellor, or lord-keeper, to write or propoſe ſpecial matters of ſtate. by commiſſion, or the like, either immediately from his majeſty's orders, or by order of his council; as well ordinary as extraordinary, *viz.* commiſſions of lieutenancy, of juſtices of aſſiſe, oyer and terminer, gaol-delivery, and of the peace, with their writs of aſſociation, &c. All general pardons, upon grants of them at the king's coronation, or in parliament, where he ſits in the lords' houſe in parliament time; the writs of parliament, with the names of the knights, citizens, and burgeſſes, are alſo returned into his office, and filed; beſides which, he has the making of ſpecial pardons, and writs of execution upon bonds of ſtatute ſtaple forfeited, which was annexed to this office in the reign of queen Mary, in conſideration of his chargeable attendance.

CLERK *of the Declarations*, an officer in the court of king's bench, that files all declarations in cauſes there depending, after they are engroſſed, &c.

CLERK *of the Deliveries*, is an officer in the Tower of London, who takes indentures for all ſtores iſſued thence.

CLERK *of the Errors*, in the court of common pleas, tranſcribes, and certifies into the king's bench, the tenor of the records of the cauſe, or action, upon which the writ of error, made by the curſitor, is brought there, to be heard and determined.

CLERK *of the Errors*, in the king's bench, tranſcribes and certifies the records of ſuch cauſes in that court into the exchequer; if the cauſe, or action, is by bill: if by original, the lord chief juſtice certifies the record into the houſe of peers in parliament, by taking the tranſcript from the clerk of errors, and delivering it to the lord chancellor, there to be determined, according to the ſtats. 27 Eliz. c. 8. and 31 Eliz. c. 1.

CLERK *of the Errors*, in the exchequer, tranſcribes the records certified thither out of the king's bench; and prepares them for judgment in the court of exchequer, to be given by the juſtices of the common-pleas, and barons, there. Stats. 16 Car. II. c. 2. 20 Car. II. c. 4.

CLERK *of the Eſſoins*, in the court of common pleas, keeps the eſſoin-rolls, or enters eſſoins. He alſo provides parchment, cuts it into rolls, marks the number on them; delivers out all the rolls to every officer, and receives them again when written, binds and makes up the bundles of every term, which he does as ſervant of the chief juſtice. The chief juſtice of C. B. is at the charge of the parchment of all the rolls, for which he is allowed: as is alſo the chief juſtice of B. R. beſides the penny for the ſeal of every writ of privilege and outlawry, the ſeventh penny taken for the ſeal of every writ in court under the green wax, or petit ſeal: the ſaid lord chief juſtices having annexed to their offices or places the cuſtody of the ſaid ſeals belonging to each court. See ESSOIN.

CLERK *of the Eſtreats*, belongs to the exchequer; and, every term, receives the eſtreats out of the lord-treaſurer's remembrancer's office, and writeth them out to be levied for the king. He alſo maketh ſchedules of ſuch ſums eſtreated as are to be diſcharged. See ESTREAT.

CLERKS *of the Green-Cloth*. See GREEN-CLOTH.

CLERK *of the Hamper*, or *Hanaper*, is an officer in chancery, whoſe buſineſs is to receive all money due to the king for the ſeals of charters, patents, commiſſions, and writs: as alſo fees due to the officers for inrolling and examining the ſame. He is obliged to attend on the lord-chancellor, or lord-keeper, daily, in term-time; and at all times of ſealing; having with him leather bags, wherein are put all charters, &c. After they are ſealed, thoſe bags, being ſealed with the lord-chancellor's private ſeal, are delivered to the controller of the hanaper, who, upon receipt of them, enters the effect of them in a book, &c. This hanaper repreſents what the Romans called "fiſcum," which contained the emperor's treaſure; and the exchequer was anciently ſo called, becauſe "in eo reconderentur hanapi et ſcutræ cæteraque vaſa quæ in cenſum et tributum perſolvi ſolebant;" or perhaps, becauſe the yearly tribute which princes received was in hampers or large veſſels full of money. There being an arrear of 10,590*l*. 12*s*. 11*d*. of ſeveral ancient fees and ſalaries, &c. payable out of this office; and there being a remainder of 13,698*l*. 1*s*. 11*d*. of the ſix-penny ſtamp duty on writs granted for the relief of the ſuitors of the court of chancery; it was enacted by the ſtat. 23 Geo. II. c. 25. that thereout the 10,590*l*. 12*s*. 11*d*. ſhould be paid to the creditors of this office:—that the ſaid duty ſhould be made perpetual; 'and out of it 3000*l*. *per annum.* ſhould be paid to the "clerk of the hanaper:"—that the reſidue of the 13,698*l*. 1*s*. 11*d*. ſhould be laid out in government ſecurities, and the intereſt paid to the "clerk of the hanaper," who ſhould pay 1,200*l*. to the maſter of the rolls:—and that in caſe the revenue of this office ſo augmented, ſhould be more than ſufficient to pay all fees, ſalaries, &c. the clerk ſhould account for the ſurplus.

Clerk *of the Inrollments of Fines and Recoveries*, in the court of common pleas, is an officer under the three elder judges of that court, and removeable at their pleaſure, who inrols and exemplifies all fines and recoveries, and returns writs of entry, &c. See Inrollment.

Clerk *of the Juries*, is an officer belonging to the court of common pleas, who makes out the writs called *habeas corpus*, and *diſtringas*, for the appearance of juries, either in that court or at the aſſiſes; after the panel is returned upon the *venire facias*. He alſo enters into the rolls the awarding of theſe writs; and makes all the continuances, from the going out of the *habeas corpora* until the verdict is given. See Jury.

Clerk *of the Market*, is an officer of the king's houſe, whoſe duty is to take charge of the king's meaſures; and to keep ſtandards of them, that is, examples of all the meaſures that ought to be uſed through the land; as of ells, yards, quarts, gallons, &c.; and of weights, buſhels, &c.; and to ſee that all weights and meaſures in every place be anſwerable to the ſaid ſtandard. With regard to this officer's duty there are divers ſtatutes, as 13 Ric. II. cap. 4; and 16 Ric. II. cap. 3, by which every clerk of the market is to have weights and meaſures with him when he makes aſſay of weights, &c. marked according to the ſtandard; and to ſeal weights and meaſures, under penalties. The ſtat. 16 Car. I. c. 19, enacts, that clerks of the market of the king's or prince's houſehold ſhall only execute their offices within the verge; and head-officers are to act in corporations, &c. The clerks of markets have generally power to hold a court, for which purpoſe they may iſſue out proceſs to ſheriffs and bailiffs to bring a jury before them; and give a charge, take preſentments of ſuch as keep or uſe falſe weights and meaſures; and may ſet a fine upon the offenders, &c. 4 Inſt. 274. But if they take any other fee or reward than what is allowed by ſtatute, &c. or impoſe any fines without legal trial; or otherwiſe miſdemean themſelves; they ſhall forfeit 5*l*. for the firſt offence; 10*l*. for the ſecond; and 20*l*. for the third offence; on conviction before a juſtice of peace, &c. The "Court of the clerk of the market" is incident to every fair and market in the kingdom, to puniſh miſdemeanours therein; as a court of "pie-powdre" is to determine all diſputes relating to private or civil property. It is the moſt inferior court of criminal juriſdiction in the kingdom. Blackſt. Com. vol. iv. See ſtats. 22 Car. II. c. 8. 23 Car. II. c. 12, and Weights and Measures.

Clerk *Marſhal* of the king's houſe, ſeems to be an officer who attends the marſhal in his court, and records all his proceedings. See Marshal.

Clerk *of the Nichils*, or *Nihils*, is an officer in the exchequer; who makes a roll of all ſuch ſums as are *nihilled* by the ſheriffs upon their eſtreats of green-wax; and delivers the ſame into the lord treaſurer's remembrancer's office, to have execution done upon them for the king. Stat. 5 Ric. II. c. 13. See Nihil.

Clerk *of the Ordnance*, is an officer in the Tower, who regiſters all orders relating to the king's ordnance. See Ordnance.

Clerk *of the Outlawries*, is an officer belonging to the court of common-pleas; being a deputy to the king's attorney-general, for making out the writs of *capias utlagatum*, after outlawry; and the king's attorney's name is to every one of thoſe writs.

Clerk *of the Paper-Office*, is an officer of the king's bench, who makes up the paper-books of ſpecial pleadings and demurrers in that court.

Clerk *of the Papers*, an officer in the court of common-pleas, who keeps the papers of the warden of the Fleet, enters commitments and diſcharges of priſoners, delivers out day-rules, &c.

Clerk *of the Parcels*, an officer of the exchequer. See Parcel-*Makers*.

Clerk *of a Pariſh*. See Parish *Clerk*.

Clerk *of the Parliament Rolls*, is an officer who records all things done in parliament; and engroſſes them fairly into parchment rolls for the better preſervation of them to poſterity. Of theſe there are two; one of the houſe of lords, and the other of the houſe of commons.

Clerk *of the Patents*, or letters patent under the great ſeal; an office created 18 Jac. I. See Patent.

Clerk *of the Peace*, is an officer belonging to the ſeſſion of the peace, whoſe duty is at the ſeſſion to read the indictments, to inrol the acts, and draw the proceſſes; to inrol proclamations of rates for ſervants' wages; to inrol the diſcharge of apprentices; to keep the counterpart of the indenture of armour, to preſerve the regiſter-book of licences given to badgers of corn, of perſons licenſed to kill game, to regiſter the eſtates of papiſts and of others not taking the oaths, &c. He alſo certifies into the king's bench tranſcripts of indictments, outlawries, attainders, and convictions, had before the juſtices of the peace within the time limited by ſtatute. He is appointed by the *cuſtos rotulorum* of the county, and liable to be diſcharged for miſdemeanour by the juſtices of peace in quarter-ſeſſions. See ſtats. 37 Hen. VIII. c. 1. 1 W. & M. c. 21. The following is the form of the oath preſcribed by the latter ſtatute, to be taken by the clerk of the peace, in open ſeſſions, before he enters on his office:

"I C. P. do ſwear, that I have not (paid) nor will pay any ſum or ſums of money, or other reward whatſoever, nor given any bond or other aſſurance to pay any money, fee, or profit, directly or indirectly, to any perſon or perſons whomſoever for (my) nomination or appointment.

So help me God."

He is alſo to take the oaths of allegiance, ſupremacy, and abjuration, and perform ſuch requiſites as other perſons who qualify for offices. By ſtat. 22 Geo. II. c. 46. § 14, No clerk of the peace, or his deputy, ſhall act as ſolicitor, attorney, or agent at the ſeſſions where he acts as clerk or deputy, on penalty of 50*l.* with treble coſts. If the juſtices of the peace ſhould diſcharge this officer for miſconduct, the cuſtos rotulorum is to chuſe another, reſident in the county, or on his default the ſeſſions may appoint one:—the place is not to be ſold, on pain of forfeiting double the value of the ſum given by each party, and diſability to enjoy their reſpective offices, &c. Stat. 1 W. & M. Seſſ. 1. c. 21.

CLERK *of the Pells*, belongs to the exchequer; his buſineſs is, to enter every teller's bill into a parchment roll, called *pellis receptorum;* and alſo to make another roll of payments, called *pellis exituum*, wherein he ſets down by what warrant the money was paid. 22 and 33 Car. II. c. 22. This officer is appointed for life, by a conſtitution under the hands and ſeals of the commiſſioners of the Treaſury, to exerciſe his office either by himſelf or his deputy. In conſequence of this privilege, it has not been uſual, for many years, for the clerk of the pells to execute any part of the buſineſs himſelf; the deputy tranſacts the whole, and receives and accounts with his principal for all the profits that belong to him.

CLERK *of the Petty Bag*, is an officer in chancery, whereof there are three; the maſter of the rolls being the chief. Their office is to record the return of all inquiſitions out of every county, all liveries granted in the court of wards, all oſter les mains; to make all patents of cuſtomers, gaugers, comptrollers, and aulnagers; congé d'elires for the creations of biſhops; ſummonſes of the nobility and burgeſſes to parliament; commiſſions directed to the knights and others, of every ſhire, for aſſeſſing of ſubſidies and taxes; writs for nomination of collectors for the fifteenths; and all traverſes upon any office, bill, or otherwiſe; and to receive the money due to the king for the ſame. See PETTY-*Bag*.

CLERK *of the Pipe*, an officer in the exchequer, who having the accounts of debts due to the king, delivered and drawn out of the remembrancer's offices, charges them down in the great roll, and is called "Clerk of the Pipe," from the ſhape of that roll, which is put together like a pipe; he alſo writes out warrants to the ſheriffs to levy the ſaid debts upon the goods and chattels of the debtors; and if they have no goods, then he draws them down to the lord treaſurer's remembrancer, to write eſtreats againſt their lands The ancient revenue of the crown ſtands in charge to him, and he ſees the ſame anſwered by the farmers and ſheriffs; he makes a charge to all ſheriffs of their ſummons of the pipe, and green wax, and takes care it be anſwered in their accounts. He hath alſo the drawing and engroſſing of all leaſes of the king's lands; having a ſecondary and ſeveral clerks under him. In the reign of king Hen. VI. this officer was called "Ingroſſator magni rotuli." See ſtat. 33 Hen. VIII. c. 22. See PIPE-*Office*.

CLERK *of the Pleas*, is an officer in the exchequer, in whoſe office the officers of the court, upon ſpecial privilege belonging to them, ought to ſue, and be ſued, in any action.

The clerk of the pleas has under him many clerks, who are attornies in all ſuits commenced or depending in the court of exchequer.

CLERKS *of the Privy-ſeal*, are four officers who attend the lord-keeper of the privy-ſeal, or, if there be none ſuch, the principal ſecretary of ſtate; and write, or make out, all things ſent by warrant from the ſignet to the privy-ſeal, and to be paſſed to the great ſeal; as alſo to make out privy-ſeals upon any ſpecial occaſion of the king's affairs; as for loan of money or the like.

He that is now called "Lord Privy-Seal," ſeems to have been in ancient times called "Clerk of the Privy-Seal," and yet to have been reckoned in the number of the great officers of the realm. Stats. 12 R. II. c. 11. 27 Hen. VIII. c. 11.

CLERK *of the Remembrance*, an officer in the exchequer, who is to ſit againſt the clerk of the pipe, to ſee the diſcharges made in the pipe, &c. Stat. 37 Ed. III. c. 4. The clerk of the pipe and remembrancer ſhall be ſworn to make a ſchedule of perſons diſcharged in their offices. Stat. 5 Ric. II. ſt. 1. c. 15.

CLERK *of the Rolls*, in chancery, an officer who ſearches for, and copies deeds, offices, &c.

CLERK *of the Rules*, in the court of king's bench, an officer who draws up and enters all the rules and orders made in court, and gives rules of courſe in divers writs. This officer is mentioned in ſtat. 22 and 23 Car. II. c. 22.

CLERK *of the Sewers*, is an officer belonging to the commiſſioners of the ſewers, who writes down all things they do by virtue of their commiſſion, and the authority given them by 13 El. cap. 9. See SEWERS.

CLERK *of a ſhip*, is an officer appointed to take care that nothing be ſquandered or ſpent needleſsly.

He is obliged to keep a regiſter, or journal, containing an exact inventory of every thing in the loading of the veſſel; as the rigging, apparel, arms, proviſions, ammunition, merchandizes; as alſo the names of the paſſengers, if there be any; the freight agreed on; a liſt of the crew, their age, quality, wages; the bargains, purchaſes, ſales, or exchanges the ſhip makes from its departure; the conſumption of proviſion; and, in ſhort, every thing relating to the expence of the voyage. He alſo regiſters the conſultations of the captains, pilots, &c. He alſo does the office of a regiſter in all criminal proceſſes; and of a notary, to make and keep the wills of thoſe who die in the voyage; takes inventories of their effects, &c. The clerk is not allowed to quit the veſſel during the voyage, on forfeiture of all his wages, &c. In ſmall veſſels, the maſter, or pilot, does the office of clerk.

CLERK *of the Signet*, is an officer continually attending on the king's principal ſecretary; who has cuſtody of the privy-ſignet, as well for ſealing the king's private letters, as for ſuch grants as paſs his majeſty's hands by bills ſigned. Of theſe there are four, who attend in their turn, and have their diet at the ſecretary's table.

The fees of the clerk of the ſignet and privy-ſeal are limited particularly by ſtatute, with a penalty annexed for taking any thing more. 27 Hen. VIII. c. 11.

CLERK *of the King's Silver*, is an officer belonging to the common-pleas; to whom every fine is brought, after it has paſſed the office of the *cuſtos brevium*; and by whom the effect of the writ of covenant is entered into a paper-book; according to which note, all the fines of that term are alſo recorded in the rolls of the court. After the king's ſilver is entered, it is accounted a fine in law, and not before. See FINE. See alſo QUEEN *Gold*.

CLERK *of the Superſedeas*, is an officer in the court of common-pleas, who makes out writs of *ſuperſedeas* (upon the defendant's appearing to the exigent on an outlawry) whereby the ſheriff is forbidden to return the exigent.

CLERK *of the Treaſury*, an officer of the common-pleas who has charge of the records of the court, and makes out all the records of *niſi prius*, and has the fees due for all ſearches and the certifying of records into the king's bench, when a writ of error is brought. He alſo makes out all writs of *ſuperſedeas de non moleſtanda*, which are granted for the defendants while the writ of error is depending: and all exemplifications of records, being in the treaſury.

He is the ſervant of the chief juſtice, and removeable at pleaſure; whereas all other officers of the court are for life. There is a ſecondary, or under-clerk of the treaſury, for aſſiſtance; who hath ſome fees and allowances; and likewiſe an under-keeper, that always keeps one key of the treaſury door, and the chief clerk of the ſecondary, another; ſo that the one cannot come in without the other.

CLERK *of the King's great Wardrobe*, keeps an account or inventory, in writing, of all things belonging to the king's wardrobe. Stat. 1 Ed. IV. c. 1. See WARDROBE.

CLERK *of the Warrants*, is an officer belonging to the court of common-pleas, who enters all warrants of attorney for plantiff and defendant in ſuits; and inrols all deeds in indentures of bargain and ſale, which are acknowledged in the court, or before any judges out of the court; and it is his office to eſtreat into the exchequer all iſſues, fines, and amerciaments, which grow due to the king in that court, for which he has a ſtanding fee or allowance.

CLERKS, *Regular*, a general denomination, comprehending ſeveral diſtinct religious orders, and aſſumed to denote a reformation attempted to be introduced among them. See THEATINS and FATHERS.

CLERKS, *Regular, of the Company of Jeſus*. See JESUITS.

CLERKS, *Regular, of St. Maieul*. See FATHERS *of Somaſquo*.

CLERKS, *Regular, of St. Paul*. See BARNABITES.

CLERKS, *Miſpriſion of*. See MISPRISION.

CLERK, *riding*. See RIDING.

CLERKS, *Six*. See SIX.

CLERKS, *Apoſtolic*, in *Eccleſiaſtical Hiſtory*. See JESUATES.

CLERKE, CHARLES, in *Biography*, a celebrated Engliſh navigator, was bred up to the navy from his youth, and during the war which began in 1756 ſerved in various actions; particularly in that between the Bellona and Courageux, where, being ſtationed in the mizen-top, he was carried over board with the maſt, but was taken up without having received any hurt. He accompanied commodore Byron in his firſt voyage round the world in the ſtation of a midſhipman; and in the year 1768 he again circumnavigated the globe as maſter's mate and lieutenant on board the Endeavour. Soon after his return in 1775, he was appointed maſter and commander. In captain Cook's laſt voyage, Mr. Clerke was captain of the Diſcovery, and upon the diſaſtrous death of that celebrated officer he ſucceeded to the chief command; but did not long enjoy that new dignity. Having manifeſted ſymptoms of a conſumption before he left England, the diſeaſe not only continued during his whole voyage, but was aggravated by long reſidence in cold northern climates. Such, however, was the ardour of his mind in the proſecution of the ſervice to which he was devoted, that declining to avail himſelf of the only chance for prolonging life by returning to a warmer climate, he perſiſted in his endeavours to explore a paſſage between the Aſiatic and American continents, until all his officers were unanimous in their opinion that it was impracticable. Retaining his ſpirits and manifeſting ſingular firmneſs and equanimity during the progreſs of his diſeaſe, his life was at length prematurely terminated on the 22d of Aug. 1779, in the 38th year of his age, within view of the coaſt of Kamſchatka. Cook's Third Voyage, vol. iii. p. 281.

CLERKE'S *Harbour*, otherwiſe called *Port Clerke*, in *Geography*, lies to the S. of Pickerſgill's cove, in Chriſtmas ſound (which ſee), and is much larger than the cove. On the N. of ſome low rocks lying off a point on Shag iſland is the entrance into Port Clerke at W. by S. 1½ mile, with from 12 to 24 fathoms. Here may be procured both wood and freſh water, which are two very eſſential articles in ſuch a climate. To the ſouthward of this port about a mile, a large iſland appears to cover another bay from S. and S.E. winds.

CLERKE'S *iſlands*, are two iſlands, ſituated in the north Pacific ocean, on the weſtern ſide of the American continent. At a diſtance they appear to be of conſiderable extent, and to contain ſeveral hills connected by land, but ſeeming to form a group of iſlands. Near the eaſt point is a ſmall iſland, having upon it 3 elevated rocks. N. lat. 63° 15'. W. long. 190° 30'.

CLERKE'S *rocks*, are ſituated on the coaſt of ſouth Georgia, in about 55° 5'. S. lat. and 34° 4' W. long. 12 leagues S. 75° E. from Cooper's iſland.

CLERMONT, a county of America, in the ſtate of Ohio, bounded N. on Warren county, S. on the Ohio, E. on Adams, and W. on Hamilton county. Its extent from N. to S. is 30 miles, and from E. to W. 23 miles. By the cenſus of 1803 it contained 755 inhabitants; it has one ſenator in the ſtate legiſlature and one repreſentative.

CLERMONT, a poſt-town of America, in Columbia county, and the ſtate of New York; 117 miles N. of New York, and 212 from Philadelphia. The townſhip contains 867 inhabitants, including 113 ſlaves.

CLERMONT, a town of America, in New Hampſhire, on the eaſt bank of the river Connecticut, between Dartmouth and Charleſton.

CLERMONT, or CLERMONT *en Beauvaiſis*, a town of France, and principal place of a diſtrict in the department of the Oiſe, ſeated on an eminence near the Breſche; 7½ poſts N. of Paris. The place contains 1995, and the canton 10,465 inhabitants: the territory includes 145 kiliometres and 18 communes.

CLERMONT, a city of France, and capital of the department of Puy-de-Dôme; before the revolution the capital of Auvergne, and the ſee of a biſhop, ſuffragan of Bourges: ſeated on a ſmall eminence at the foot of a lofty mountain. The place, comprehending the N. S. and S. E. cantons, contains 24,478, and the 3 cantons 38,485 inhabitants: the territory of the firſt canton includes 52½ kiliometres and 5 communes; that of the ſecond 67½ kiliometres and 2 communes: and that of the third 120 kiliometres and 3 communes. The commerce of this city conſiſts in corn, wine, wool, woollen ſtuffs, tammies, ſerges, linen, lace, &c.

Near this place are ſome mineral ſprings, and the water of a brook, which paſſes through one of the fauxbourgs, petrified a wooden bridge to perfect ſtone, ſo that carriages can paſs over it. A council was held here in the year 1095, to determine on the cruſade againſt the infidels in the Holy Land, during the pontificate of Urban II. It is called Clermont-Ferrand from the town of Montferrand being united to it, and forming one of its fauxbourgs; diſtant 23¾ poſts W. from Lyons, and 46¾ S. from Paris. N. lat. 45° 46' 44". E. long. 3° 5' 2".

CLERMONT, a town of France, in the department of the Hérault, and chief place of a canton, in the diſtrict of Lodève, 20 miles W. of Montpellier. The place contains 5430, and the canton 11,440 inhabitants: the territory includes 167½ kiliometres and 15 communes. The chief trade conſiſts in wool and cattle, with manufactures of cloth and hats for exportation.

CLERMONT, a town of France, in the department of the Meuſe, and chief place of a canton in the diſtrict of Verdun; ſeated on an eminence ſurrounded with woods and paſtures; 4 leagues W.S.W. of Verdun. The place contains 1598, and the canton 9660 inhabitants: the territory

tory includes 207½ kilometres and 17 communes. N. lat. 49° 7'. E. long. 4°.

Clermont, a town of France, in the department of the Lot and Garonne; 3 leagues W. of Agen.

Clermont, a town of France, in the department of the Sarthe, 1 league N.E. of La Flèche.

Clermont *Manuſcript*, *Codex Claromontanus* or *Regius* 2245, in *Biblical Literature*, is a Greek-Latin copy of St. Paul's Epiſtles, found in the monaſtery of Clermont en Beauvaiſis in France, and uſed by Beza, together with the Cambridge MS. in preparing his edition of the New Teſtament.

Wetſtein charges Beza with a miſtake in regard to its having been preſerved at Clermont, and ſays that he confounded it with the Cambrige MS. He conjectures that it was brought into Switzerland from the monaſtery of Cluny which the Swiſs plundered, and that Beza deſignedly concealed the manner in which it came into his poſſeſſion. But this reflection on the part of Wetſtein is thought to be partial and unjuſt; as Beza, who had procured it either by purchaſe or gift, and thus reſcued it from deſtruction, might have openly avowed the fact, without incurring the charge of a literary theft, or being in danger of having it redemanded. From the hands of Beza it came into the Putean library, a library which derived its name from the family of Du Puy; the proprietor being Jacques du Puy, who was librarian to the king of France, and died in 1656. Du Puy bequeathed it with all his other MSS. to the Royal Library at Paris, where it is now preſerved and marked Cod. Græc. 107; and it is noted D in the ſecond part of Wetſtein's New Teſtament. This copy is written on vellum in Greek and Latin, with ſome mutilations. According to the accounts of Wetſtein and Sabatier, thirty-ſix leaves were cut out of it, in the beginning of the laſt century, probably by John Aymon, a noted literary thief, who robbed both the royal and private libraries; and theſe leaves were ſold in England; but they were ſent back by lord Oxford in 1729. The MS. is therefore again complete, as there fails only the covering, in which the ſtolen ſheets had been incloſed, which is kept in the Britiſh Muſeum, and filled with the letters that paſſed on the occaſion, as a monument of this infamous theft.

This manuſcript, like other codices Græco-Latini, has been accuſed of having a Greek text that has been altered from the Latin. Wetſtein has produced ſeveral examples, of unequal weight, in ſupport of this charge. Nevertheleſs, though perhaps the charge is not wholly unfounded, it harmonizes with other ancient verſions, more eſpecially the Syriac; and as no one can ſuppoſe, that this MS. has been corrupted from them all, no other cauſe of coincidence can be aſſigned beſides its high antiquity. From ſeveral examples, produced by Michaelis in conſequence of having examined only a few chapters, it may be concluded, that the ſuſpicion of its having been altered throughout from the Latin is ungrounded. Mill contended that the Codex Claromontanus was the ſecond part of the Cantabrigienſis: but Wetſtein has ſufficiently confuted this opinion, and ſhewn that the former is by no means connected with the latter, as appears from the difference of their form, their orthography, and the nature of the vellum on which they are written. This has likewiſe been confirmed by Grieſbach in his "Symbolæ Criticæ," who has examined both MSS.

Beza was the firſt who made uſe of the Clermont MS.; it was afterwards collated by Morinus, with a view of diſcovering readings in ſupport of the Vulgate; more copious extracts were given in the London Polyglot, which Mill transferred to his Greek Teſtament; and Wetſtein has twice collated it himſelf in 1715 and 1716. The Latin verſion publiſhed by Sabatier was taken from this manuſcript and the Sangermanenſis.

With regard to the antiquity of this MS. Sabatier eſtimates it at 1200 years; and it is ſuppoſed by Montfaucon to have been written in the 7th century. He has deſcribed it in his "Palæographia Græca," p. 217), and in the plate fronting this page he has given a fac-ſimile of its characters. Though written in Uncial letters, it has accents and marks of aſpiration, of which Montfaucon ſays: "ſecundâ manu, ut videtur, nec diu, ut creditur, poſt deſcriptum codicem adjecti ſunt." The marks of aſpiration, however, are not of the modern ſemicircular form. This MS. was probably written in the weſt of Europe, not only becauſe it has a Latin tranſlation, but becauſe the epiſtle to the Hebrews is written at the end; and in the catalogue of the books of the New Teſtament placed after the epiſtle to Philemon, no mention is made of the epiſtle to the Hebrews. To this may be added, that neither Simon nor Wetſtein has noted that this epiſtle is written even by a later hand, and was therefore wholly excluded from the canon by the original writer of the manuſcript. Conſequently, as the epiſtle to the Hebrews was, during a conſiderable time, rejected by the Church of Rome, but not by the Greek Church, it is certain, that the Codex Claromontanus was written in a country, that was under the dominion of the former. Michaelis's Introd. to the New Teſtament by Marſh, vols. ii. and iii. See Cambridge *Manuſcript*.

In the above-mentioned catalogue the Latin order of the goſpels is likewiſe obſerved, *viz.* Matthew, John, Mark, Luke, which furniſhes additional evidence that it was written by a member of the Latin church.

CLERODENDRUM, in *Botany*, (from κληρος, *lot* or *fortune*, and δενδρον, *a tree*; ſortunate tree). Linn. Gen. 789. Schreb. 1057. Willd. 1202. Gært. 340. Juſſ. 106. Vent. 2. 316. (Peragu, Encyc. Meth.) Claſs and order, *didynamia angioſpermæ*. Nat. ord. *Perſonatæ*, Linn. *Vitices*, Juſſ. *Pyrenaceæ*, Vent.

Gen. Ch. *Cal.* Perianth one-leafed, campanulate; ſegments five, ovate-acute, broader than the tube of the corolla, permanent. *Cor.* monopetalous, irregular; tube long, ſlender; border regularly cleft, upper ſegments more deeply divided. Filaments four, filiform, much longer than the corolla, aſcending and widely ſpreading through its two upper fiſſures; anthers ſimple. *Piſt.* Germ roundiſh; ſtyle the length of the filaments; ſtigma ſimple. *Peric.* Berry, or rather drupe, encloſed by the inflated calyx, one-celled, with four ſtones, (pyrenes, Gært.) often ſeparating into four parts in the ſtate of maturity; ſtones or pyrenes one-celled, each containing a ſingle kernel or ſeed.

Eſſ. Ch. Calyx five cleft, campanulate. Tube of the corolla ſlender; border five-cleft equal. Stamens very long, projecting through the two upper fiſſures of the corolla, widely ſpreading. Berry or drupe one-celled; ſtones four, each with a ſingle ſeed.

Obſ. There is a great reſemblance in the general habit and ſeveral prominent characters between the ſpecies of this genus and thoſe of volkameria. It differs from the latter in having a ſimple, not a bifid ſtigma, and one-ſeeded, not two-ſeeded ſtones. The number of kernels or ſeeds is, however, in both genera exactly the ſame.

Sp. 1. C. *infortunatum*, Linn. Sp. Pl. 1. Mart. 1. Poir. 1. Willd. 1. Gært. tab. 57 fig. 1. Lam. Ill. tab. 544. Lour. 387. (Peragu, Rheed. Hort. Mal. 2. tab. 25.) "Leaves heart-ſhaped, tomentous." A ſhrub about three feet high, (ſeven feet, Lour.) *Roots* fibrous, yellow or reddiſh. *Stems* cylindrical near the bottom, quadrangular above with a deep groove on each of the ſides, cloathed with a ruſſet down. *Leaves* oppoſite, without ſtipules, cordate-acute, entire, nerved; their upper ſurface deep green, with a few very ſhort, fine, ſcattered hairs; their under ſurface cloathed with a thick, cloſe, ruſſet down. *Flowers* yellowiſh white, (bright ſcarlet, Lour.) in a terminal pyramidal panicle; each peduncle terminated by one or two pedicelled flowers. *Fruit* blackiſh when ripe. A native of ſandy places on the coaſt of Malabar and other parts of the Eaſt Indies. 2. C. *fortunatum*, Linn. Sp. Pl. 2. Mart. 2. Poir. 2. Willd. 2. Oſbeck. It. tab. 11. "Leaves lanceolate, quite entire." A ſhrub. Stems cylindrical, ſlightly hoary. *Leaves* two or three inches long, more than an inch broad, oppoſite, petioled, naked, nerved, a little decurrent along the petioles; petioles a third of the length of the leaves, rather cylindrical near the baſe, ſtriated and almoſt flat above. *Flowers* yellowiſh white, axillary, in ſmall corymbs; common peduncles an inch long, narrow, ſcarcely pubeſcent, dividing into ſhort branched bifurcations, each ſupporting a ſingle flower; calyx much expanding, deeply divided; ſegments ovate, acute, ſmooth, permanent; tube of the corolla ſcarcely longer than the calyx; filaments nearly twice the length of the corolla, capillary; anthers oval, very ſmall; piſtil ſhorter than the ſtamens. A native of the iſland of Java and other parts of the Eaſt Indies. 3. C. *calamitoſum*, Linn. Mant. 90. Mart. 4. Poir. 3. Willd. 3. (Volkameria alternifolium, Burm. Ind. tab. 44??) "Leaves oval, ſomewhat toothed, naked." *Stem* erect, woody. *Leaves* oppoſite, petioled; petioles one-third of their length. *Flowers* ſmaller than thoſe of the preceding ſpecies, axillary, in a ſpreading panicle. A native of Java. 4. C. *phlomoides*, Linn. jun. Suppl. 292. Mart. 3. Poir. 4. Willd. 4. Vahl. Symb. 2. (Volkameria multiflora, Burm. tab. 45. fig. 1.). "Leaves egg-ſhaped, entire, toothed and angular; peduncles axillary, with about three flowers." A hoary ſhrub. *Stems* woody, whitiſh, pubeſcent, nearly cylindrical. *Leaves* oppoſite, petioled, acute, thick, tomentous, yellowiſh white on both ſides, entire near the baſe, toothed and almoſt angular from the middle to the ſummit, nearly as broad as long; petioles about half an inch long, a little ſhorter than the leaves. *Flowers* white, forming altogether a ſpreading panicle; branches axillary, from the upper leaves; peduncles tomentous, white, nearly the length of the leaves; bractes ovate, acute, entire, tomentous, white; calyx campanulate, divided nearly to the middle; ſegments open, lanceolate, very acute; tube of the corolla at leaſt three times longer than the corolla, ſlender, enlarged near its orifice; diviſions of the border five, ſhort, ovate, a little reflexed; ſtamens half as long again as the corolla, leſs ſpreading than in the other ſpecies. A native of the Eaſt Indies; found by Koenig and Sonnerat. 5. C. *umbellatum*, Poir. 5. "Leaves coriaceous, egg-ſhaped, ſhining, quite entire; flowers ſomewhat umbelled." A ſhrub. *Stems* tetragonous, quite ſmooth, ſtriated, reddiſh or purple. *Leaves* oppoſite, petioled, quite ſmooth, very acute, about three inches long, one inch broad; petioles very ſhort. *Flowers* reddiſh, in a terminal four-rayed umbel; peduncles twice biehotomous or trichotomous, with one flower at the ends of the laſt diviſions; calyx pubeſcent, tubular, cleft to the middle; ſegments narrow, linear; tube of the corolla more than an inch long, ſlender; lobes of the border rather large; filaments twice the length of the corolla, purple. A native of Africa; found by Smeathman; deſcribed from a ſingle branch in the herbarium of La Marck. 6. C. *ſquamatum*, Mart. 7. Poir. 6. Willd. 5. Vahl. Symb. 2. p. 74. "Leaves heart-ſhaped, obſcurely angular; branches of the panicle dichotomous, ſmooth." *Stems* fruteſcent erect; branches ſmooth, tetragonous, with a groove on each ſide. *Leaves* from three to five inches long, from two to four broad, with a deep ſinus at their baſe, oppoſite, acute, entire, or ſometimes obſcurely toothed, three or five-nerved, tender, ſmooth; pale green underneath, and covered with minute, roundiſh, umbilicated ſcales; deeper green above, and cloathed with a few ſmall very ſhort hairs; petioles at firſt villous, afterwards ſmooth, at leaſt as long as the leaves. *Flowers* in a large, terminal, ſpreading, ſmooth, panicle; peduncles deeply furrowed, thrice dichotomous, ſometimes trichotomous at the ſecond diviſion; pedicels one-flowered, filiform; lower bractes oppoſite, petioled, oppoſite, heart-ſhaped, ſlightly villous; upper ones ſeſſile, narrow, awl-ſhaped; calyx deeply divided; ſegments quite ſmooth, a little coloured, oval, acute, permanent; tube of the corolla ſlender, three times the length of the calyx; diviſions of the border lanceolate, acute; ſtamens projecting two inches out of the corolla; piſtil of the ſame length. A native of the Eaſt Indies. Specimens ſent by Sonnerat are preſerved in the Herbarium of La Marck, from which Vahl formed his ſpecific character and deſcription. Poiret, who examined the ſame ſpecimens, was induced by appearances to ſuſpect that the ſuppoſed ſcales on the under ſurface of the leaves are really either a kermes, or ſome kind of paraſitic fungus, allied to æcidium. If this ſuſpicion be well founded, the plant is miſnamed, and loſes the moſt prominent part of its ſpecific character. 7. C. *trichotomum*, Mart. 6. Poir. 7. Willd. 6. Thunb. Jap. 256. (Seo kuſits, vulgo kuſaggi, Kæmpf. Amœn. 827. Ic. Select. tab. 22.) "Leaves lobed and undivided, broad-egg-ſhaped, quite entire; panicle trichotomous." *Stems* fruteſcent; branches ſmooth, tetragonous, with a deep furrow on each ſide. *Leaves* oppoſite, petioled; lower ones larger, three-lobed; upper ones undivided; uppermoſt very ſmall; all acuminate, ſmooth, entire, nerved, deep green above, paler underneath; petioles ſlightly pubeſcent, ſhorter than the leaves. *Flowers* white, in a very large panicle, without bractes; peduncles and pedicels ſmooth, compreſſed at the diviſion; calyx inflated, contracted above, with five angles, ſhrivelling but permanent, much wider and ſhorter than the corolla, ſmooth; ſegments keeled, acute, erect; tube of the corolla an inch long, filiform, a little bent; diviſions of the border oblong, obtuſe, ſpreading; filaments inſerted into the tube of the corolla within the throat, whitiſh, divaricated at the bottom; anthers cordate-ovate; germ ſuperior, tetragonous, ſmooth; ſtyle longer than the ſtamens; ſtigma ſimple, truncated. *Fruit* an almoſt globular capſule, ſmooth, with four furrows, four-celled, four-valved. *Seeds* ſmooth, one in each cell. A native of Japan. The leaves have a ſtrong poiſonous ſmell like mandragora. *Obſ.* The fruit of this ſpecies, as deſcribed by Thunberg, is altogether at variance with the eſſential generic character. 8. C. *diverſifolium*, Mart. 8. Poir. 8. Willd. 7. Vahl. Symb. 2 75. "Leaves entire and three-lobed, egg-ſhaped; branches of the panicle dichotomous, villous; pedicels racemed." *Stems* woody; branches tetragonous, with a furrow on each ſide, villous at the top. *Leaves* from ſix to eight inches long, five or ſix broad, oppoſite, petioled, ſmooth, deep green above, covered underneath with ſcales ſimilar to thoſe of C. ſquamatum; lower leaves very large, five-lobed, enlarged at the baſe; lobes acute, middle one much longer, acuminate; upper leaves ſmaller, narrowed at the baſe, three-lobed; two lateral lobes ſhort, rather acute; terminal leaves ſmall, entire, lanceolate, ſeſſile, or narrowed into a petiole. *Flowers* in a large terminal panicle eight or ten inches long, villous in all its ramifications; common peduncles oppoſite, expanding, once or twice dichotomous, terminated by ſimple racemes; calyx pubeſcent, with oblong acute ſegments; tube of the corolla about an inch long, ſlightly pubeſcent, two-lipped; upper lip bifid, with erect linear diviſions; lower one three-lobed, the two lateral lobes ſhorter than that in the middle; filaments nearly twice the length of the corolla. A native of the Eaſt Indies. Deſcription formed by Vahl from ſpecimens communicated to La Marck by Sonnerat. 9. C. *paniculatum*, Linn. Mant. 90. Mart. 5. Poir. 9. Willd. 8. Vahl. Symb. 2. 74. "Leaves lobed, ſerrated; panicles very large." Linn. "Leaves five-lobed, toothed, ſmooth; panicle brachiate; axils woolly." Vahl. *Stems* fruteſcent; branches ſmooth, tetragonous, deeply furrowed on each ſide, purple. *Leaves* five or ſix inches long, oppoſite, petioled, heart-ſhaped; lobes unequal, lanceolate, acute, edged with remote ſmall teeth; petioles cylindrical, ſtriated, about the ſize of a pigeon's quill; axils garniſhed with long curling whitiſh hairs. *Flowers* in a vaſt, much branched, expanding panicle, which is about ſix inches long; peduncles oppoſite, ſmooth, many times dichotomous; pedicels capillary, one-flowered; ſegments of the calyx lanceolate, ſmooth; corolla about an inch long; tube filiform, diviſions of the border oblong. A native of the Eaſt Indies.

Clerodendrum *fruticoſum ſpinoſum*, Brown. Jam. See Volkameria *aculeata*.

CLEROMANCY, derived from κληρος, *lot*, and μαντεια, *divination*, a kind of divination performed by the throwing of dice, or little bones; and obſerving the points or marks turned up.

At Bura, a city of Achaia, was a temple, and a celebrated oracle of Hercules; where ſuch as conſulted the oracle, after praying to the idol, threw four dies, the points whereof being well ſcanned by the prieſt, he was ſuppoſed to draw an anſwer from them.

Something of this kind ſeems to have been practiſed with regard to Jonah. See Jonah, i. 7.

CLERORUM, in *Ancient Geography*, an epiſcopal ſee of Aſia, in Phrygia Salutaris.

CLEROTI, among the Athenians, a kind of public arbitrators. See Diætetæ.

CLERVAL, in *Geography*, a town of France, in the department of the Doubs, and chief place of a canton, in the diſtrict of Baume; 7 leagues N.E. of Beſançon. The place contains 1118, and the canton 9005 inhabitants: the territory includes 217½ kiliometres, and 25 communes.

CLERVAUT, a town of France, in the department of the Vienne; 5 miles N. of Chatellerault.

CLERVAUX, a town of France, in the department of the Forêts, and chief place of a canton, in the diſtrict of Dieckirch; the place contains 528, and the canton 6763 inhabitants: the territory includes 262½ kiliometres, and 10 communes.

CLERY, a town of France, in the department of the Somme, and diſtrict of Pèrone; 1 league N.W. of it.

Clery, *Notre-Dame de*, a town of France, in the department of the Loiret, and chief place of a canton in the diſtrict of Orleans; 7 miles S.W. of Orleans. The place contains 2224, and the canton 4473 inhabitants: the territory includes 125 kiliometres, and 4 communes.

CLESSIDES, in *Biography*, an ancient painter, who, imagining himſelf ſlighted by Stratonice, painted a ſatyrical repreſentation of that queen, in the arms of a fiſherman, with whom, it was whiſpered, ſhe was enamoured; hung it up to public view in the port of Epheſus, and then took to his oars and got away. The picture was admirable; and Stratonice, valuing the art more than her own reputation, would not ſuffer it to be removed. Orlandi. Della Valle, Vite dei Pitt. Ant.

CLETÆBENI, in *Ancient Geography*, a people of Arabia Felix, ſituated near the Red Sea, between the Sabæans and Minæans.

CLETCH, in *Rural Economy*, a term ſignifying a young brood, as of chickens, &c.

CLETHARRO, in *Ancient Geography*, a town placed by Ptolemy in Arabia Petræa.

CLETHRA, in *Botany*, (κληθρα, Theoph. lib. i. cap. 10, which Gaza tranſlates *alnus*, alder. H. Stephens derives it from κλειω, *claudo*, to cloſe or ſhut up, referring probably to the ſituation of the ſeeds in the female catkin of the alder.) Linn. Gen. 553. Schreb. 751. Willd. 872. Gært. 383. Juſſ. 160. Vent. ii. 462. Claſs and order, *decandria monogynia*. Nat. ord. *Bicornes*, Linn. Vent. *Ericæ*, Juſſ.

Gen. Ch. *Cal.* Perianth one-leafed, five-cleft, (five-leaved, Gært.); ſegments concave, egg-ſhaped, erect, permanent. *Cor.* Petals five, longer than the calyx, oblong, enlarged towards the ſummit, half-expanding, obtuſe. *Stam.* Filaments ten, a little longer than the petals, awl-ſhaped; anthers forked. *Piſt.* Germ ſuperior, roundiſh; ſtyle permanent; ſtigma trifid. *Peric.* Capſule roundiſh, encloſed in the calyx, three-celled, three-valved; partitions contrary to the valves. *Seeds* ſix or eight in each cell, attached to an angular receptacle, which is finally deciduous.

Eſſ. Ch. Calyx five-cleft. Petals five. Stigma trifid. Capſule three-celled, three-valved.

Sp. 1. C. *alnifolia*, alder-leaved clethra, Linn. Sp. Pl. 1. Mart. 1. Lam. 1. Willd. 1. Gært. i. tab. 63. Lam. Ill. Pl. 369. fig. 1. (Alnifolia americana, Pluk. Alm. tab. 115. fig. 1, 2. Cateſb. Car. i. tab. 66.) "Shrubby; leaves obovate-lanceolate, ſerrated, ſmooth on both ſides; racemes ſimple, in form of ſpikes." *Roots* ſpreading. *Stems* from eight to ten feet high; branches diffuſe, cylindrical, pubeſcent near the ſummit. *Leaves* about three inches long, an inch and quarter broad in the middle, alternate; on ſhort petioles, nerved. *Flowers* white, numerous, in terminal racemes; bractes linear, ſhorter than the flowers, caducous. A native of Virginia and Carolina, in moiſt ground, and on the banks of rivulets. 2. C. *tomentoſa*, Lam. 2. (C. alnifolia, *β*. Hort. Kew.) "Leaves tomentous, hoary underneath." Smaller than the preceding ſpecies. Peduncles, calyxes, and bractes very villous. *Flowers* white. A native of Virginia and Carolina. 3. C. *paniculata*, Hort. Kew. ii. p. 73. Mart. 2. Willd. 2. "Shrubby; leaves lanceolate, naked on both ſides; flowers panicled, bracteate." Panicle not compoſed of racemes, narrow, elongated; peduncles pubeſcent, white. A native of North America, flowering from Auguſt to October. 4. C. *arborea*. "Leaves oblong, acuminate, ſerrated, ſmooth; racemes panicled; flowers without bractes; peduncles hirſute". A tree. *Calyxes* obtuſe. *Receptacles* of the ſeeds not ſolitary at the baſe of each cell, as in C. alnifolia, but fixed laterally at the top of a ſhort three-ſided central column, with which the partitions are in contact. A native of Madeira: introduced by Maſſon in 1784. 5. C. *tinifolia*, Mart. 4. Willd. 4. Poir. Sub. Tinier. Swartz. Prod. 74. Ind. Occid. ii p. 845. (Tinus occidentalis, Linn. Sp. Pl. p. 530. Volkameria arborea, Brown. Jam. 214. tab. 21. fig. 1. Baccifera arbor calyculata, Sloan. Jam. ii. tab. 198. fig. 2, but not the deſcription.) "Leaves oblong, quite entire, hoary underneath; racemes panicled; flowers without bractes, peduncles tomentous." A ſhrub, with the habit of the other ſpecies of clethra, twelve or fourteen feet high; branches ſpreading. *Leaves* alternate, petioled, ſmooth, and green on their upper ſurface, acute, narrowed at the baſe. *Flowers* in axillary and terminal racemes; calyx a little pubeſcent, with five equal ſegments; petals five, a little enlarged, connivent at the baſe; ſtamens ten; filaments free, not projecting; ſtigma trifid. *Fruit* a capſule reſembling a berry, or rather a drupe, ſmooth, roundiſh, three-celled, three-valved. A native of Jamaica.

Obſ. Linnæus, who was imperfectly acquainted with the fructification, made it a diſtinct genus, and placed it in his claſs Enneandria. Juſſieu, without venturing to alter this diſpoſition, conjectured that its ſuppoſed berry would prove a capſule, and that the plant muſt be aſſociated with clethra. Subſequent obſervations have confirmed his opinion.

Clethra, in *Gardening*, contains a plant of the hardy deciduous flowering ſhrubby kind; of which the ſpecies is alder-leaved clethra (C. *alnifolia*), which is a ſhrub that has the roots ſpreading far on every ſide, and ſending up many ſtems, from eight or ten to fourteen feet high, which are covered with a greyiſh bark, and divide into many round alternate branches. The leaves are about three inches long, and an inch and a quarter broad in the middle; of a deep green on their upper ſide, and a whitiſh green underneath, alternate, and on very ſhort petioles. The flowers are on looſe ſpikes from four or five inches to a ſpan long; the petals are white. They appear in July, and, when the ſeaſon is mild, ſome ſpikes are produced in October. It is a native of North America.

Method of Culture. It is capable of being increaſed by ſeeds, layers, and ſuckers.

The ſeeds procured from America ſhould be ſown in pots of light mould, and removed into the ſhade during ſummer, and ſheltered in winter, as ſometimes the plants do not come up till the ſecond ſpring after they have been ſown.

And the layers ſhould be made from the young ſhoots in autumn, and water given them the following ſummer; and in the autumn after, or when well rooted, they ſhould be taken off and planted out in ſeparate pots, or in the places where they are to remain.

In the laſt mode, the ſuckers from the roots may be removed in the autumn, or early ſpring months, fibres being preſerved to them as much as poſſible, and be planted out in pots, or other places where they are to remain.

This is a very ornamental ſhrub, particularly during the time of its bloom, but ſhould have a rather moiſt ſituation.

CLETHRITES *lapis*, a name given by the ancients to ſuch pieces of foſſile wood as ſhewed a grain reſembling that of the wood of the alder.

CLETHY, in *Geography*, a river of South Wales, which riſes in Pembrokeſhire, about 5 miles S.E. of Newport, and joins the Dungledy, 4 miles N. of Pembroke.

CLETON, a river of Wales, which runs into the Dee, two miles below Bala, in Merionethſhire.

CLETTER, a river of Wales, in Cardiganſhire, which runs into the Dovy, a few miles below Machynlleth.

CLEVELAND, a diſtrict of England, in the county of York, on the borders of Durham.

Cleveland, a pleaſant ſmall town of America, in the ſtate of Ohio, and county of Trumbull, favourably ſituated on the borders of lake Erie, at the mouth of Cayahoga river.

CLEVES, a town of Germany, in the circle of Weſtphalia, and capital of a duchy to which it gives name; but ſince the French revolution, the principal place of a diſtrict in the department of the Roer; the place contains 4243, and the canton 8353 inhabitants; and the territory includes 16 communes. It is ſituated on the river Kermiſdal, about two miles from the Rhine, on the brow of a hill, ſurrounded with walls, but not much fortified, and conſiſts of ſeveral irregular ſtreets. The land about the town is very well cultivated, which is owing to the abolition of the great land-holders. About half a mile from the town is a very pleaſant park, with a cloſe avenue of noble plane trees; and near this agreeable ſpot is a mineral ſpring, which in ſummer is much frequented. The Dutch language and coins are current here, as well as the High German. The Roman Catholics, the Lutherans, the Calviniſts, and the Mennonites, have their reſpective churches, and the Jews have a ſynagogue. In the ſame department, in the diſtrict of Cleves, and about the diſtance of five miles from the Rhine, is the town of Calcar: the place containing 1304, and the canton 9345 inhabitants, and the territory including 22 communes. See Calcar.

Cleves is about 10 miles E.S.E. of Nimmeguen. N. lat. 51° 50′. E. long. 5° 50′.

Cleves, *Duchy of*, forming, ſince the revolution, a part of the French department of Roer, is a principality of Germany, which belonged to the king of Pruſſia, and is bounded on the north by Overyſſel and the biſhoprick of Munſter, on the eaſt by the former and the county of Rechlinghauſen, on the ſouth by the county of Mark and duchy of Berg, and on the weſt by Guelderland and Brabant. It is about 50 miles in length, and 13 in breadth; the air is very healthy, but the ſoil is unequal. On the eminence are ſeen fields, woods, and extenſive foreſts, bordered by towns and villages; and on the banks of the Rhine, which runs through this country, are extenſive fine paſtures, which feed a great number of cattle. The produce is corn, tobacco, and all ſorts of vegetables. Game is plentiful, and the rivers abound with all ſorts of fiſh. The manufactures of ſilk, cloth, linen, lace, pipes, &c. are very conſiderable. The whole country contains 22 towns, the principal of which are Cleves, Calcar, Nieder-Weſel, Duiſburg, Xanton, Rees, and Emmerich, in which perſons of all religious ſects are allowed freedom of worſhip. The population, according to the eſtimate of Hoeck (edit. 1801), amounts to 100,000 perſons. The principal rivers are the Rhine, Meuſe, Ruhr, Emſer, Lippe, and the Iſſel. The revenues of Cleves and Mark are ſaid to have amounted to a million of crowns; and the king of Pruſſia, as duke of Cleves, was accuſtomed to pay towards the charges of the empire 1208 florins, and to the Imperial chamber 676 crowns. See Roer.

Cleves, a town of America, in the ſtate of Virginia; two miles north of Port Royal.

CLEUSIS, in *Ancient Geography*, a river which ran from north to ſouth, between Mela and the lake Benacus.

CLEVUM, or Glevum, a town of Great Britain, which, according to the Itinerary of Antonine, lay on the route from Iſca or Caerleon to Calleva or Silcheſter, between Ariconium near Roſs, and Duroconovium or Cirenceſter. It was the preſent city of Glouceſter.

CLEVVY, in *Agriculture*, a term ſometimes provincially applied to a ſort of draft-iron of a plough.

CLEW-*bay*, in *Geography*, a large bay on the weſt coaſt of Ireland, in the county of Mayo, which has been ſometimes called Newport bay. It is twelve miles from eaſt to weſt, and from five to ſeven miles from north to ſouth. At the bottom it is crowded with ſmall iſlands, between ſome of which there is deep and ſafe anchorage. It is ſheltered on the north and ſouth by the mountains of Burriſhoole and Moriſk, and defended from weſtern ſtorms by the high and rocky iſland of Clare. There are two ſmall ports on this bay, Newport Prat and Weſtport, which will be mentioned in their proper places. The entrance S. of Clare Iſland is in about 53° 46′. N. lat. and the whole bay is between 9° 27′ and 9° 46′ long. W. from Greenwich. Beaufort. M'Kenzie.

Clew, or Clue, *of the ſail of a ſhip*, is the lower corner of it which reaches down to that earing where the tacks and ſheets are faſtened; ſo that when a ſail is made goring, or ſloping by degrees, ſhe is ſaid to have a *great clew:* and a ſhip is ſaid to have a great clew, when ſhe has a very long yard, and ſo has much canvas in her ſails.

Clew *garnet*, a rope faſtened to the clew of the ſail, and from thence running in a block ſeized to the middle of the main and fore-yard. Its uſe is to haul up the clew of the ſail cloſe to the middle of the yard, in order to its being furled. Hence to *clew*, or *clue up*, is to haul up the clews of a ſail to its yard by means of the clew-lines.

Clew-*line* is the ſame to the top-ſails, top-gallant-ſails, and ſprit-ſails, that the clew-garnet is to the main-ſail and fore-ſail, and has the very ſame uſe. In a guſt of wind, when a top-ſail is to be taken in, they firſt haul home the lee clew-line, and by that means the ſail is taken in much eaſier.

CLEYER, Andrew, M.D., in *Biography*, was born at Caſſel, near the Rhine, the beginning of the 17th century. His diſpoſition leading him to the ſtudy of medicine, and natural hiſtory, after being initiated in the knowledge of pharmacy and ſurgery, he accepted the office of phyſician to the Dutch ſettlement at Batavia, in the iſland of Java, where he appears to have reſided ſeveral years. He had been previouſly elected a member of the Imperial Academy, whoſe Tranſactions he enriched with numerous curious and intereſting communications, the titles of which follow: "An Account of Hydatids, found in a Human Stomach," "Of the Cuſtom of the Indians, of taking Opium," "ut ad venerem ſe excitent." They think opium, taken in the quantity of a drachm in the day, has the power of prolonging life. In Java, he ſays, the elephantiaſis made its firſt appearance about twenty years before he arrived in the iſland; from his deſcription of the diſeaſe, it appears to have been the yaws. He deſcribes 289 plants growing in the iſland, with the uſes they are put to by the natives; particularly the moxa, ginſeng, and the tea-plant; of the greater part of which there are engravings, elegantly, Haller ſays, but not very accurately, drawn. His publications are, "Specimen Medicinæ Sinicæ, ſive Opuſcula Medica ad Mentem Sinenſium." Francof. 1680, 4to. It conſiſts of ſeveral treatiſes on the pulſe, as deſcribed by the Chineſe; of the indications of diſeaſe, taken from the pulſe, colour of the tongue, &c. The obſervations on the medicine of the Chineſe, in part tranſlated from their books, was the work of William Teu Rhyne, who was alſo reſident in Java, and who complains that they were publiſhed without his knowledge. Haller Bib. Med. Anat. Chir. Bot.

CLEYERA, in *Botany*, Thunb. See Ternstrœmia.

CLEYN, or Clenn, Francis de, in *Biography*, was a native of Roſtock, in Germany; having an inclination towards the fine arts, he went to Rome, where he ſtudied four years. He afterwards came to England, and was employed by James I. to make deſigns for ornamental tapeſtries. His talent lay chiefly in painting friezes, and other groteſque decorations, in which he introduced ſea-nymphs, tritons, and cupids; with ſufficient grace of deſign and freedom of execution. Several paintings by him of this deſcription ſtill exiſt at Holland houſe; and ſeveral of them were engraved by himſelf and others. He died in London, in the year 1658. Pilkington. Strutt.

CLIBADIUM, in *Botany*, (κλιβαδιον, Dioſcor.) Linn. Gen. 1329. Schreb. 1430. Willd. 1670. Juſſ. 191. Claſs and order, *monœcia pentandria*. Nat. Ord. *Corymbiferæ*, Juſſ.

Gen. Ch. *Cal. common* imbricated; ſcales egg-ſhaped, acute. *Cor.* Florets tubular, funnel-ſhaped, five-cleft; male florets in the diſk, numerous, pedicelled; female ones in the ray, three or four. *Stam.* in the males; filaments five, very ſhort, capillary; anthers oblong, approximating, but not united. *Piſt.* in the males abortive; germ very ſmall, ſuperior; ſtyle filiform; ſtigma ſimple; in the females, germ roundiſh, inferior; ſtyle filiform; ſtigma bifid. *Peric. common* none, except the permanent, coloured calyx; *proper*, to the males, none; to the females, a roundiſh, umbilicated drupe, with a yellow viſcid juice. *Seeds* one in each drupe, heart-ſhaped, compreſſed.

Eſſ. Ch. Common calyx imbricated. Anthers of the male florets approximating, not united; female florets three or four. Drupe umbilicated.

Sp. C. *ſurinamenſe*, Linn. Mant. p. 294. Mart. Poir. Willd. (C. fœtidum; Allemand MSS.) *Leaves* oppoſite, petioled, egg-ſhaped, acuminate, acutely crenate, ſcabrous. *Flowers* white; peduncles oppoſite; common calyx violet-coloured, when ripe. *Drupe* green. A native of Surinam.

CLIBANARII. See Cataphracti or Cataphractarii.

CLIBANUS, in *Ancient Geography*, a town of Aſia Minor, in the interior of Iſauria, according to Pliny.—Alſo a mountain of Italy, in Magna Græcia, in the vicinity of the Lacinian promontory. Pliny.

CLICH, a ſabre in uſe among the Turks. It is curved and very large. They have another ſabre, which cuts with one ſide or edge only, and has ſolid iron along the back of it. This is called *gadara*, and is leſs curved than the *clich.* They have alſo a third kind of ſabre, which is ſtraight, rounded, and ſharp at the end, and cuts with both edges. It is called *palas*.

CLICHY *la Garenne*, in *Geography*, a town of France, in the department of Paris; one league W.N.W. of Paris.

CLIDE or Iauclide, in *Ancient Military Language*, a long piece of wood or ſtrong plank, held in its poſition by a counter-weight, which, when looſened from the ſame, lets fly a great weight of ſtones into beſieged fortreſſes. Theſe machines were in uſe under Charlemagne.

CLIDES *inſulæ*. See Cleides.

CLIDOMANCY, from κλεις, a *key*, and μαντεια, *divination*, a ſpecies of divination performed by means of keys. See Datyliomancy.

CLIE, Le, in *Geography*, a lake of Upper Canada, about 38 miles long, and 30 broad; the waters of which communicate with thoſe of lake Huron. N. lat. 44° 20′. W. long. 80°.

CLIENT, Cliens, among the Romans, a citizen who put himſelf under the protection of ſome great man, who, in that relation, was called his patron, *patronus*.

The patron aſſiſted his client with his protection, intereſt, and eſtate, adviſed him in points of law, managed his ſuits, took care of him as of his own child, and to the utmoſt of his power, contributed to ſecure his peace and happineſs: and the client gave his vote for his patron, when he ſought any office for himſelf, or his friends. Clients owed reſpect to their patrons, as theſe reciprocally owed them their protection.

This right of patronage was appointed by Romulus, to unite the rich and poor together, in ſuch manner, as that one might live without contempt, and the other without envy. This patronage was a tie as effectual as any conſanguinity or alliance, and had a wonderful effect towards maintaining union and concord among the people for an interval of 600 years; during which time we find no diſſenſions or jealouſies between the patrons and their clients, even in the times of the republic, when the populace frequently mutinied againſt thoſe who were the moſt powerful in the city. But the condition of a client, in courſe of time, became little elſe but a moderate kind of ſlavery.

By degrees, the cuſtom extended itſelf beyond Rome; and not only families, but cities, and entire provinces, even out of Italy, followed the example. Thus Sicily, *v. gr.* put itſelf under the clientela, or protection of Marcellus.

Lazius and Budæus refer the origin of fiefs and tenures to the patrons and clients of ancient Rome: but the difference is pretty conſiderable between the relation of vaſſals and their lords, and that of clients and their patrons. See Vassal.

The clients, beſide the reſpect they bore their patrons, and the vote they gave them, were obliged to aſſiſt them in all affairs: and even to pay their ranſom, if they ſhould be taken priſoners in war, in caſe they were not able to do it of themſelves; to contribute to the portions of their daughters, and to defray, in part, the charges of their public employments. They were never to accuſe each other, or take contrary ſides; and if either of them was convicted of having violated this law, the crime was equal to that of treaſon, and any one was allowed to kill the offender with impunity.

Client is now uſed for a party in a law-ſuit, who has turned over his cauſe into the hands of a counſellor, or ſolicitor, and who puts himſelf under their protection and defence. Clients are ſo called from their reſemblance to thoſe above-mentioned, who were dependant upon the ancient Roman orators. Thoſe, indeed, practiſed *gratis,* for honour merely, or at moſt for the ſake of gaining influence: and ſo likewiſe it is eſtabliſhed with us (Davis, pref. 22.1 Chan. Rep 38), that a counſel can maintain no action for his fees; which are given, not as *locatio vel conductio,* but as *quiddam honorarium;* not as a ſalary or hire, but as a mere gratuity, which a counſellor cannot demand without doing wrong to his reputation: (Davis, 23); as is alſo laid down with regard to advocates in the civil law, (Ff. 11. 6. 1.), whoſe *honorarium* was directed by a decree of the ſenate not to exceed in any caſe 10,000 ſeſterces, or about 80*l.* of Engliſh money. (Tac. Ann. l. 11.) And, in order to encourage due freedom of ſpeech in the lawful defence of their clients, and at the ſame time to give a check to the unſeemly licentiouſneſs of proſtitute and illiberal men, (a few of whom may ſometimes inſinuate themſelves even into the moſt honourable profeſſions), it hath been holden that a counſel is not anſwerable for any matter by him ſpoken, relative to the cauſe in hand, and ſuggeſted in his client's inſtructions; although it ſhould reflect upon the reputation of another, and even prove abſolutely groundleſs: but if he mentions an untruth of his own invention, or even upon inſtructions, if it be impertinent to the cauſe in hand, he is then liable to an action from the party injured. (Cro. Jac. 90.) And counſel guilty of deceit or colluſion are puniſhable by the ſtatute Weſtm. 1 (3 Edw. I. c. 28.) with impriſonment for a year and a day, and perpetual ſilence in the courts:—a puniſhment ſtill ſometimes inflicted for groſs miſdemeanors in practice. (Raym. 376.) Blackſt. Com. B. 111.

Clients. Gentlemen, who ſerved in the French armies under the pennon of a chevalier, under the banner of a banneret, or under that of the advowée of ſome abbey.

CLIFF, Cliff-Regis, or King's-Cliff, in *Geography,* a town of England, in the county of Northampton, with a weekly market on Tueſdays; 8 miles S. of Stamford, and 88 N. of London.

Cliff, a village in Kent, in the lath of Aylesford, ſituate at the edge of the marſhes which border on the Thames river, near the top of the chalk ſtrata. The ſituation of the ſteeple of its church was determined in the government trigonometrical ſurvey in 1799, by an obſervation from Gad's-hill ſtation diſtant 19,967 feet; and another from Graveſend ſtation diſtant 30,549 feet, and bearing 70° 49′ 7″ S.W. from the parallel to the meridian of Greenwich obſervatory: whence is deduced its latitude 51° 27′ 43″ N. and its longitude 29′ 50″ E.

CLIFFORD, George, in *Biography,* the third earl of Cumberland, a nobleman diſtinguiſhed for his ſkill and enterprize in naval expeditions, was born at Brougham caſtle in Weſtmoreland in the year 1558. He received his college education at Peterhouſe, Cambridge, under Whitgift, who was afterwards archbiſhop of Canterbury. The bent of his purſuits at this period was the ſtudy of mathematics, by which he was afterwards eminently qualified for the ſeveral great expeditions in which he engaged. He was likewiſe much addicted to athletic exerciſes, and is ſaid to have excelled all his contemporaries in tilts, tournaments, and field ſports. The firſt public buſineſs in which we find him engaged, was in 1586, when as a peer of the realm he ſat in judgment upon Mary queen of Scots. In the ſame year he fitted out a ſmall fleet, conſiſting of four veſſels, for the South-ſea, with a view either to maritime diſcoveries, or more probably that he might diſtinguiſh himſelf in injuring the enemies of his ſovereign: his operations were, however, in this inſtance, chiefly confined to the eaſtern coaſt of South America, and he returned with little ſucceſs. In the year 1588, the earl of Cumberland was among the number of thoſe who ſignalized themſelves by the deſtruction of the famous armada intended for the ruin of this country. The valour which he exhibited on this highly intereſting and important occaſion ſo far recommended him to the queen, that as a reward ſhe gave him a commiſſion to proceed to the South-ſeas, and lent him a veſſel of her own for his admiral ſhip. In this and ſome ſubſequent expeditions during three following years, he was generally unfortunate. Not diſcouraged, however, by the want of that ſucceſs which he had anticipated, he undertook, in 1592, another expedition with a fleet of his own: he firſt proceeded to the Azores, where, in conjunction with ſome other Engliſh ſhips, they attacked the Santa Cruz, a rich carrack, which the Spaniards ſet on fire, after they had put the moſt valuable part of its cargo on ſhore; but the Engliſh landed, and made themſelves maſters of it and of the town. The ſhare of the prize-money which ſhould have fallen to the earl of Cumberland, in this expedition, would have been very conſiderable, but from a ſeries of unfortunate occurrences it was reduced to 36,000*l.* In 1593, he made another cruize, and took many valuable prizes: and in 1595 he built a veſſel of 900 tons burden, which was the largeſt that had been ſent to ſea by any Engliſh ſubject; he at the ſame time fitted out three ſmall ones, with a view of undertaking another expedition in which he was diſappointed by the queen's mandate: his ſhips, however, purſued their voyage under a different commander, and were ſucceſsful in capturing a number of veſſels, ſome of which were richly laden. His laſt and moſt conſiderable expedition was in 1598, when he commanded nineteen ſhips; of theſe the principal one was his own great ſhip, to which the queen had given the name of "The Scourge of Malice." With this fleet he proceeded to the Weſt Indies: he firſt touched at the Canaries, and then, after muſtering all his force at the Virgin iſles, he failed to Porto Rico, the capital of which he attacked and captured, with its ſtrong fort of Mora. This town being reckoned the key of the Weſt-

India iſlands, and a paſſage to all the wealth on the continent of America, the noble earl reſolved to keep poſſeſſion of it. For this purpoſe he ſent away the inhabitants to Carthagena, though he aſſerts that he was offered property to the amount of half a million ſterling, to abandon this ſtep. This expedition, though in many reſpects highly ſucceſsful, proved in the end very diſaſtrous. Before his return he loſt more than 700 men, either by diſeaſe or the ſword, beſides ſeveral of his veſſels by ſhipwreck. The character of the earl of Cumberland's expeditions, of which he made eleven, will not bear to be ſeverely ſcrutinized; they were rather of a predatory nature than calculated to improve the noble ſcience of navigation. No diſcoveries are recorded to render his name illuſtrious as a philoſopher, and no very important victories that could give him juſt pretenſions to the title of hero, by which he was, in his own, and ſome ſucceeding ages, deſignated. His adventures were nevertheleſs of conſiderable importance to the nation, as well by exciting and ſupporting a ſpirit of maritime enterprize, as by injuring and reducing the power of Spain. By theſe eleven voyages, and by building ſhips, horſe-racing, tilting, and other expenſive exerciſes, this nobleman is ſaid to have waſted more of his eſtate than any of his anceſtors. It ought not to be omitted that in the year 1592, he was elected knight of the garter: and in 1601, he was one of thoſe who were ſent with forces to reduce the earl of Eſſex to obedience. It appears alſo that he ſat upon the earl's trial and made a feeble oppoſition to the ſentence paſſed on him: ſaying, "that if he thought it would have availed, he would have demanded more time to deliberate on the ſubject; that he deemed it ſomewhat too ſevere, and that any commander in chief might eaſily incur a ſimilar penalty." "But, however," added he, "in confidence of her majeſty's mercy, I agree with the reſt." The earl of Cumberland died at the Savoy in October 1605, and was buried at Skipton, Yorkſhire, where a fine monument was afterwards erected to his memory. He married Margaret, the third daughter of the earl of Bedford, by whom he had two ſons, who died young, and a daughter, who was the celebrated counteſs of Dorſet, Pembroke, and Montgomery. Biog. Brit. Hume's Hiſt.

CLIFFORTIA, in *Botany*, (named by Eichrodt in honour of George Clifford, a merchant at Amſterdam, the friend and patron of Linnæus, a catalogue of whoſe garden was publiſhed by him at Amſterdam in 1737, in a ſplendid folio, under the title of "Hortus Cliffortianus"). Linn. Gen. 1133. Schreb. 1550. Juſſ. 337. Vent. 3. 334. Claſs and order, *diœcia polyandria*. Nat. Ord. *Tricoccæ*, Linn. *Roſaceæ*, Juſſ. Vent.

Gen. Ch. *Male. Cal.* Perianth three-leaved (three-cleft, Juſſ. Vent.) leaves egg-ſhaped, acute, coriaceous, ſpreading, deciduous. *Cor.* none. *Stam.* Filaments about thirty, capillary, erect, the length of the calyx; anthers didymous, oblong, obtuſe, erect, compreſſed. *Female. Cal.* Perianth three-leaved, equal, erect, ſuperior, permanent; leaves acute, lanceolate. *Cor.* none. *Piſt.* Germ oblong, inferior; ſtyles two, filiform, long, plumoſe; ſtigmas ſimple. *Peric.* Capſule oblong, nearly cylindrical, crowned with the calyx, two-celled. *Seeds* linear, one in each cell.

Eſſ. Ch. *Male.* Calyx three-leaved. Cor. none. Stamens about thirty. *Fem.* Calyx three-leaved, ſuperior. Cor. none. Capſule two-celled. Seeds one in each cell.

All the known ſpecies are perennial ſhrubs from the Cape of Good Hope, and have either ternate or ſimple leaves.

* *Leaves ſimple.*

Sp. 1. C. *odorata*, Linn. jun. Supp. 431. Mart. 1. Lam. 8. "Leaves egg-ſhaped, ſerrated, ribbed, villous underneath." A ſhrub, about three feet high, erect, but little branched; branches ſimple, ſomewhat pubeſcent. *Leaves* alternate, on ſhort petioles, obtuſe, reſembling thoſe of mint; nearly an inch and half long, an inch broad; ſtipules at the baſe of the leaf, membranous, ſemibifid, acute; villous as well as the petioles, withering. *Flowers* axillary, ſeſſile. The younger Linnæus had ſeen only a plant with male flowers, which agreed with the other ſpecies, though the habit of the plant is different. Found by Thunberg. 2. C. *ilicifolia*, Linn. Sp. Pl. 1. Mart. 2. Lam. 1. Ill. Pl. 827. fig. 1. Dill. Elth. tab. 31. fig. 35. "Leaves ſomewhat heart-ſhaped, toothed." A ſhrub, two or three feet high, quite ſmooth; branches alternate, diffuſe, covered with ſhort, ſheathing, two-pointed ſtipules. *Leaves* ſmall, alternate, biennial, continuing green all the year, cartilaginous about the edge, placed near together, truncate-heart-ſhaped, or roundiſh, a little embracing the ſtem, jointed on the hinder edge of the ſheathing ſtipule, ſmooth, nerved, edged with rather diſtant ſpinous teeth. *Flowers* green, lateral, axillary, ſolitary, ſeſſile. Cultivated in Chelſea garden, 1714, flowering in June, July, and Auguſt. 3. C. *cordifolia*, Lam. 2. "Leaves heart-ſhaped, quite entire, embracing the ſtem; upper ones toothed." Nearly allied to the preceding; communicated to La Marck by Sonnerat. 4. C. *ruſcifolia*, Linn. Sp. Pl. 2. Mart. 3. Lam. 3. Ill. Pl. 827. fig. 2. (Frutex æthiopicus, &c. Pluk. Alm. 159. tab. 297. fig. 2.) "Leaves lanceolate, quite entire." A ſhrub, about two feet high, thickly branched; branches alternate, compound, aſcending, aſh-coloured, and ſmooth near the bottom, brown and tomentous above; little branches ſhort, covered with lanceolate, acuminate, ſheathing ſtipules, leafy only at the end. *Leaves* ſmall, numerous, growing cloſe together, ſeſſile, terminated by a ſharp, and ſometimes bifid ſpine, ſmooth and ſhining above, nerved and villous underneath. *Flowers* at the ends of the little branches, in roundiſh ſpikes, intrenched in the leaves; bractes ſmaller than the leaves, involving each flower, trifid, hirſute on the outſide, ſpinous, with a ſharp membranous hairy leaflet near the baſe, on each ſide; germ egg-ſhaped, obtuſe, alternated at the baſe, rather gibbous, ſtreaked and angular. Introduced by Maſſon in 1786; communicated alſo to La Marck by Maſſon. 5. C. *graminea*, Linn. jun. Supp. 429. Mart. 5. Lam. 10. "Leaves enſiform, ſlightly ſerrated; petioles dilated, terminated by two ſtipule-ſhaped awns." A ſhrub. *Stems* ſeveral, two feet high, ſcarcely branching, ſtriated, covered with leaves. *Leaves* growing near together, erect, convolute, ſmooth, ſtriated, acute; petioles broad, connected with the leaves by a joint; the edges elongated into awl-ſhaped, erect diviſions. Found by Thunberg. 6. C. *ferruginea*, Linn. jun. Supp. 429. Mart. 4. (C. berberidifolia, Lam. 9.) "Leaves lanceolate, ſetaceous-ſerrated," Linn. jun. "Stem ſmooth; branches alternate, very ſhort, leafy; leaves ſomewhat lanceolate, ſetaceous-ſerrated, crowded," Lam. *Stems* like thoſe of knot-graſs, filiform, uſually proſtrate, even ſurface, and branching; branches ſhort, ferruginous, herbaceous. *Leaves* alternate, on ſhort petioles, ſtriated, acute, naked; ſerratures ſetaceous, unarmed; ſtipules two-cleft, ferruginous, ſcarious. *Flowers* axillary, ſeſſile, trifid; filaments capillary, long; anthers egg-ſhaped. La Marck doubts whether this be the ſame plant with his berberidifolia, as there is no mention of the crowded leaves, and the abundant hairs on the ſtipulary ſheaths, which appear in his ſpecimens. Found by Sparman. 7. C. *polygonifolia*, Linn. Sp. Pl. 3. Mart. 6. Lam. 4. "Leaves linear, hairy." An under-ſhrub, about a foot high, much branched, villous; branches ſlender, cylindrical, pubeſcent, leafy. *Leaves* very ſmall, linear, acute, quite entire, but undulated, apparently in alternate faſcicles, but really growing three together upon each ſmall ſheath. *Capſules* of an even ſurface, ſmaller than grains of wheat. 8. C. *filifolia*, Linn. jun. 430. Mart. 7. Lam. 17. "Leaves filiform, triquetrous, ſmooth, quite entire." Found by Thunberg. 9. C. *teretifolia*, Linn. jun. Supp. 430. Mart. 17. Lam. 18. "Leaves faſcicled, cylindrical, incurved, ſmooth, entire." 10. C. *ericæfolia*, Linn. jun. Supp. 430. Mart. 18. Lam. 19. "Leaves faſcicled, cylindrical, furrowed, ſmooth." The laſt three ſpecies greatly reſemble each other. They were all found by Thunberg, and were introduced into England by Maſſon, 1787. 11. C. *cuneata*, Hort. Kew. 3. 413. Mart. 19. "Leaves wedge-ſhaped, ſerrated at the end." Introduced by Maſſon, 1787.

* * *Leaves compound.*

12. C. *crenata*, Linn. jun. 430. Mart. 8. Lam. 12. "Leaves binate, orbicular, crenulate." *Leaves* alternate, ſeſſile, ſmooth, the ſize of a finger-nail. *Flowers* axillary, ſolitary, trifid. Found by Thunberg. 13. C. *pulchella*, Linn. jun. Supp. 430. Mart. 19. Lam. 13. "Leaves binate, orbicular, quite entire." *Leaves* connivent, forming a cavity which protects the flowers, beautifully adorned on the outſide with radiating nerves. Found by Thunberg. 14. C. *trifoliata*, Linn. Sp. Pl. 4. Mart. 10. Lam. 5. (myrica, Hort. Cliff. 456. 6. Thymeleæ forte affinis; Pluk. Alm. 367. tab. 319. fig. 4) "Leaves ternate; intermediate leaflet three-toothed." *Stems* ſlender, woody, procumbent, ſilky, with hairs, ſending out ſlender branches on every ſide. *Leaves* ſeſſile, hairy; ſide leaflets lanceolate; middle one broader. *Flowers* axillary, on ſhort peduncles. There is a variety with ſmaller, linear-lanceolate leaflets. Cultivated by Miller before 1759; flowering in July and Auguſt. 15. C. *ſarmentoſa*, Linn. Mant. 299. Mart. 11. Lam. 6. "Leaves ternate, linear, villous." *Stem* four feet high, ſhrubby, filiform, ſarmentous; branches alternate, ſhort, ſimple, cylindrical, pubeſcent. *Leaves* alternate, almoſt ſeſſile, nearly equal, very narrow, unarmed; petiole ſhort, ſtipular, membranous, dilated, emarginate, naked. *Flowers* white, axillary, ſolitary, ſeſſile. 16. C. *ſtrobilifera*, Murray, Syſt. 893. (cedrus conifera; Pluk. Alm. 91. tab. 275. fig. 2.) "Leaves ternate, linear, acute, even-ſurfaced." A ſhrub. *Branches* ſlender, cylindrical, ſmooth. *Leaves* ſeſſile, carinated, on a ſhort ſheathing petiole; ſtipular ſheaths permanent, after the leaves have fallen, nearly egg-ſhaped, ſcarious, with two teeth, ſmooth. The ſeſſile, lateral, ſcaly, egg-ſhaped cones which occur on the branches, are ſuppoſed by Linnæus to be galls, and not fruit. Juſſieu doubts, whether it be really a cliffortia. La Marck's ſpecimens are beſet with cones of different ſizes, without any appearance of fructification. 17. C. *obcordata*, Linn. jun. Supp. 429. Mart. 13. Lam. 11. "Leaves ternate; leaflets roundiſh, middle one inverſely heart-ſhaped." An erect, low ſhrub, with diſtich branches. *Leaves* ſmall, ſeſſile, inverſely egg-ſhaped, nerveleſs, very obtuſe, quite entire, ſmooth, reſembling thoſe of purſlane (peplis), often binate. *Flowers* axillary, ſeſſile, not longer than the leaves. 18. C. *ternata*, Linn. Supp. 430. Mart. 14. Lam. 16. "Leaves ternate; leaflets entire, hairy." A ſhrub, very diſtinct from the other ſpecies. *Leaflets* ſmall, ovate-lanceolate. Found by Thunberg. 19. C. *juniperina*, Linn. jun. 430. Mart. 15. Lam. 15. "Leaves ternate, triquetrous, awl-ſhaped, crowded." A ſhrub, with the habit of a juniper, three feet high, much branched. *Leaves* on a broadiſh, very ſhort, ſcarcely perceptible peduncle; leaflets aceroſe, linear, channelled, mucronate, ſomewhat ſerrated. *Flowers* axillary, ſeſſile. 20. C. *falcata*, Linn. jun. Supp. 431. Mart. 16. Lam. 14. "Leaves ternate, linear, falcate, ſmooth." A ſhrub, about a foot high, erect, branched, ſtiff and ſtraight. *Leaves* reſembling thoſe of C. ſarmentoſa, but ſmooth, often three from each bud; leaflets rather acute, incurved. Found by Thunberg.

Propagation and culture. C. ilicifolia is eaſily propagated by cuttings in any of the ſummer months. Theſe ſhould be planted in ſmall pots, filled with light earth; when they have taken root, they ſhould be gradually expoſed to the open air, and when they have gained ſome ſtrength, may be tranſplanted ſeparately into ſmall pots, and placed with other hardy kinds of exotic plants, in a ſheltered ſituation, till October; they ſhould then be placed under a common hot-bed frame, or removed into the green-houſe, but ſhould enjoy the free air, whenever the ſeaſon is mild. When the plants advance in height, their ſtem and branches will require ſupport, they will then thrive with the ſame treatment as myrtles, and other hardy green-houſe plants, but muſt have little water in winter. C. trifoliata is equally hardy. C. ruſcifolia is more tender, and more difficult to propagate.

CLIFT, in the *Manege*, a deficiency in the new, ſoft, and rough uneven hoof that grows in horſes feet, upon the hoof caſt. It is alſo called *chink*, *crack*, or *chop*, and by the French *avalure*. See CLEFT.

CLIFTS, in timber. See TIMBER.

CLIFTON, FRANCIS, in *Biography*, doctor in medicine, received his education in the univerſity of Oxford, which completed, he came to London, and about the year 1730, he was admitted a fellow of the College of Phyſicians, and ſoon after of the Royal Society. In 1732 he publiſhed "The State of Phyſic, ancient and modern, briefly conſidered, with a Plan for improving it," 8vo. The firſt part of the volume contains a compendium of the hiſtory of phyſic, written in the manner of Friend's hiſtory, but not equally correct. He ſhews a marked partiality for empirics, amongſt whom he places Hippocrates, and cenſures Galen, for attempting to found his practice on ratiocination. He propoſes a law, obliging phyſicians and ſurgeons to keep regiſters of the caſes they attend, which are to be ſent to an inſtitution, to be formed for the purpoſe. The accounts are to contain ſimply deſcriptions of the diſeaſes with the remedies employed in their cure. He had before, *viz.* in 1731, publiſhed, "A plain and ſure Way of practiſing Phyſic," 8vo. He recommends the uſe of the warm-bath in the ſmall-pox, and condemns the practice of giving purges in that complaint, which had been recommended by Dr. Friend. He alſo tranſlated "Hippocrates de Aere, Aquis et Locis," with the title of Hippocrates on air, water, and ſituations, upon epidemical diſeaſes, and upon prognoſtics in acute caſes, illuſtrated with notes, and added a tranſlation from Thucydides, of the account of the plague at Athens, 8vo. 1734. Boerhaave Methodus Studii Medici.

CLIFTON, in *Geography*, a village of Glouceſterſhire, famous for its medicinal ſprings, called "Briſtol hot-wells," ſuppoſed to be one of the pleaſanteſt villages in the kingdom; 1 mile from Briſtol. See BRISTOL.

The ſituation of a wind-mill in a conſpicuous place in this pariſh, ſometimes called Clifden wind-mill, was determined it the government trigonometrical ſurvey in 1797, by an obſervation from Dundry ſtation, diſtant 12,860 feet, and bearing 9° 52′ 50″ S.W. from the parallel to the meridian of Black-down ſtation; and another from Lanſdown ſtation, diſtant 51,725 feet; whence is deduced its latitude 51° 25′ 53″ N. and its longitude from Greenwich 2° 37′ 26″ W. or $10^{m}\ 29^{s}.7$ in time.

CLIFTON, a village near the ſouth-eaſtern extremity of the weſt-riding of Yorkſhire, in the hundred of Strafford; which pariſh will probably be hereafter often noted, on account of a remarkable eminence therein, called Beacon Hill, on which a ſtation was choſen in 1801, in the government trigonometrical ſurvey, and where, in 1802, the curious *zenith-ſector*, (ſee that article), the laſt work of that celebrated artiſt Mr. Jeſſe Ramſden, was uſed for determining the latitude of this ſtation, as the northernmoſt point in the terreſtrial arc of the meridian, of whoſe meaſurement a detailed account has been publiſhed by major William Mudge in the Philoſophical Tranſactions for 1803; being the firſt attempt at the meaſurement of an arc of the meridian in Britain of any conſiderable length, ſince the days of our countryman Norwood, about the year 1635. Clifton ſtation was choſen, on account of its falling almoſt exactly on the meridian of the ſtation at Dunnoſe, in the Iſle of Wight, which had been fixed on, as the ſouth end of the Britiſh meridional arc to be meaſured; and alſo on account of the fen called the Iſle of Axholme, in Lincolnſhire, lying within full view of this ſtation, and preſenting an eligible ſituation for meaſuring a baſe of verification; and whereon, in the part called Miſterton-carr, a line 26342.7 feet in length, terminated by points called Miſterton north and ſouth ſtations, was meaſured in June and July, 1801, on the level ſurface of the fen, by means of the curious ſteel chains and apparatus of Ramſden's conſtruction, which were uſed in the re-meaſurement of the firſt baſe on Hounſlow-heath in 1791; this Miſterton baſe being ſituate about 35 feet above the level of half tide in the ocean, at the mouth of the Humber river.

In Auguſt 1801, one of Ramſden's great *theodolites* (ſee that article) was erected on Clifton ſtation, the horizontal angles between Miſterton north and Miſterton ſouth ſtations, Gringley ſtation and Heatherſedge, or Lords'-ſeat ſtation, reſpectively, were repeatedly obſerved; and thirteen obſervations of the pole-ſtar, when at its greateſt elongations from the meridian, were carefully made; whence, Gringley ſtation was found to bear 76° 17′ 25″ S.E. from the meridian of Clifton ſtation, diſtant by calculation 75,068 feet; Miſterton north and ſouth ſtations, and Heatherſedge ſtation being 64,462, 73,322, and 92,227 feet reſpectively diſtant. The ſpire of Loughton en le Morthen church being found to bear only 1° 56′ 8″ W. of the ſouth meridian of Clifton ſtation, the ſpindle of its weathercock was made uſe of as a meridian mark, for adjuſting the zenith-ſector, when the ſame was erected on the 19th of July, 1802, on a ſpot 3½ feet ſouth of the ſtation at Clifton, by ſetting off that arc on the azimuth circle of the inſtrument; between the above date and the 19th of Auguſt, the following zenith diſtances of ſtars were carefully obſerved as they paſſed the meridian, *viz.* 15 of β Draconis, the mean of which gave 1° 0′ 17″.84 S.; 15 of γ Draconis, which gave 1° 56′ 26″.64 S.; 9 of 45 *d* Draconis, which gave 3° 26′ 22″.92 N.; 11 of 46 *c* Draconis, which gave 1° 53′ 6″.24 N.; 9 of 51 Draconis, which gave 0° 21′ 38″.12 N.; 6 of μ Draconis, which gave 1° 16′ 38″.20 N.; 3 of 16 Draconis, wich gave 0° 7′ 51″.25 S.; 14 of 1 κ Cygni, which gave 0° 27′ 0″.32 S.; 12 of 10 ι Cygni, which gave 2° 8′ 42″.22 S.; one of γ Urſæ, which gave 1° 20′ 13″.53 N.; 5 of η Urſæ, which gave 3° 9′ 6″.98 S.; 5 of ζ Urſæ, which gave 2° 30′ 10″.37 N.; 8 of 85 ι Herculis, which gave 7° 20′ 24″.98 S.; 4 of 52 Herculis, which gave 7° 7′ 25″.52 S.; 6 of τ Herculis, which gave 6° 40′ 1″.29 S.; 5 of α Perſei, which gave 4° 18′ 36″.02 S.; and 5 of Capella, which gave 7° 40′ 25″.66 S.

Comparing theſe, with 10 of theſe ſtars' zenith diſtances, obſerved by help of this zenith-ſector at Greenwich royal obſervatory (for the remaining ſtar, 15 ι Herculis, ſeems either to have been miſtaken in the obſervation for ſome other ſmall ſtar, or its z.d. to have been wrong obſerved near 1′) we get 1° 58′ 52″ for the difference of latitude between Greenwich and Clifton; whence, the latitude of Clifton ſtation is found 53° 27′ 32″, and its longitude appears to be 1° 12′ 23″.6 W. of Greenwich. The elevation of Clifton ſtation above the level of the ſea is not given, but we are told that from thence the apparent depreſſion of Gringley ſtation was 18′ 47″, and the apparent elevation of Heatherſedge ſtation 29′ 12″. The ſingular reſult of the meaſurement of the different parts of the arc between Dunnoſe and Clifton, wherein the lengths of degrees decreaſe inſtead of increaſing, as they ought to do on a flattened ellipſoid, preſents matter of curious inveſtigation, and may, perhaps, furniſh ſome data for aſcertaining the arrangement of the gravitating maſſes of which the earth is compoſed. We wiſh that the zenith-ſector were uſed at more of the intermediate ſtations, in order to diſcover more exactly the law of decreaſe in the Britiſh degrees.

CLIKAPOTIN, a town of Poland, in the palatinate of Volhynia; 72 miles E. of Lucko.

CLIMA, in *Ancient Geography*, a term uſed under the Lower Empire for a diviſion of provinces.

CLIMA *Anatolicum*, an epiſcopal ſee of Aſia, in Phœnicia, near mount Libanus, under the metropolis of Edeſſa. —— *Anatolis*, an epiſcopal ſee of Aſia, in Arabia. —— *Anzitines*, a place of Aſia, in the Fourth Armenia. —— *Aſtianicæ*, a place of Aſia in the ſame province. —— *Bilabitenſis*, a place of the ſame province. —— *Digeſenes*, a place in the ſame province. —— *Gablanim*, or *Galanis*, an epiſcopal ſee of Aſia, under the metropolis of Scythopolis. —— *Garenes*, an epiſcopal ſee of Aſia, in the 4th Armenia. —— *Imbrudorum*, an epiſcopal ſee of Aſia, in the Phœnicia of Libanus, under the metropolis of Edeſſa. —— *Magludorum*, an epiſcopal place in Aſia, in the Phœnicia of Libanus, under the metropolis of Edeſſa. —— *Mamuzurarum*, an epiſcopal ſee of Aſia, in the 4th Armenia. —— *Meſticon*, one of the fine towns of the prefecture of Thrace. —— *Orientalium* et *Occidentalium*, an epiſcopal ſee of Arabia. —— *Orzianices*, an epiſcopal ſee of Aſia, in the 4th Armenia. —— *Sophenes*, an epiſcopal place of Aſia, in the ſame province.

CLIMACÆ, a place in the iſland of Eubœa, mentioned by Heſychius.

CLIMACIDES, among the Greeks, were women ſervants who aſſiſted their miſtreſſes to get on horſeback, by ſerving as ſteps for them to aſcend by.

CLIMACTERIC, *Annus* CLIMACTERICUS, a critical year, or period, in a man's age, wherein, according to aſtrologers, there is ſome very notable alteration to happen in the body; and a perſon is expoſed to great danger of death. The word comes from *κλιμακτηρ*, or *κλιμακτερικος*, of *κλιμαξ*, *κλιμακος*, *ſcala*; q. d. *by a ſcale*, or *ladder*.

The firſt climacteric is, according to ſome, the ſeventh year of a man's life; the reſt are multiples of the firſt, as 14, 21, 49, 56, 63, and 84; which two laſt are called the *grand climacterics*, and the dangers here are ſuppoſed more imminent.

The opinion has a great deal of antiquity on its ſide. Aulus Gellius ſays, it was borrowed from the Chaldeans; who might probably receive it from Pythagoras, whoſe philoſophy turned much on numbers; and who imagined an extraordinary virtue in the number 7.

Marc. Ficinus gives us the foundation of the opinion: he tells us, there is a year aſſigned for each planet to rule over the body of man, each in his turn: now Saturn being the moſt maleficent planet of all, every ſeventh year, which falls to his lot, becomes very dangerous; eſpecially thoſe of 63 and 84, when the perſon is already advanced in years.

Some hold, according to this doctrine, every ſeventh year an eſtabliſhed climacteric; but others only allow the title to thoſe produced by the multiplication of the climacterical ſpace by an odd number, 3, 5, 7, 9, &c. Others obſerve every ninth year as a climacteric.

Hevelius has a volume under the title of Annus Climactericus, deſcribing the loſs he ſuſtained in the burning of his obſervatory, &c. which it ſeems happened in his firſt *grand climacteric.*

Suetonius ſays, Auguſtus congratulated his nephew upon his having paſſed his firſt grand climacteric, whereof he was very apprehenſive.

Some pretend that the climacteric years are alſo fatal to political bodies; which perhaps may be granted, when it is proved that they are ſo to natural ones.

Authors on this ſubject, are Plato, Cicero, Macrobius, Aulus Gellius, among the ancients; Argol, Magirus, and Salmaſius, among the moderns. And St. Auguſtine, St. Ambroſe, Beda, and Boetius, countenance the opinion.

CLIMATARCHÆ, Κλιματαρχαι, were governors of provinces to the Greek emperors.

CLIMATE, Clima, or Clime, in *Geography,* a part of the ſurface of the earth, bounded by two circles parallel to the equator, and of ſuch a breadth, as that the longeſt day in the parallel near the pole exceeds the longeſt day in that next the equator by ſome certain ſpace; *viz.* half an hour, an hour, or a month.

The word comes from κλιμα, *inclinamentum,* an *inclination;* becauſe the difference of climates ariſes from the different inclination or obliquity of the ſphere.

The beginning of the climate is the parallel circle wherein the day is the ſhorteſt; and the end of it is that wherein the day is the longeſt. The climates therefore are reckoned from the equator to the pole; and are ſo many bands, or zones, terminated by lines parallel to the equator: though, in ſtrictneſs, there are ſeveral climates in the breadth of one zone. Each climate only differs from its contiguous ones, in that the longeſt day in ſummer is longer or ſhorter, *e.g.* by half an hour, in the one place than in the other.

As the climates commence at the equator, the firſt climate, at its beginning, has its longeſt day preciſely twelve hours long; at its end, twelve hours and an half; the ſecond, which begins where the firſt ends, *viz.* at twelve hours and an half, ends at thirteen hours; and ſo of the reſt, as far as the polar circles, where thoſe, which the geographers call *hour-climates* terminate, and *month climates* commence.

As an *hour-climate* is a ſpace compriſed between two parallels of the equator, in the firſt of which the longeſt day exceeds that in the latter by half an hour; ſo the *month climate* is a ſpace terminated between two circles parallel to the polar circles, whoſe longeſt day is longer or ſhorter than that of its contiguous one by a month, or thirty days.

The ancients, who confined the climates to what they imagined the habitable parts of the earth, only allowed of ſeven. The middle of the firſt northern climate they made to paſs through Meroe; the ſecond through Syene; the third through Alexandria; the fourth through Rhodes; the fifth through Rome; or, according to others, through the Helleſpont; the ſixth through the mouth of the Boryſthenes; and the ſeventh through the Riphæan mountains. The ſouthern part of the earth being then very little known; the ſouthern climates received their names from the northern ones, to which they did in ſuch a manner correſpond, that they were as far diſtant from the equator ſouthward as the others were northward. The moderns, who have ſailed farther toward the poles, make thirty climates on each ſide: and in regard the obliquity of the ſphere makes a little difference in the length of the longeſt day; inſtead of half an hour, ſome of them only make the difference of climates a quarter.

A parallel is ſaid to paſs through the middle of a climate, when the longeſt day in that parallel differs a quarter of an hour from the longeſt day in either of the extreme parallels that bound the climate; this parallel does not divide the climate into two equal parts, but the part neareſt to the equator is larger than the other; becauſe the farther we go from the equator, the leſs increaſe of latitude will be ſufficient to increaſe the length of the longeſt day, a quarter of an hour; in the middle parallel of the firſt climate the longeſt day is 13 hours; in the middle of the ſecond climate, 13 hours and a half; in the middle of the third, 14 hours, &c. We may obſerve that every climate has three parallels, which mark the beginning, the middle, and the end of it; and that the parallel which marks the end of every preceding climate is the beginning of that which is immediately ſubſequent. Some of the ancients divide the earth by theſe parallels, and ſometimes by a parallel, they do not mean a mere linear circle, but a ſpace of ſome breadth; in which ſenſe a parallel is the ſame as half a climate; and ſhews the difference of a quarter of an hour in the length of the longeſt day.

In fixing the climates, there ordinarily is no regard had to the refraction.

Varenius gives us a table of thirty climates; but without any regard to the refraction. Ricciolus furniſhes a more accurate one, wherein the refractions are allowed for: an abſtract of which follows:

A Table of Climates.

								N. Lat.		S. Lat.	
Middle of Climate.	Longeſt Day.	Latitude.	Climates.	Longeſt Day.	Latitude.	Middle of Climate.	Latitude.	Continual Day.	Continual Night.	Continual Day.	Continual Night.
I	12^h 30	7° 18	VIII	16^h 0	48° 1	XV	66° 53	31^d	27^d	30^d	28^d
II	13 0	15 36	IX	17 0	53 46	XVI	69 30	62	58	60	59
III	13 30	23 8	X	18 0	57 44	XVII	73 0	93	87	89	88
IV	14 0	29 49	XI	19 0	60 39	XVIII	78 6	124	117	120	118
V	14 30	35 35	XII	20 0	62 4	XIX	84 0	156	148	150	149
VI	15 0	40 32	XIII	22 0	65 10	XX	90 0	188	180	178	177
VII	15 30	44 42	XIV	24 0	65 54						

Vulgarly, the term climate is beſtowed on any country or region differing from another, either in reſpect of the ſeaſons, the quality of the ſoil, or even the manners of the inhabitants; without any regard to the length of the longeſt day.

Abulfeda, an Arabic author, diſtinguiſhes the firſt kind of climates by the term *real climates;* and the latter by that of *apparent climates*.

The temperature of any climate, although it ſhould ſeem to depend principally on latitude, or diſtance from the equator, and the conſequent more vertical or more oblique incidence of the rays of the ſun, is, nevertheleſs, very materially affected by a variety of collateral circumſtances; ſuch as the ſituation, whether it be high or low, the nature of the ſoil, the extent of the continent, the vicinity of mountains, foreſts, marſhes, lakes, and ſeas, and the direction of the winds. The influence of theſe is, however, on various accounts leſs conſiderable in the greater part of the ancient continent than in that of America, where the rigour of the frigid zone extends over half of that which ſhould be temperate by its poſition; and where lands, ſituated in the ſame parallel with the moſt fertile and beſt cultivated provinces in Europe, are chilled with perpetual froſts, which almoſt deſtroy the power of vegetation. Thus, Newfoundland, part of Nova Scotia, and Canada, lie in the ſame parallel with France; and yet, in every part of theſe the water of the rivers is frozen during winter to the thickneſs of ſeveral feet; the earth is covered with ſnow as deep; almoſt all the birds fly during that ſeaſon, from a climate where they could not live. The country of the Eſquimaux, part of Labrador, and the countries on the ſouth of Hudſon's bay, are in the ſame parallel with Great Britain; and yet, in all theſe the cold is ſo intenſe, that even the induſtry of the Europeans has not attempted cultivation. As we proceed to thoſe parts of America, which lie in the ſame parallel with provinces of Aſia and Africa, poſſeſſing genial warmth, eminently favourable to life and vegetation, the dominion of cold prevails, and winter, during its ſhort period, often reigns with extreme ſeverity. In advancing along the American continent into the torrid zone, the exceſs of its fervour will be found in a conſiderable degree mitigated by the cold of this continent. While the negro on the coaſt of Africa is ſcorched with unremitting heat, the inhabitant of Peru breathes a mild and temperate air, and is ſhaded under a canopy of grey clouds, which intercepts the fierce beams of the ſun, without obſtructing his friendly influence. Along the eaſtern coaſt of America, the climate, though more ſimilar to that of the torrid zone in other parts of the earth, is, nevertheleſs, conſiderably milder than in thoſe countries of Aſia and Africa which lie in the ſame latitude. If, from the ſouthern tropic, we continue our progreſs to the extremity of the American continent, we meet with frozen ſeas, and countries that are barren and ſcarcely habitable for cold, ſooner than in the north. M. de Paw, in his "Recherches Philoſophiques ſur les Americains," cited by Dr. Robertſon, (Hiſt. Amer. vol. ii. p. 472.) ſuppoſes, that the difference in heat between America and the old continent is equal to 12 degrees, and that a place 30° from the equator, in the latter, is as warm as one ſituated 18° from it in the former. Dr. Mitchell alſo, after obſervations carried on during 30 years, contends, that the difference is equal to 14 or 15 degrees of latitude; or that it is as hot in the countries of the old continent at 29 or 30 degrees, as in the countries of the new continent, which are at 15 degrees. The abbé Clavigero, in his "Hiſtory of Mexico," (p. 263.) diſputes theſe facts; and he ſays, that as there are many countries in America more cold than others of the old continent equi-diſtant from the equator, there are alſo others more hot. Agra, the capital of Mogul, and the port of Loretto in California, are nearly in the ſame latitude, and ſtill the heat of that Aſiatic city is not comparable to that of the American port. Hue, the capital of Cochin-China, and Acapulco, are almoſt equidiſtant from the equator, and yet the air of Hue is cool, in compariſon of that of Acapulco. M. de Paw has alſo affirmed, that in the centre of the torrid zone the liquor of the thermometer does not riſe to ſo great a height as it does in Paris in the greateſt heat of ſummer; to which Clavigero replies, that if that were true, the difference between the American and European climates would not be only 12°, as M. de Paw would make it, but 49°, that is, as much as the difference of latitude between the centre of the torrid zone and Paris. It is true, ſays the abbé, that according to the obſervations made in Quito, compared with thoſe made in Paris, the heat of that equinoctial city never equals that of Paris in the ſummer; but it is equally certain that, according to the obſervations made by the ſame academicians with the ſame thermometers, in the city of Carthagena, which is not the centre of the torrid zone, but ten degrees from it, the uſual heat of this city is equal to the greateſt heat of Paris, agreeably to the teſtimony of Ulloa, one of the obſervers. We ſhall here add, as the reſults of obſervations of M. de Paw, that the climate of America is not ſo various as that of Europe; and, of courſe, that the inhabitants of the New World are not, like thoſe of the greater part of Europe, obliged to endure the alternate extremes of exceſſive cold and intolerable heat.

Thoſe who maintain that the climate of America is extremely different from that of the ancient continent enumerate a variety of cauſes that have combined to produce this difference. Although the utmoſt extent of America towards the north be not yet diſcovered, it is allowed that it advances much nearer to the pole than either Europe or Aſia. The latter have large ſeas to the north, which are open during part of the year; and even when covered with ice, the wind that blows over them is leſs intenſely cold than that which blows over land in the ſame high latitudes. But in America the land ſtretches from the river St. Lawrence towards the pole, and ſpreads out immenſely to the weſt. A chain of enormous mountains, covered with ſnow and ice, runs through all this dreary region. The wind, in paſſing over ſuch an extent of high and frozen land, acquires a piercing keenneſs, which it retains in its progreſs through warmer climates, and is not entirely mitigated until it reach the gulf of Mexico. Over all the continent of North America, a north-weſterly wind and exceſſive cold are ſynonymous terms. Even in the moſt ſultry weather, the moment that the wind veers to that quarter, its penetrating influence is felt in a tranſition from heat to cold, no leſs violent than ſudden. To this powerful cauſe we may aſcribe the extraordinary dominion of cold, and its violent inroads into the ſouthern provinces in that part of the globe. Beſides, in that portion of the American continent which lies between the tropics, the wind blows in an invariable direction from eaſt to weſt. As this wind holds its courſe acroſs the ancient continent, it arrives at the countries which ſtretch along the weſtern ſhore of Africa, inflamed with all the fiery particles which it hath collected from the ſultry plains of Aſia, and the burning ſands in the African deſerts. Accordingly, the coaſt of Africa is the region of the earth which feels the moſt fervent heat, and is expoſed to the unmitigated ardour of the torrid zone. But this ſame wind which brings ſuch an acceſſion of warmth to the countries lying between the river of Senegal and Cafraria, traverſes the Atlantic ocean, before it reaches the American ſhore. In its paſſage over this vaſt body of water it is cooled, and is felt as a refreſhing gale along the coaſt of

Braſil and Guiana, rendering theſe countries, which are reckoned among the warmeſt in America, temperate, when compared with thoſe which lie oppoſite to them in Africa. As this wind advances in its courſe acroſs America, it meets with immenſe plains, covered with impenetrable foreſts, or occupied by large rivers, marſhes, and ſtagnating waters, where it can recover no conſiderable degree of heat. At length it arrives at the Andes, which run from north to ſouth through the whole continent. In paſſing over theſe elevated and frozen ſummits, it is ſo thoroughly cooled, that the greater part of the countries beyond them ſcarcely feels the ardour to which they ſeem expoſed by their ſituation. Acoſta appears to have been the firſt philoſopher, who endeavoured to account for the different degrees of heat in the old and new continents, by the agency of the winds which blow in each. M. de Buffon has adopted this theory and embelliſhed it by his deſcriptive eloquence; it has alſo been illuſtrated by later writers, in their inquiries concerning the temperature of various climates, as we ſhall find in the ſequel of this article. Profeſſor Robiſon furniſhed the elegant and popular hiſtorian of America with a variety of obſervations, elucidating this theory. To this purpoſe he obſerves, that, when a cold wind blows over land, it muſt in its paſſage rob the ſurface of ſome of its heat; and thus the coldneſs of the wind is abated. But continuing to blow in the ſame direction, it will, by degrees, paſs over a ſurface already cooled, and loſe no degree of its keenneſs; and advancing over a large tract of land, it will occaſion the ſeverity of intenſe froſt. If the ſame wind be ſuppoſed to blow over an extenſive and deep ſea, the ſuperficial water muſt be immediately cooled to a certain degree, and the wind proportionably warmed. But the ſuperficial and colder water becoming ſpecifically heavier than the warmer water below it, deſcends; the warmer ſupplies its place, which, being cooled in its turn, continues to warm the air which paſſes over it, or to diminiſh its cold. This change of the ſuperficial water, (and ſucceſſive aſcent of that which is warmer, and conſequent ſucceſſive abatement of coldneſs in the air,) is aided by the agitation cauſed in the ſea by the mechanical action of the wind, and alſo by the motion of the tides. By this proceſs, the rigour of the wind will continue to decreaſe until the whole water is ſo far cooled, that the water on the ſurface is no longer removed from the action of the wind, faſt enough to hinder it from being arreſted by froſt. Whenever the ſurface freezes, the wind is no longer warmed by the water from below, and it goes on with undiminiſhed cold. Theſe principles ſerve to explain the ſeverity of winter froſts in extenſive continents; their mildneſs in ſmall iſlands; and the ſuperior rigour of winter in thoſe parts of North America, with which we are beſt-acquainted. In the N.W. parts of Europe, the ſeverity of winter is mitigated by the weſt winds, which uſually blow in the months of November, December, and part of January. On the other hand, when a warm wind blows over land, it heats the ſurface, which muſt therefore ceaſe to abate the fervour of the wind. But, the ſame wind, blowing over water, agitates it, brings up the colder water from below, and thus is continually loſing ſome of its own heat. After all, the great power of the ſea to mitigate the heat of the wind or air paſſing over it, proceeds from the following circumſtance; that on account of the tranſparency of the ſea its ſurface cannot be heated to a great degree by the ſun's rays; whereas the ground, ſubjected to their influence, very ſoon acquires great heat. When, therefore, the wind blows over a torrid continent, it is ſoon raiſed to a heat almoſt intolerable; but during its paſſage over an extenſive ocean, it is gradually cooled; ſo that on its arrival at the fartheſt ſhore, it is again fit for reſpiration. Theſe principles will account for the ſultry heat of large continents in the torrid zone; for the mild climates of iſlands in the ſame latitude; and for the ſuperior warmth in ſummer which large continents, ſituated in the temperate or colder zones of the earth enjoy, when compared with that of iſlands. The heat of a climate depends not only upon the immediate effect of the ſun's rays, but on their continued operation, on the effect which they have formerly produced, and which remains for ſome time in the ground. Thus the day is warmeſt about two in the afternoon, the ſummer warmeſt about the middle of July, and the winter coldeſt about the middle of January.

The temperate climate in the equatorial parts of America is greatly owing to the foreſts which cover the country, and hinder the ſun-beams from heating the ground; the ground, not being heated, cannot heat the air; and the leaves, which receive the rays intercepted from the ground, have not a maſs of matter ſufficient to abſorb heat enough for the purpoſe. Beſides, it is a known fact, that the vegetative power of a plant occaſions a perſpiration from the leaves, in proportion to the heat to which they are expoſed; and from the nature of evaporation, this perſpiration produces a cold in the leaf proportional to the perſpiration. Thus the effect of the leaf in heating the air in contact with it is prodigiouſly diminiſhed. See alſo Dr. Williamſon's Obſervations on the effects of the agency of winds in reference to the temperature of different climates, in the firſt volume of the "Tranſactions of the American Philoſophical Society," p. 272, &c. For a further account of the cauſes that produce a change in the temperature of the air; ſee the article *Temperature of the* ATMOSPHERE.

But to return from this digreſſion on the effect of winds: We may obſerve that in the other provinces of America, from Terra Firma weſtward to the Mexican empire, the heat of the climate is tempered, in ſome places, by the elevation of the land above the ſea; in others, by their extraordinary humidity; and in all, by the enormous mountains ſcattered over this part. The iſlands of America, in the torrid zone, are either ſmall or mountainous, and are fanned alternately by refreſhing ſea and land breezes.

The cauſes of the extraordinary cold that prevails towards the ſouthern limits of America, and in the ſeas beyond it, cannot be aſcertained in a manner equally ſatiſfactory. It was long ſuppoſed, that a vaſt continent, diſtinguiſhed by the name of "Terra Auſtralis Incognita," lay between the ſouthern extremity of America and the Antarctic pole. The ſame principles which account for the extraordinary degree of cold in the northern regions of America were adopted in order to explain that which is felt at Cape Horn, and the adjacent countries. The immenſe extent of the ſouthern continent, and the large rivers which it poured into the the ocean, were admitted by philoſophers as cauſes ſufficient to occaſion the unuſual ſenſation of cold, and the ſtill more uncommon appearances of frozen ſeas in that region of the globe. But as ſuch a continent is imaginary, and the ſpace ſuppoſed to be occupied by it is an open ſea, new conjectures muſt be formed with reſpect to the cauſes of a temperature of climate, ſo extremely different from that which we experience in countries removed at the ſame diſtance from the oppoſite pole. Of the extraordinary degree of cold, that occurs in ſouthern latitudes, many inſtances are recorded. In lat. 48° ſome French voyagers, in 1739, found iſlands of floating ice; and a conſiderable degree of cold was experienced in lat. 44°. Dr. Halley found ice in lat. 59°. Commodore Byron, in lat. 50° 33′ S. of the coaſt of Patagonia, on the 15th of December, nearly midſummer in that part of the globe, compares the climate to that of England in the middle of winter.

When Mr. (ſir Joſeph) Banks and his companions landed on Terra del Fuego, in the bay of Good Succeſs, lat. 55°, Jan. 16. correſponding to July in our hemiſphere, two of his attendants died in one night of extreme cold, and the whole party was in great danger of periſhing. On the 14th of March the mountains were covered with ſnow. Capt. Cook, in his voyage towards the S. pole, expreſſes his ſurpriſe, that an iſland of no greater extent than 70 leagues in circuit, between the latitudes of 54° and 55°, ſhould in the very height of ſummer be in a manner wholly covered many fathoms deep with frozen ſnow; but more eſpecially the S. W. coaſt. The very ſummits, he ſays, of the lofty mountains were caſed with ſnow and ice; but the quantity that lay in the vallies is incredible; and at the bottom of the bays, the coaſt was terminated by a wall of ice of conſiderable height. The moſt obvious and probable cauſe of the ſuperior degree of cold, towards the ſouthern extremity of America, ſeems to be the form of the continent there. Its breadth gradually decreaſes as it ſtretches from St. Antonio ſouthwards, and from the bay of St. Julian to the ſtraits of Magellan its dimenſions are much contracted. On the eaſt and weſt ſides, it is waſhed by the Atlantic and Pacific oceans. From its ſouthern point an open ſea probably extends to the Antarctic pole. In whichever of theſe directions the wind blows, it is cooled before it approaches the Magellanic regions, in paſſing over a great body of water; nor is the land there of ſuch extent that it can recover any conſiderable degree of heat in its progreſs over it. Theſe circumſtances concur in rendering the temperature of the air in this diſtrict of America more ſimilar to that of an inſular than to that of a continental climate, and hinders it from acquiring the ſame degree of ſummer heat, with places in Europe and Aſia, in a correſponding northern latitude. The north wind is the only one that reaches this part of America, after blowing over a great continent; and this wind, though it blows over land, does not bring to the ſouthern extremity of America, which is properly the termination of the immenſe ridge of the Andes, an increaſe of heat, collected in its paſſage over torrid regions; but before it arrives there, it muſt have ſwept along the ſummits of the Andes, and comes impregnated with the cold of that frozen region. Beſides, though the idea of a ſouthern continent in that region of the globe which it was ſuppoſed to occupy is abandoned, it nevertheleſs appears from Capt. Cook's diſcoveries, that there is a large tract of land near the ſouth pole, which is the ſource of moſt of the ice ſpread over the vaſt ſouthern ocean. Whether, ſays Dr. Robertſon, the influence of this remote frozen continent may reach the ſouthern extremity of America, and affect its climate, is an inquiry not unworthy of attention. See Ice *iſlands*.

Having conſidered the variety of temperature to which different climates are ſubject, we ſhall next proceed to evince the change to which they have been ſubject in different intervals of time, and to ſpecify the moſt obvious cauſes of this change. This is a ſubject to which various authors, both ancient and modern, have directed their attention; among theſe we may mention M. de Buffon, Hume, the Abbé du Bos, M. Pelloutier, the Hon. Daines Barrington, Dr. Williamſon of America, and Dr. Robertſon; but they have generally written on the ſubject in a curſory manner. The moſt complete diſſertation which we have ſeen, is that of the Abbé Mann, in the 6th volume of the "Tranſactions of the Electoral Academy of Sciences at Manheim." The firſt part of this elaborate diſſertation is employed in demonſtrating the fact, that a change of temperature and ſoil has actually taken place in the climates of Europe; and the ſecond part contains an inquiry into the phyſical cauſes of this change. The firſt teſtimony to the fact is that of Herodotus, who informs us, more than once, that in the European part of Scythia, in the Palus Mæotis, the winter continued eight months every year with almoſt inſupportable ſeverity; and that the countries farther northwards were on that account uninhabitable; and he adds, that the other four months, called ſummer, were alſo exceedingly cold. In this country, which lies between the 44th and 50th degree of N. latitude, nothing of the like kind has taken place for a long time. Cæſar, Virgil, Diodorus Siculus, Ovid, Strabo, Pomponius Mela, Seneca, Petronius, Pliny the naturaliſt, Statius, Herodian, and Juſtin, all ſpeak to the ſame purpoſe of the inſupportable cold of the winter in different parts lying in the ſame latitude of from 44 to 50 degrees between Gaul and the Euxine ſea. The deſcriptions they concur in giving are ſuch as would at preſent ſuit thoſe countries which lie between 56 degrees of latitude and the polar circle; and in ſome reſpects they ſeem to exceed the cold of the winter in Sweden and Norway. Indeed, their deſcriptions of the climate of the middle part of Europe could at preſent be realized only in Lapland, Siberia, and thoſe regions of America that lie to the north of Hudſon's bay, where the ſtate of the climate is the ſame with that which was found 2000 years ago on the banks of the Rhine and the Danube, the Palus Mæotis, the Dnieper, and the Don. The firſt effect of the winter's cold in that whole part of Europe between the 44th and 50th degrees of latitude, uniformly mentioned by the ancients, is, that all the ſeas, lakes, and rivers contained in thoſe diſtricts were continually frozen, ſo that armies of barbarians, Scythians and Sarmatians, paſſed with their horſes, waggons, and baggage over the ice, in order to plunder the more ſouthern countries. This is expreſsly aſſerted by Herodotus, Virgil, Ovid, and Strabo, of the European part of Scythia, Dacia, and Thrace, all of them countries which lay in a northern and weſtern direction from the Palus Mæotis and the Euxine ſea. The ſame thing is aſſerted by Diodorus Siculus, Seneca, Pliny the younger, Florus, Herodian, Ammianus Marcellinus, Fernandez the Goth, and Xiphilinus the abridger of Dio Caſſius, in regard to the rivers and lakes of Pannonia, Germany, and Gaul. In the treatiſe on rivers, aſcribed to Plutarch, it is ſaid, that the Thermodon, a Scythian river, froze even in ſummer; a circumſtance which never happens at preſent with regard to the rivers of Siberia, Lapland, and Greenland. Ovid tells us, that he himſelf paſſed over the Pontus Euxinus on the ice, and that oxen and carriages paſſed over it. Plutarch ſays, that the preſſure of this enormous maſs of ice againſt the ſides of ſhips frozen into it, cruſhed them to pieces; and he mentions an inſtance of a Roman ſhip which had experienced the ſame fate in the Danube. Strabo and Virgil ſpeak of braſs veſſels that burſt by the expanſive force of the ice; and we are aſſured by Virgil and Ovid, that the people in Thrace and on the Danube cut the wine with axes, and diſtributed it in ſolid portions.

> "Udaque conſiſtunt formam ſervantia teſtæ
> Vina, nec hauſta meri, ſed data fruſta, bibunt."
> Ovid. lib. iii. el. 10.

They likewiſe add, that men's hair and beards were often covered with ice.

> "Cæduntque ſecuribus humida vina.—
> Stiriaque impexis indurant horrida barbis."
> Virgil, Georg. l. iii.

> "Sæpe ſonant moti glacie pendente capilli,
> Et nitet inducto candida barba gelu." Ovid.

If we compare this deſcription with the preſent ſtate of France, Germany, Hungary, Romania, Tranſylvania, Wallachia, Moldavia, Bulgaria, Leſſer Tartary, Podolia, and the Ukraine, it will be ſound that the preſent temperature of theſe countries has no reſemblance to what it was 2000 years ago. Moreover, Herodotus, Pomponius Mela, and Pliny the elder, ſpeak of the European part of Scythia as if its atmoſphere were continually filled with ſnow and fogs, which prevented the view of the neareſt objects, and obſcured the light of day. Diodorus Siculus ſpeaks of Celto-Scythia as covered with ſnow in the winter time; and this relation is confirmed by Florus and Petronius. Virgil, ſpeaking of Thrace and the countries on both ſides of the Danube, ſays, that a continual winter prevailed in them; and that the ſnow lay upon the ground ſometimes to the depth of 7 ells. Ovid ſays that at Tomi, lat. 44$\frac{1}{2}$°, placed by Dr. Wells, in his maps of Ancient Geography, in the 44th degree of N. latitude, the ſnow continued 2 years without being melted by the ſun or rain. Diodorus Siculus, Tacitus, and Ovid, when they ſpeak of Gaul, Germany, and Thrace, take notice of the prodigious force of the wind which prevailed in theſe countries in theſe times, and during the preceding centuries. Theſe winds raiſed even ſtones and men from the earth; carried away the roofs of houſes; tore up trees by the roots, and overturned turrets and houſes. Varro, Diodorus Siculus, Ovid, Pomponius Mela, Seneca, Petronius, Pliny the elder, Tacitus, Appian, Dio Caſſius, and Herodian, all agree in ſaying that the ſeverity of the climate and weather, which in their time prevailed in Gaul, Germany, Pannonia, Thrace, Moeſia, and Dacia, would hardly allow the culture of vines, olives, or any kind of fruit trees: and that, in cultivating them, it was neceſſary to cover them with dung, or with earth, to preſerve them throughout the winter. It is obſerved by Herodotus, Strabo, and Tacitus, that the oxen in the European part of Scythia and the country of the Celto-Scythians had no horns, or horns exceedingly ſmall; which they aſcribed to the ſeverity of the cold and climate. Strabo, as a proof of the great cold which prevailed in the country now called the Ukraine, obſerves, that it produced no aſſes;—animals, ſays he, that cannot endure the cold; and he adds, that the horſes there are extremely ſmall. Pauſanias expreſsly ſays, that in Thrace there were in his time bears and wild ſwine of a white colour. Such animals are found at preſent only in the remoteſt parts of the north, on the other ſide of the polar circle. Virgil, Ovid, and Pomponius Mela, inform us, that the inhabitants of the European part of Scythia and Thrace lived, during the whole winter, under the earth, as the Laplanders do at preſent; that they burnt large logs of wood to keep themſelves warm; that they never went abroad without being wrapped in ſkins; and that they left no part of the body uncovered but the mouth and eyes.

As a farther evidence of a change of climate, it has been alleged, that the rein-deer, from which the ſavage of the north derives the beſt comforts of his dreary life, is of a conſtitution that ſupports, and even requires the moſt intenſe cold. He is found in the rocks of Spitzberg, within 10 degrees of the pole; he ſeems to delight in the ſnows of Lapland and Siberia; but, at preſent, he cannot ſubſiſt, much leſs multiply, in any country to the ſouth of the Baltic; whereas in the time of Cæſar (vid. De Bell. Gallic. vi. 23, &c) the rein deer, as well as the elk and the wild bull, was a native of the Hercynian foreſt, which then overſhadowed a great part of Germany and Poland.

With a view of aſcertaining the boundaries of the northern countries, which the ancients deemed deſolate and uninhabitable on account of the great intenſity of the cold, we learn from Herodotus, that beyond the Melanchlini, a Sarmatian people, ſo called from their black hair, there were only lakes, moraſſes and unoccupied diſtricts as far as was then known; and we learn alſo from Ovid, that on the other ſide of the Cimmerian Boſphorus, the Tanais, and the Scythian moraſſes, a cold prevailed which rendered the country uninhabitable. Strabo repeatedly ſays, that all the lands towards the north of the tribes, who lived on the banks of the Tanais and the Boryſthenes, were uninhabitable on account of the ſeverity of the cold. This river, as far as it has been traced, does not lie beyond the 55th degree of latitude; and therefore it is on the ſame parallel with the northern parts of England and Germany, the middle of Lithuania, and the middle of Ruſſia. Strabo alſo ſays, that the whole northern part of Britain was very thinly peopled on account of the cold, and that he believed all the countries lying beyond it to be uninhabited. As no part of Great Britain extends beyond the 60th degree of north latitude, that parallel muſt include all Norway, almoſt the whole of Sweden, and the half of Ruſſia. Theſe countries, therefore, in the time of Strabo, that is, about the period of Auguſtus, were conſidered as uninhabited. The ancients, in general, ſpeak of all the lands which lay beyond the 55th degree of N. latitude as filled with lakes, moraſſes, ice, ſnow, and fogs, almoſt like thoſe countries to the north of Hudſon's Bay. From the authorities above cited, we derive ſufficient evidence of the exceſſive ſeverity which prevailed 2000 years ago in the climate of thoſe countries of Europe, lying between 44° and 50° N. lat. and of the difference between the ſtate of their temperature in that period and the preſent. The more northern lands, which the ancients, on account of their inſupportable cold, conſidered as uninhabitable; Iceland, Norway, Lapland, and the northern part of Ruſſia, and Siberia; are habitable, and actually inhabited, though exceſſively cold. The ancients alſo ſpeak of effects produced by the cold of winter in Italy, Greece, Leſſer Aſia, &c. which at preſent are certainly unknown. The ſoil of the latter countries, as well as that of the ancient Aſſyria, Chaldæa, Paleſtine, the Roman part of Africa, and Spain, is at preſent remarkably ſtony, and burnt up with heat. We know, however, that Spain in particular, about 1800 years ago, was exceedingly rich and fruitful, and abounded with all ſorts of proviſions, which are no longer to be found in it. The change of the ſoil and fertility in all the countries bordering on the Mediterranean Sea, and which formed the greateſt and moſt beautiful part of the Roman empire, is admitted as a certain fact, by all thoſe who have ſpoken of their former and preſent ſtate.

Upon the whole it may be affirmed as an unqueſtionable truth, that the ſoil and temperature of all the lands from Spain to India, and from the ridge of mount Atlas to Lapland and the remote parts of the north, have, in the courſe of ages, ſince the period of the oldeſt hiſtorical monuments ſtill extant to the preſent time, been gradually ſubjected to a complete change, from the utmoſt degree of moiſture and cold, to a great degree of dryneſs and warmth. The effect has been conſtant and uniform, and muſt therefore be traced to a correſponding cauſe. Dr. Williamſon (ubi ſupra) aſſerts, that the climate of America is becoming continually milder; and he confirms the aſſertion by a number of facts. This effect, indeed, is directly contrary to the hypotheſis of the celebrated naturaliſt, Buffon, reſpecting the theory of the earth and planets, who aſſerts, that they have been continually loſing warmth, ſince they were firſt in a ſtate of fuſion, and are becoming always colder; ſo that they will at length be incapable of keeping alive any animal or vegetable production. All hiſtorical and phyſical monuments, however, prove the contrary.

It is not merely in modern times, and ſince the improvement of natural philoſophy, that this change of temperature and ſoil has been noticed. A great number of places, well known and deſcribed by the ancients, in Paleſtine, Syria, Leſſer Aſia, Greece, Italy, Spain, and Barbary, exhibit proofs of the changes which have taken place in the ſoil and temperature in the courſe of time. Their preſent dry and barren ſtate is well known, and ſeems to be irremediable. Columella is the firſt author who ſpeaks of vines in Gaul; and he ſays that the Sabines and the Romans in the preceding century had procured, amidſt the devaſtation of war, more abundant crops than had been procured in his time during a ſtate of perfect peace. With regard to the changes of climate his obſervation is remarkable. "I find," ſays he, "that it is the opinion of many reſpectable authors, that the quality and ſtate of the atmoſphere became changed in the courſe of a long ſeries of ages: for Saſerna, in that work which he has left on agriculture, infers that the ſtate of the atmoſphere is changed, becauſe certain diſtricts, which formerly were incapable of producing vines and olives on account of the continued ſeverity of the winter, now yield abundant vintages and plenty of oil, by the climate having become milder and warmer."

Many different cauſes have been alleged in order to account for thoſe alterations of climate which we have above recited. Of theſe ſome are only accidental, and have taken place in different countries at very different periods; while in others ſome of them have not occurred at all. Among theſe the principal are the draining of lakes and moraſſes, the extirpation of foreſts, and the cultivation of land. All the ancient writers who ſpeak of the countries of Europe beyond 50° N. lat. repreſent them as filled with lakes and moraſſes, and covered with immenſe foreſts, almoſt as America, in various parts of it, is at preſent. But of late years the people of America have been employed in extirpating the foreſts, draining the marſhes, and cultivating the land; and it is well known that the climate there is become milder and more temperate. In the ſame manner the inhabitants of all the northern parts of Europe have for a thouſand or two thouſand years employed themſelves in the improvement of the ſoil; and thus they have contributed to ameliorate the climate, not only in the countries that were thus cultivated, but even in neighbouring regions expoſed to the effects of their atmoſphere. In the ſouthern parts of Europe there alſo exiſted a great number of lakes and moraſſes, which muſt have rendered the air exceedingly cold and moiſt, and conſequently unhealthful; but in later periods few of theſe have remained, if we except ſuch as may ſtill be found in Sweden and Norway; though the places where they exiſted, both in England and on the continent, in Gaul, Germany, and the European Sarmatia, may ſtill be diſtinctly perceived. It is well known, that in the time of Julius Cæſar, and even long after, almoſt the whole of Germany and Sarmatia was covered with immenſe foreſts. The Hercynian foreſt in particular was ſixty days' journey in length, commencing in Belgic Gaul near the ſea and extending through Germany and Poland. Theſe foreſts which covered the mountains and plains, and the lakes or marſhes which occurred in almoſt every valley, muſt have vitiated the air; and it is obvious that a very conſiderable change muſt have been produced by clearing the woods and draining off the ſtagnant waters. Large and thick woods prevent the ſolar beams from penetrating into the ſoil, and warming it; whilſt their fallen leaves and branches rot on the ground and occaſion a thick cruſt which impedes the eſcape and diffuſion of the internal heat. They alſo concentrate the cold and moiſt vapours, render them putrid, and corrupt the whole atmoſphere. This we find from the account of Dr. Williamſon to have been particularly the caſe in the middle colonies of North America; and the conſequences were bilious and intermittent fevers in ſummer and autumn, and inflammatory fevers in winter. But when theſe countries were cleared and cultivated, and the land was rendered more open and dry, the prevalence of ſuch fatal diſeaſes was reſtrained and diminiſhed. The caſe muſt formerly have been the ſame in Europe under the like circumſtances, and ſimilar cauſes muſt have contributed to render its climate milder and more ſalubrious. The progreſs of cultivation and of agricultural improvements, was, however, in a great degree obſtructed by the diſpoſitions and habits of the Celts and Sarmatians, who were the firſt occupiers of all the European countries, which lay to the north of Italy and Greece. Like the other barbarous people that deſcended from them under different names, and over-ran the Roman empire in the 5th and 6th centuries, they deſpiſed agriculture, and cultivated only land ſufficient to ſupply the wants of the current year. They ſubſiſted chiefly by hunting and by feeding on the fleſh of domeſtic animals which they reared in great numbers; and attention to theſe objects was regarded by them as much more dignified and important than the cultivation of land. This error has been ſufficiently detected and expoſed by the practice of more modern times; as it has been found that the culture of the earth, by breaking and ſoftening its ſurface, has thus rendered it capable of imbibing the rays of the ſun in ſummer, and of affording a paſſage to the internal heat in winter, and accordingly contributed to preſerve a continual equilibrium between the heat of the earth and that of the atmoſphere. The contrary takes place in all uncultivated countries, eſpecially when they are moiſt and covered with wood. It cannot juſtly be queſtioned that the gradual draining of the ſtagnant water in Celto-Scythia and European Sarmatia, together with the deſtruction of their large foreſts and the general cultivation of the fields in theſe countries, muſt have had an influence, not only on the ſtate of their own climate, but alſo on the atmoſphere of Greece and Italy. Thoſe cutting north-winds which converted every thing into ice, and of which the Greeks and the Romans complain ſo much, have in a great meaſure ceaſed, ſince the principal cauſes that produced them no longer exiſt. As long as Germany, Pannonia, Dacia, Mœſia, and Thrace remained uncultivated and covered with immenſe foreſts, their atmoſphere was extremely cold, thick, and heavy, and had a conſiderable influence on that of Italy and Greece, in which, becauſe they were more open and warm countries, the atmoſphere was conſequently far lighter. The exertions of this fluid to recover its equilibrium were the cauſes of the cutting north-winds, of which the Greeks and the Romans complained ſo much. But when the whole of Celto-Scythia and Sarmatia became more open and better cultivated, their atmoſphere muſt have come nearer to an equilibrium with that of Greece and Italy, and conſequently thoſe ſtreams of air from the north muſt have decreaſed in the ſame proportion. This is a circumſtance which muſt have contributed to moderate the climate of Greece and of Italy, and to render it much milder than it was about 1800 or 2000 years ago: and to ſuch a degree that, if there had been no other cauſe, we could no longer wonder at, or entertain a doubt of, the effects of the cold which the ancients remarked in their time, and which are not obſerved at preſent. The honourable Daines Barrington (See Phil. Tranſ. vol. 58.) having ſhewn by the authorities which we have already cited, contraſted againſt thoſe of modern travellers, that the climate of Tomus or Tomi, ſuppoſed to be the ſame with the preſent Temeſware, whither Ovid was baniſhed, has undergone a very conſiderable change, urges this fact againſt the common obſervation, that the cultivation of a country will render the climate more temperate: "becauſe," he ſays, "the adjacent country is now in the ſame ſtate that it was in the time of Ovid." He adds, "that Italy was better cultivated in the Auguſtan age than it is now, which ſhould conſequently have made the temperature of the air more warm than it is now experienced to be. Virgil, in his "Georgics," is conſtantly adviſing precautions againſt ſnow and ice in the management of cattle; and ſpeaking of Calabria, the moſt ſouthern part of Italy, he expreſſes himſelf with regard to the rivers being frozen, as what was commonly to be expected. It appears alſo from the 6th ſatire of Juvenal, that the Tyber's being commonly frozen in winter, ſupplied the ladies of Rome with a very extraordinary inſtance of implicit deference to the commands of the Egyptian prieſts in the performance of their ablutions.

> "Hybernum fracta glacie deſcendet in amnem,
> Ter matutino Tyberi mergetur ———"

In farther proof of the fact, that the Italian rivers were conſtantly frozen over, a paſſage is cited from Ælian (De Animal. lib. xiv. cap. 29.), which conſiſts of inſtructions how to catch eels, whilſt the water is covered with ice; whereas, if we may believe the concurrent accounts of modern travellers, it would be almoſt as ridiculous to adviſe a method of catching fiſh in the rivers of Italy, which depended entirely upon their being commonly frozen over, as it would be to give ſuch directions to an inhabitant of Jamaica. Many paſſages of Horace ſuppoſe the ſtreets of Rome full of ſnow and ice. The winters are now unqueſtionably much more temperate at Rome than formerly. At preſent the Tyber no more freezes at Rome, than the Nile at Cairo. Indeed, the Romans term the winter very rigorous, if the ſnow lie two days; and, if one ſee for 48 hours a few icicles hang from a fountain that has a north expoſure. To the facts above-mentioned, it may be ſufficient to refer to what has been already obſerved with regard to the influence of the winds; or to allege, that the cultivation of a country, though one, is not the only cauſe of the amelioration of its climate. If it ſhould be ſaid, that as the cold of winter decreaſes, by the operation of the cauſes now recited, the heat of ſummer ought to increaſe in the ſame proportion; the abbé Mann admits the fact, and thinks it demonſtrable by many monuments, hiſtorical as well as phyſical, that the ſum-total of the mean ſummer heat is greater than it was formerly, and that it continually increaſes, though at long intervals, and in an imperceptible manner. With reſpect to that ſtifling heat which is occaſionally experienced even in Lapland, he thinks that it is leſſened by all the cauſes which diminiſh the cold of winter. Experience teaches us, that the thinner, purer, and more elaſtic the air is, the leſs, in the ſame proportion, is the intenſity of the ſummer heat; and, on the contrary, the thicker the atmoſphere is, and the more it is filled with ſtagnant and concentrated vapours, the heat is more intenſe and more ſtifling. For this reaſon it is always cooler on the ſummits of high mountains, while a ſtifling and inſupportable heat prevails in the neighbouring plains, eſpecially when they are ſurrounded with wood. This is always obſerved in the ſavannahs of America. Dr. Williamſon concurs in this opinion, and obſerves, that when the extenſive country of North America becomes entirely open, when its woods are cut down, and its plains cultivated, the ſeverity of the winter cold will not only decreaſe, but the ſtifling unhealthful heat of the ſummer will be moderated. The quantity of ſnow, ice, and moiſture, is already evidently leſſened; and many plants, which could not be cultivated there formerly, now thrive and ſucceed. The abbé Mann alleges another, and, in his eſtimation, principal cauſe of the amelioration of climate, the agency of which is general and uniform, that is, an union of the two diſtinct principles, moiſture and heat. The principle of heat, he ſays, increaſed continually in the courſe of time, ſo as to overcome the oppoſite principles of moiſture and cold, renders, by theſe means, the earth drier and fuller of ſtones, and conſequently increaſes the ſum of the degree of heat. Without this principle, it is his opinion, that we can never find ſufficient grounds for the wonderful changes which have taken place in the nature of the ſoil of all thoſe lands which border on the Mediterranean ſea, which formed the ancient empire of Rome, from Syria to India, and which at preſent are all become uncommonly fruitful, dry, and ſtony. The mere neglect of agriculture could never have produced theſe effects, and muſt have been attended rather with effects of a contrary nature.

That the difference of climate has a very conſiderable influence on the productions of the ſoil, and on the animals of every ſpecies, that occupy particular diſtricts of the globe, is a fact that has been very generally acknowledged. But the extent and degree of this influence are ſubjects, with regard to which different writers have expreſſed very different ſentiments. Dr. Robertſon adopts the general ideas of count de Buffon, and M. de Paw, on this ſubject; and in its relation to America, obſerves, that the uncultivated ſtate of the New World affected not only the temperature of the air, but the qualities of its productions. The principle of life, he ſays, ſeems to have been leſs active and vigorous there than in the ancient continent. So that, notwithſtanding the vaſt extent of America and the variety of its climates, the different ſpecies of animals peculiar to it are much fewer in proportion than thoſe of the other hemiſphere. Of 200 different kinds of animals, according to Buffon, ſpread over the face of the earth, only about one-third exiſted in America at the time of its diſcovery. Beſides, nature, it is ſaid, was not only leſs prolific in the new world, but ſhe appears to have been likewiſe leſs vigorous in her productions. The animals originally belonging to this quarter of the globe appear to be of an inferior race, neither ſo robuſt nor ſo fierce, as thoſe of the other continent. The ſame qualities in the climate of America, which ſtinted the growth, and enfeebled the ſpirit of its native animals, have proved pernicious to ſuch as have migrated into it voluntarily from the other continent, or have been tranſported thither by the Europeans. Moſt of the domeſtic animals with which the Europeans ſtored the provinces in which they ſettled, have degenerated with reſpect either to bulk or quality, in a country whoſe temperature and ſoil ſeem to be leſs favourable to the ſtrength and perfection of the animal creation. It is further alleged, that the ſame cauſes which checked the growth and the vigour of the more noble animals, have favoured the propagation and increaſe of reptiles and inſects, which multiply faſter, perhaps, in America than in other parts, and grow of a more monſtrous bulk. The birds, alſo, of the new world, are not diſtinguiſhed by qualities ſo conſpicuous and characteriſtical, as thoſe which have been obſerved in its quadrupeds; ſo that ſuch as are peculiar to America nearly reſemble thoſe with which mankind were acquainted in ſimilar regions of the ancient hemiſphere. The American birds of the torrid zone, like thoſe of the ſame climate in Aſia and Africa, are decked in plumage, which dazzles the eye with the vivid beauty of its colours; nevertheleſs, nature, ſatisfied with clothing them in this gay dreſs, has denied moſt of them that melody of ſound, and variety of notes, which catch and delight the ear. In ſome diſtricts of America, the unwholeſome temperature of the air ſeems to be unfavourable even to this part of the creation. The number of birds is leſs than in other countries, and the traveller is ſtruck with the amazing ſolitude and ſilence of its foreſts. Moreover, although the ſoil, in a continent ſo extenſive as America, muſt of courſe be extremely various; yet it may be obſerved in general, that moiſture and cold, which predominate ſo remarkably in all parts of America, muſt have great influence on its nature and productions; and, therefore, chilled by intenſe cold, the ground never acquires warmth ſufficient to ripen the fruits, which are found in the correſponding parts of the other continent. Allowing, however, for the diverſity that occurs in a continent ſo extenſive, the ſoil of America is naturally as rich and fertile as in any part of the earth.

In order to account for the condition and character of the Americans, ſome philoſophers (as count de Buffon) have maintained, that that part of the globe, occupied by them, had but lately emerged from the ſea, and become fit for the reſidence of man; that every thing in it bore marks of a recent original; and that its inhabitants lately called into exiſtence, and ſtill at the beginning of their career, were unworthy to be compared with the people of a more ancient and improved continent. Others (*e. g.* M. de Paw) have imagined, that, under the influence of an unkindly climate, which checks and enervates the principle of life, man never attained in America the perfection which belongs to his nature, but remained an animal of an inferior order, defective in the vigour of his bodily frame, and deſtitute of ſenſibility, as well as of force, in the operations of his mind. In oppoſition to both theſe, other philoſophers (as M. Rouſſeau) have ſuppoſed, that man arrives at his higheſt dignity and excellence long before he reaches a ſtate of refinement; and, in the rude ſimplicity of ſavage life, diſplays an elevation of ſentiment, and independence of mind, and a warmth of attachment, for which it is vain to ſearch among the members of poliſhed ſocieties. Accordingly the rude manners of the Americans have been propoſed as models to the reſt of the ſpecies. Dr. Robertſon, in his judicious and elaborate inveſtigation of this intereſting ſubject, cautions thoſe who inquire concerning either the bodily or mental qualities of particular races of men, from being miſled by the common or ſeducing error of aſcribing to a ſingle cauſe thoſe characteriſtic peculiarities, which are the effect of the combined operations of many cauſes. Some philoſophers of great eminence, he ſays, finding that the climate and ſoil of America differ, in ſo many reſpects, from thoſe of the other hemiſphere, have laid hold on this as ſufficient to account for what is peculiar in the conſtitution of its inhabitants. Accordingly they reſt on phyſical cauſes alone, and conſider the feeble frame and languid deſire of the Americans as conſequences of the temperament of that portion of the globe which they occupy. But he thinks that the influences of political and moral cauſes ought not to have been overlooked. Theſe operate with no leſs effect than that on which many philoſophers reſt as a full explanation of the ſingular appearances that are diſcernible in the bodily conſtitutions and mental qualities of the inhabitants of the New World. However, in contemplating the inhabitants of a country ſo widely extended as America, great attention ſhould be paid to the diverſity of climates under which they are placed. The American provinces are of ſuch different temperament, that this alone is ſufficient to conſtitute a diſtinction between their inhabitants. In every part of the earth where man exiſts, the power of climate operates, with deciſive influence, upon his condition and character; and in thoſe countries which approach near to the extremes of heat or cold, this influence is ſo conſpicuous as to ſtrike every beholder. Whether we conſider man, ſays Dr. Robertſon, merely as an animal, or as a being endowed with rational powers, which fit him for activity and ſpeculation, we ſhall find that he has uniformly attained the greateſt perfection of which his nature is capable, in the temperate regions of the globe. There his conſtitution is moſt vigorous, his organs moſt acute, and his form moſt beautiful. There, too, he poſſeſſes a ſuperior extent of capacity, greater fertility of imagination, more enterpriſing courage, and a ſenſibility of heart which gives birth to paſſions, not only ardent, but perſevering. In this favourite ſituation he has diſplayed the utmoſt efforts of his genius, in literature, in policy, in commerce, in war, and in all the arts which improve or embelliſh life. (See Ferguſon's Eſſay on the Hiſtory of Civil Society, part iii. c. i.) This powerful operation of climate is felt moſt ſenſibly by rude nations, and produces greater effects than in ſocieties more poliſhed. The talents of civilized men are continually exerted in rendering their conſtitution more comfortable; and by their ingenuity and inventions, they can, in a great meaſure, ſupply the defects, and guard againſt the inconveniences, of any climate. But the improvident ſavage is affected by every circumſtance peculiar to his ſituation. He takes no precaution either to mitigate or to improve it. Like a plant or an animal, he is formed by the climate under which he is placed, and feels the full force of its influence. This natural diſtinction between the inhabitants of the temperate and torrid zones is ſignally exemplified among the rude nations of America. Thoſe of the former claſs comprehend the North Americans from the river St. Lawrence to the gulf of Mexico, together with the people of Chili, and a few ſmall tribes towards the extremity of the ſouthern continent. In this claſs, the human ſpecies appears manifeſtly to be more perfect; the natives are more robuſt, more active, more intelligent, and more courageous; and they poſſeſs, in the moſt eminent degree, that force of mind, and love of independence, which are the chief virtues of man in a ſavage ſtate. To the other claſs belong all the inhabitants of the iſlands, and thoſe ſettled in the various provinces which extend from the iſthmus of Darien almoſt to the ſouthern confines of Braſil, along the eaſt ſide of the Andes; and over theſe the Europeans have moſt completely eſtabliſhed their dominion, whilſt the others have defended their liberty againſt them with perſevering fortitude. It is allowed, however, that moral and political cauſes affect the diſpoſition and character of individuals, as well as nations, ſtill more powerfully than the influence of climate. Accordingly, ſome tribes have been found in various parts of the torrid zone, who poſſeſs courage, high ſpirit, and the love of independence, in a degree hardly inferior to the natives of more temperate climates. Upon the whole, it is not by attending to any ſingle cauſe or principle, however powerful and extenſive its influence may appear, that we can explain the actions, or account for the character of men. Even the law of climate, more univerſal, perhaps, in its operation than any that affects the human ſpecies, cannot be applied in judging of their conduct, without many exceptions. (Robertſon's Hiſt. Amer. book iv.)

Clavigero, in his "Hiſtory of Mexico," has defended the climate and ſoil of America againſt the objections of count de Buffon and M. de Paw. He begins with ſhewing that the lakes and marſhes, which theſe writers have conſidered as traces of a general inundation, are merely the effects of the great rivers, innumerable fountains, and very plentiful rains of America. Whoever has obſerved, he ſays, the ſtupendous elevation of the inland countries of America, will not eaſily perſuade himſelf that the water could riſe ſo as to cover them without inundating Europe. To the proof alleged by M. de Paw of the overflow of the ſoil by water, from the veins of metals which are found near the ſurface of the earth, he replies that this phenomenon may much more ſatisfactorily be accounted for by ſuppoſing that ſome violent eruptions of ſubterraneous fires, which appear manifeſt in the many volcanoes of the Cordilleras, deſtroyed the ſurface of ſome ſoils, and left the veins of metals almoſt naked. The diſcovery of marine bodies, heaped up together in ſome inland places of America, if it ſhould prove the pretended inundation, would prove ſtill more ſtrongly a greater inundation of the old continent, in which they are much more abundant. As to the extinction or deſtruction of the great quadrupeds of America, which M. de Paw ſays are the firſt to periſh in water, and which, as he ſuppoſes, periſhed in this imaginary inundation, Clavigero thinks it aſtoniſhing that elephants and camels, which are ſo ſwift in their motion, ſhould periſh, and that the ſloth, which is ſo ſlow, and unable to move, ſhould have eſcaped. Although we ſhould admit that ſuch quadrupeds have formerly exiſted in America, we are not obliged to believe that their deſtruction has been occaſioned by the ſuppoſed inundation, becauſe it might be aſcribed to other very different cauſes. After examining and refuting ſome other arguments of M. de Buffon, Clavigero denies the reality of the inundation, which theſe writers ſuppoſe; more eſpecially as there has been no record or tradition among the Americans of any other inundation than that univerſal deluge which is mentioned in ſcripture.

Againſt the charges of Meſſrs. Buffon and de Paw, who repreſent the ſoil of America as barren, and its whole territory as compoſed of inacceſſible mountains, impenetrable woods and waſtes, watry plains and marſhes, the Mexican hiſtorian alleges the teſtimony of Acoſta, who obſerves, that if there be any land in the world to which the name of Paradiſe may be applied, it is that of America, and he adduces the multitude, variety, and excellence of its vegetable productions, and particularly thoſe of Mexico and Peru, as an evidence of the fertility of its lands.

Clavigero, after a variety of obſervations on the ample ſupply of vegetables furniſhed by the different climates of America, proceeds to examine one of the principal arguments urged by Buffon and de Paw in proof of the poverty of the ſoil and malignity of the climate of America, which is the degeneracy of animals, both ſuch as are natives and ſuch as are tranſported thither from the ancient continent. The firſt ground of diſparagement to America, in the judgment of count de Buffon, is the ſmall number of its quadrupeds, compared with thoſe of the old continent. He reckons (as we have already obſerved) 200 ſpecies of quadrupeds hitherto diſcovered over the whole globe, of which 130 belong to the old continent, and only 70 to the new world. To this argument it is replied, that the extent of America is one-third part of the whole earth, and that it appears to have one-third part, or its due proportion, of all the ſpecies of quadrupeds. But it is difficult to aſcertain the true number of ſpecies, and to aſſign to each its proper proportion; and therefore all reaſoning on this topic muſt be in a degree vague and inconcluſive. In the enumeration and arrangement of the natural hiſtorian himſelf, there is a conſiderable degree of confuſion and ſelfcontradiction. But it is alleged, that all the animals of America are of a much ſmaller ſize than they are in Europe; but no argument can be fairly deduced from this circumſtance againſt the ſoil or climate of America; becauſe according to principles eſtabliſhed by Buffon himſelf, the larger kinds of animals are peculiar to intemperate climes, and the ſmaller to climes which are mild and temperate: and if the advantages of climate are to be deduced from the ſize of quadrupeds, one might juſtly ſay, that the climate of Africa and the ſouth of Aſia is much better than that of Europe. But the fact, in its unlimited extent, is not true, and has been contradicted even by Buffon himſelf. It has been alſo ſaid that the animals of South America, which are thoſe that properly belong to the new continent, are almoſt all deprived of tuſks, horns, and tails; that they are deformed in figure, their limbs being diſproportionate, and ill ſet; and that ſome of them, as the ant-killers and ſloths, are of ſo miſerable a nature, that they have hardly ability to move and eat. However, it would be difficult to prove that any irregularity in the conformation of different animals is owing to the climate of America, or that it is peculiar to that country. What our philoſophers have ſaid with reſpect to the leſs ferocity of American wild beaſts; inſtead of aſſiſting them to prove the malignity of that climate, ſerves only, on the principle expreſsly ſtated by Buffon himſelf, to demonſtrate its mildneſs and bounty. A decreaſe of ferocity, therefore, cannot be juſtly pleaded as a proof of degeneracy occaſioned by the malignity of the climate. But if the American quadrupeds are ſmaller in ſize, more ungraceful in form, and more puſillanimous in their nature than thoſe of the old continent, this circumſtance would not afford a certain argument of the malignity of the American climate, becauſe the ſame degeneracy is not manifeſt in the reptiles and birds of America. It has been ſaid, with regard to American birds, that, though they are ſuperior in beauty of plumage, they are exceeded in excellence of ſong by thoſe of Europe. This fact, however, has been contradicted; and it has been aſſerted that the ſong of the nightingale is more melodious, more varied, and more durable in America than in Europe. The centzontli or polyglot is preferred even to the nightingale, with reſpect to the ſingular ſweetneſs of its ſong, the prodigious variety of its notes, and the talent it poſſeſſes of counterfeiting the different tones of the birds and quadrupeds which it hears. As a further proof of the degeneracy of quadrupeds in America, it has been ſaid that all the animals tranſported from Europe to America, ſuch as horſes, aſſes, bulls, ſheep, goats, hogs, and dogs, are conſiderably ſmaller there than they are in Europe, and, as Buffon ſays, without one ſingle exception. If we ſeek for the proof of this univerſal aſſertion, we ſhall find no other, ſays Clavigero, in the whole hiſtory of that philoſopher than that cows, ſheep, goats, hogs, and dogs, are ſmaller in Canada than they are in France. The Mexican hiſtorian proceeds to examine and refute the charge of degeneracy in the human ſpecies occaſioned by the malignity of the climate. Accordingly he maintains, that the Americans, in general, are neither more diminutive in ſtature, nor more deformed and feeble, nor more ſubject to diſeaſe than the Europeans; and where any inſtances occur to the contrary, he attributes them to incidental cauſes and not to the influence of the climate. After an inveſtigation of the corporeal qualities of the Americans, he produces a variety of atteſtations and arguments in favour of their mental powers and attainments. Although ſome miſſionaries, aſtoniſhed equally at their ſlowneſs of comprehenſion, and at their inſenſibility, have pronounced them to be a race of men ſo brutiſh, as to be incapable of underſtanding the firſt principles of religion, Clavigero contends, that their teſtimony cannot be truſted. He corrects ſome miſtakes of Dr. Robertſon on this ſubject, and particularly his miſapprehenſion of a decree iſſued by a council at Lima in 1552, which excluded the Indians from the euchariſt on account of their incapacity, and alſo of a bull of Paul III. iſſued in 1537, which is ſaid to have declared them to be rational creatures, intitled to all the privileges of chriſtians; whereas, he ſays, it was merely intended to certify their right to all the privileges of men, and thus to condemn their oppreſſors. "We have had intimate commerce with the Americans," ſays the hiſtorian of Mexico, "have lived for ſome years in a ſeminary deſtined for their inſtruction, ſaw the erection and progreſs of the royal college of Guadaloupe, founded in Mexico, by a Mexican Jeſuit, for the education of Indian children, had afterwards ſome Indians among our pupils, had particular knowledge of many American rectors, many nobles, and numerous artiſts ; attentively obſerved their character, their genius, their diſpoſition, and manner of thinking ; and have examined beſides with the utmoſt diligence their hiſtory, their religion, their government, their laws, and their cuſtoms : and after ſuch long experience and ſtudy of them, from which we imagine ourſelves enabled to decide without danger of erring, we declare to M. de Paw, and to all Europe, that the mental qualities of the Americans are not the leaſt inferior to thoſe of the Europeans, that they are capable of all, even the moſt abſtract ſciences, and that if equal care was taken of their education, if they were brought up from childhood under good maſters, were protected and ſtimulated by rewards, we ſhould ſee riſe among the Americans, philoſophers, mathematicians, and divines who would rival the firſt in Europe. But it is a little difficult, not to ſay impoſſible, to make great progreſs in the ſciences in the midſt of a life of miſery, ſervitude, and oppreſſion." He adds, "the whole ancient hiſtory of the Mexicans and Peruvians evinces to us, that they knew how to think and order their ideas, that they are ſuſceptible of all the paſſions and impreſſions of humanity, and that the Europeans have had no other advantage over them than that of having been better inſtructed. The civil government of the ancient Americans, their laws, and their arts, evidently demonſtrate they ſuffered no want of genius. Their wars ſhew us that their ſouls are not inſenſible to the excitements of love, as count de Buffon and M. de Paw think;" and of their courage there can be no queſtion. For other particulars with regard to their general character, cuſtoms, literature, &c. &c. we muſt refer to the "Diſſertations" annexed to Clavigero's Hiſtory of Mexico.

Monteſquieu in his "Spirit of Laws," (Book xiv. xvii.) examines the influence of different climates on the bodily conſtitution of individuals, and on the manners, characters, government, laws, and religion of different nations. The character of the mind, ſays this writer, and the paſſions of the heart are extremely different in different climates ; and the laws ought to be relative both to the difference of theſe paſſions, and to the difference of thoſe characters.

In cold countries people are more vigorous ; and ſuperiority of ſtrength produces a great many effects ; *v. g.* a greater boldneſs, that is, more courage ; a greater ſenſe of ſuperiority, that is, leſs deſire of revenge ; a greater opinion of ſecurity, that is, more frankneſs, leſs ſuſpicion, policy and cunning. On the other hand, the inhabitants of warm countries are more feeble and timorous, and poſſeſs a more exquiſite ſenſibility ; ſo that as climates are diſtinguiſhed by degrees of latitude, they might alſo be diſtinguiſhed in ſome meaſure, by degrees of ſenſibility. The heat of the climate, he ſays, may be ſo exceſſive as to deprive the body of all vigour and ſtrength. Then the faintneſs is communicated to the mind ; there is no curioſity, no noble enterprize, no generous ſentiment ; the inclinations are all paſſive ; indolence conſtitutes the utmoſt happineſs ; no puniſhment hardly is ſo ſevere as the action of the ſoul ; and ſlavery is more ſupportable than the force and vigour of mind neceſſary for human conduct. Hence the Indians are naturally a cowardly people ; and even the children of the Europeans, born in the Indies, loſe the courage peculiar to their own climate. This celebrated writer, reflecting on what the Greeks and Romans have ſaid of Aſiatic effeminacy, and the accounts given by travellers of the indolence of the Indians, is of opinion, that this indolence forms the diſtinguiſhing character of thoſe countries. Purſuing his inquiries into the common cauſe of this general fact, and finding, that all theſe nations inhabit what are called "hot countries," he has attributed the cauſe of their indolence to heat ; and aſſuming the fact as a principle, has laid it down as an axiom, that the inhabitants of hot countries muſt neceſſarily be indolent, inert of body, and from analogy, likewiſe inert of mind and character. He proceeds even ſtill farther, remarking, that unlimited monarchy is the moſt uſual form of government among theſe nations ; and conſidering deſpotiſm as the effect of the ſupineneſs of a people, he concludes that deſpotiſm is as much the natural government of theſe countries and as neceſſary as the climate under which they live. This ſyſtem has been received with great applauſe in France, nay, even throughout Europe, and the opinion of Monteſquieu is become, among the moſt numerous claſs of reaſoners, an authority from which it is preſumptuous to differ. A late writer (Volney) has conteſted this opinion, and ſuggeſted ſeveral objections againſt it. "The doctrine," he ſays, (Travels in Egypt and Syria, vol. ii.) "of the general indolence of the oriental and ſouthern nations, is founded on that opinion of Aſiatic effeminacy originally tranſmitted to us by the Greeks and Romans ; but what are the facts on which that was built ?"—"Admitting the facts as we receive them from hiſtory, were the Aſſyrians, whoſe ambition and wars during 500 years threw Aſia into confuſion ; the Medes, who ſhook off their yoke, and diſpoſſeſſed them ; the Perſians, who, under Cyrus, within the ſpace of 30 years, extended their conqueſts from the Indus to the Mediterranean ; were theſe inert and indolent people ? May we not oppoſe to this ſyſtem the Phœnicians, who, for ſo many centuries, were in poſſeſſion of the commerce of the whole ancient world : the Palmyrenians, of whoſe induſtry we poſſeſs ſuch ſtupendous monuments ; the Carduchi of Xenophon, who braved the power of the "great king," in the very heart of his empire : the Parthians, thoſe unconquerable rivals of Rome ; and even the Jews, who, limited to a little ſtate, never ceaſed to ſtruggle, for a thouſand years, againſt the moſt powerful empires ? If the men of theſe nations were inert, what is activity ? If they were active, where then is the influence of climate ? Why in the ſame countries where ſo much energy was diſplayed in former times, do we at preſent find ſuch profound indolence ? Why are the modern Greeks ſo debaſed amidſt the very ruins of Sparta and Athens, and in the fields of Marathon and Thermopylæ ? Will it be alleged, that the climate has changed ? Where are the proofs ? Suppoſing this true, it muſt have changed by irregular fits ; the climate of Perſia muſt have altered greatly from Cyrus to Xerxes ; that of Athens from Ariſtides to Demetrius Phalereus ; and that of Rome from Scipio to Sylla, and from Sylla to Tiberius. The climate of the Portugueſe muſt have changed ſince the days of Albuquerque ; and that of the Turks ſince Solyman ? If indolence be peculiar to the ſouthern countries, how are we to account for a Carthage in Africa, Rome in Italy, and the Buccaneers at St. Domingo ? Why do we meet with the Malays in India, and the Bedouins in Arabia ? Why, too, at the ſame period, and under the ſame ſky, do we find a Sybaris near Crotona, a Capua in the vicinity of Rome, and a Sardis contiguous to Miletus ? Whence is it, that we ſee, under our own eyes, and in Europe itſelf, northern governments as languid as thoſe of the ſouth ? Why, in our own country, are the ſouthern more active than the northern provinces ? If the ſame effects are obſervable under directly contrary circumſtances, and different effects under the ſame circumſtances, what becomes of theſe pretended principles ? What is this influence of climate? and what is to be underſtood by activity? Is it only to be accorded to warlike nations? and was Sparta when not engaged in war to be eſteemed inert? What do we mean by hot countries? Where are we to draw the line of cold and temperate? Let the partizans of Monteſquieu aſcertain this, that we may henceforward be enabled to determine the quantity of energy in a nation by the temperature, and at what degree of the thermometer we are to fix its aptitude to ſlavery or freedom. But a phyſical obſervation has been called in to corroborate this poſition; and we are told that heat abates our ſtrength; we are more indolent in ſummer than in winter: the inhabitants of hot countries, therefore, muſt be indolent. Let us ſuppoſe this true. Whence is it then, that, under the ſame influence of climate, the tyrant poſſeſſes more energy to oppreſs than the people to defend themſelves? But, is it not evident that we reaſon like the inhabitants of a country where cold is more prevalent than heat? Were a ſimilar theſis to be maintained in Egypt and Africa, it would there be ſaid, that cold prevents motion, and obſtructs the circulation? The truth is, that our ſenſations are relative to our habits, and that bodies aſſume a temperament analogous to the climate in which they live; ſo that they are only affected by the extremes of the ordinary medium. We hate ſweating; the Egyptian loves it, and dreads nothing ſo much as a failure of perſpiration. Thus, whether we refer to hiſtorical or natural facts, the ſyſtem of Monteſquieu, ſo ſpecious at firſt ſight, turns out, when examined, to be a mere paradox, which has owed its ſucceſs only to the impreſſion made by the novelty of the ſubject, at the time the "Spirit of Laws" appeared, and the indirect flattery it offered to thoſe nations by which it was ſo favourably received."

The author then proceeds to inveſtigate the origin and motives of activity in man; and concludes, that all action, whether of body or mind, has its ſource in our neceſſities, and augments as they increaſe. Accordingly we may follow its gradations from the rudeſt beginnings in the moſt ſavage ſtate of man, when hunger and thirſt awaken the firſt exertions of the ſoul and body, to the ſtate of the moſt mature improvement. In ſuch a progreſs, as in the primary cauſe, it muſt be acknowledged, that activity has little or no connection with heat; only the inhabitants of the north being reputed to ſtand more in need of nouriſhment than thoſe of the ſouth, it may be alleged, that they muſt conſequently be poſſeſſed of more activity; but this difference in neceſſary wants has very narrow limits. The facility of obtaining a great quantity of food, which is perhaps the primary cauſe of voraciouſneſs, depends leſs, eſpecially in a ſavage ſtate, on climate than on the nature of the ſoil, and its richneſs or poverty in paſturage, in foreſts, and in lakes; and conſequently in game, fiſh, and fruits; circumſtances which are found indifferently under every parallel. Hence it appears, that the nature of the ſoil has a real influence on activity; and we muſt perceive, that, in the ſocial as in the ſavage ſtate, a country, in which the means of ſubſiſtence are ſomewhat difficult to be procured, will have more active and more induſtrious inhabitants; while in another, where nature has laviſhed every thing, the people will be indolent and inactive. This is perfectly conformable to hiſtorical fact; for we always find the conquering nations poor, and iſſuing from lands either barren, or difficult of cultivation; while the conquered people are inhabitants of fertile and opulent countries. Theſe needy conquerors, eſtabliſhed among rich nations, ſhortly loſe their energy, and become effeminate. Such was the caſe with the Perſians, who, under Cyrus, deſcended from the Elymais into the fertile fields watered by the Euphrates; ſuch were the Macedonians under Alexander, when tranſplanted from mount Rhodope to the plains of Aſia; ſuch the Tartars of Gengis-khan, when ſettled in China and Bengal; and ſuch the Arabs ſo victorious under Mahomet, after the conqueſt of Spain and Egypt. It is not, therefore, as inhabitants of hot, but as inhabitants of rich countries, that nations are inclined to indolence; and this maxim is exactly conformable with what we obſerve in ſociety in general, ſince we ſee there is always leaſt activity among the more opulent claſſes; but as this ſatiety and poverty do not exiſt for all the individuals of a nation, we muſt recur to reaſons more general and more efficacious, than the nature of the ſoil. "I mean," ſays M. Volney, "the ſocial inſtitutions, called *Government* and *Religion*." Theſe are the true ſources and regulators of the activity or indolence of individuals and nations. Theſe are the efficient cauſes, which, as they extend or limit the natural or ſuperfluous wants, limit or extend the activity of all men. A proof that their influence operates in ſpite of the difference of climate and ſoil is, that Tyre, Carthage, and Alexandria, formerly poſſeſſed the ſame induſtry as London, Paris, and Amſterdam; that the Buccaneers and the Malayans, have diſplayed equal turbulence and courage with the Normans; and that the Ruſſians and Polanders have the apathy and indifference of the Hindoos and the Negroes. But as civil and religious inſtitutions are perpetually varied and changed by the paſſions of men, their influence changes and varies in very ſhort intervals of time. Hence it is that the Romans, commanded by Scipio, reſembled ſo little thoſe governed by Tiberius; and that the Greeks of the age of Ariſtides and Themiſtocles were ſo unlike thoſe of the time of Conſtantine. Let us examine what paſſes within ourſelves. Do we not experience, that our activity has leſs dependence on phyſical cauſes, than the actual circumſtances of the ſociety of which we are members? Are our deſires excited by neceſſary or ſuperfluous wants; both our bodies and minds are animated with new life; paſſion inſpires us with an activity ardent as our deſires and perſevering as our hopes. Are theſe hopes diſappointed; deſire decays, activity languiſhes, and diſcouragement induces apathy and indolence. This explains why our activity varies with our conditions, our ſituations, and the different periods of our life. Why does the man, who was active in his youth, become indolent in his old age? why is there more activity in capital and commercial cities, than in towns without commerce and in the country? To awaken activity, there muſt be objects of deſire, and to maintain it, the hope of arriving at enjoyment. If theſe two eſſentials are wanting, there is an end to individual and national activity. Such is the condition of the Orientals in general.—What ſhould induce them to move, if no motion procures them the hope of an enjoyment equivalent to the trouble they muſt take? How can they be otherwiſe than indolent in their moſt ſimple habits, if their ſocial inſtitutions render it a ſort of neceſſity? The moſt intelligent obſerver of antiquity, after having made the ſame remark on the Aſiatics of his time, has aſſigned the ſame reaſon.

"As to the effeminacy and indolence of the Aſiatics (ſays Hippocrates, De Aëre, Locis, et Aquis), if they are leſs warlike and more gentle in their manners than the Europeans, no doubt the nature of their climate, more temperate than ours, contributes greatly to this difference. But we muſt not forget the form of their governments, which are all deſpotic, and ſubject to the arbitrary will of their kings. Men who are not permitted the enjoyment of their natural rights, but whoſe paſſions are perpetually under the guidance of their maſters, will never be found courageous in battle. To them the riſks and advantages of war are by no means equal. Obliged to forſake their friends, their country, their families; to ſupport cruel fatigues, and even death itſelf, what is the recompence of ſo many ſacrifices? Danger and death. Their maſters alone enjoy the booty and the ſpoils they have purchaſed with their blood. But let them combat in their own cauſe, and reap the reward of their victory, or feel the ſhame of their defeat, they will no longer be deficient in courage; and the truth of this is ſufficiently proved by both the Greeks and Barbarians, who, in thoſe countries, live under their own laws, and are free; for they are more courageous than any other race of men." Upon the whole, M. Volney obſerves, as a fact which cannot be diſputed, that "the moral character of nations, taken from that of individuals, chiefly depends on the ſocial ſtate in which they live; ſince it is true, that our actions are governed by our civil and religious laws; and ſince our habits are no more than a repetition of thoſe actions, and our character only the diſpoſition to act in ſuch a manner, under ſuch circumſtances, it evidently follows, that theſe muſt eſſentially depend on the nature of the government and religion."

CLIMATE *for plants*. See TEMPERATURE.

CLIMATE, in *Agriculture*, a certain tract or ſpace on the ſurface of the earth, varying in the ſtate or temperature of the air. It has been ſtated by Mr. Donaldſon, that "it is the firſt natural advantage of every country; that which is abſolutely requiſite for animal, as well as vegetable life; that without which, ſoil and cultivation will avail little; for although ſoil may be improved with complete ſucceſs, climate cannot to any very conſiderable extent. It is well known that, beſides the particular ſituation of a country on the globe, other circumſtances combine in forming its climate; ſuch as its elevation, proximity to oceans, ſeas, mountains, marſhes, ſoil, and the like; upon ſuch natural cauſes, the climate of this country, he ſays, depends; and from theſe receives its character. (See the preceding article.) There are three diſtinct characteriſtics of our climate, that cannot eſcape the obſervation of thoſe who have made it an object of attention, and from which its advantages or diſadvantages muſt appear: 1ſt, its mildneſs; 2d, its variableneſs; and 3d, the productions dependent on it."

With regard to the firſt, it is remarked, that "from the high degree of north latitude in which this country is placed, one would not, at firſt, he ſays, ſuppoſe that its air ſhould be naturally mild; yet, on being compared with the temperature of other countries in the ſame parallel of latitude, it is certainly entitled to this character. The city of Moſcow, about half a degree ſouth of Edinburgh, is very different in point of climate. In the former city, ſo rigorous is the winter, that it is not uncommon for people to periſh by cold; the lips, noſes, ears, and fingers, of the inhabitants, are frequently froſt-bit; and water, thrown from a window, falls on the ground in ice; ſuch ſevere effects of cold may be ſaid to be unexperienced in the latter city, or in any part of the iſland. The iſland of Newfoundland, a diſtant branch of the Britiſh empire, lies in a lower latitude than England, and yet the extreme colds in winter, and the exceſſive heats in ſummer, render it very diſagreeable to the inhabitants. The ſame holds in regard to Canada, though ſituated in the 48th degree of north latitude: the climate, in point of mildneſs, is not equal to that of the mother country. Nay, in point of mildneſs, Britain excels lands on the continent, which one would think ſhould have naturally enjoyed a ſofter climate. We hear, with ſurpriſe, of the great falls of ſnow, the ſevere and long-continued froſts, the ſudden tranſition from theſe to ſultry heats, exceſſive rains, deſtructive hurricanes, and tremendous thunder-ſtorms, lightenings, and earthquakes, which ſcourge thoſe countries, whoſe inhabitants we are ready to envy, on account of their favourable climate; while, unconſcious of our own happineſs in this reſpect, we little think, that, in general, we breathe a purer air, untainted by noxious vapours, and fiery particles, that engender diſeaſe and death. In winter, too, our bodies are ſeldom ſo cramped with cold, or, in ſummer, ſo relaxed by heat, as to unfit us for paſtime or labour. This ſingular felicity of this iſland, as to climate, may be accounted for from its connection with the ocean. That immenſe body, from being always in motion, from never freezing, and from conſtantly inhaling the rays of the ſun, poſſeſſes a conſiderable degree of natural warmth. Of conſequence, the vapours exhaled from the ſea, by the action of the ſun, and which neceſſarily partake of the ſame warmth, when they mingle with our atmoſphere, muſt ſoften the coldneſs of the air. This is effected more eſpecially by the ſouth-weſt winds, which are prevalent in this country. Theſe, by the time they have croſſed the Atlantic, and reached our coaſts, muſt be charged with thoſe nutritive principles and genial vapours, which, being impregnated with the colder air of this iſland, deſcend in gentle dews and rains, that fertilize the ſoil. The ſame holds, though not in an equal degree, in regard to the wind that blows from the north, though colder than the weſt wind, in as much as it proceeds from countries nearer the pole; yet, in paſſing over the ocean it imbibes a portion of its warmth; and, when it reaches the country, is comparatively warmer than when croſſing the frozen mountains of the north. Hence, the reaſon why ſnow ſeldom lies above a few days on lands adjacent to the ſea-coaſt; hence, too, the influence of ſea-breezes, operating with other internal cauſes, namely, the natural fertility and warmth of the ſoil, the extenſive woods and plantations, with thoſe canals and rivers that carry off ſuperfluous water, the high ſtate of cultivation, the many cities, towns, villages, houſes, and animals, all combine in tempering the climate of this iſland; inſomuch, that it cannot be ſaid that, in any part of the iſland, high lands excepted, the climate is ſo intemperate as to prevent graſs growing, grain ripening, or the inhabitants from enjoying the comforts of life. Upon the whole, it appears, that a happy concurrence of circumſtances renders the climate of this country milder than that of other countries, which, from their local ſituation on the globe, might be expected to enjoy a more deſireable temperature."

In conſidering the ſecond diſtinction of climate, he remarks, that, "like the ocean that encompaſſes the iſland, our climate has been repreſented as inconſtant, unſettled, varying in the ſpace of a few hours, from dry to moiſt, from heat to cold, from clear to cloudy, and from the moſt pleaſant ſerenity to all the violence of tempeſt. He muſt, indeed, (he ſays), be an enthuſiaſtic admirer of the climate of Great Britain, who can give it a preference in point of uniform ſteadineſs to the climates of ſome continental countries. It muſt be admitted, that Britain does not enjoy that permanency of clear air and warm weather, nor that agreeable viciſſitude of ſeaſons peculiar to ſome kingdoms; nor is this poſſible, without the ſubverſion of thoſe laws which regulate ſeaſons and their changes. Upon the principles already laid down, it is obvious, that the iſland of Great Britain, waſhed upon three ſides by immenſe bodies of water, muſt neceſſarily be affected thereby; and it is impoſſible that its climate ſhould be ſo uniformly ſteady as that of other countries, ſituated in the centre of a vaſt continent, and ſheltered by ranges of mountains from the frequent inclemencies of winds and waves. To ſuch natural cauſes muſt be aſcribed the ſudden and frequent variations of our climate, felt at times ſo uncomfortably by the natives; and which draw from thoſe habituated to more conſtant climes heavy complaints againſt our atmoſphere. Theſe irregularities of climate, however diſagreeable, (he ſays), lay a foundation for advantages more ſubſtantial than any that reſult from a more pleaſant and ſteady temperature of the air. It is not in countries where the ſeaſons of heat and cold, wind and rain, are periodical, or where the greateſt regularity of climate takes place, that mankind are moſt vigorous, or the fruits of the earth moſt perfect. There is a ſameneſs of climate as well as of other things that is prejudicial to man. Beſides, the air, from being long acted upon by heat or cold, moiſture or dryneſs, is put into a ſtate no leſs unfriendly to vegetable than animal tribes. But in Britain, the air, from being refined and quickened by the frequent changes it undergoes, is in little danger of being affected by ſuch cauſes. In ſpring, it muſt be admitted, that the country is frequently drenched with rain, and the ſeed-time, of courſe, interrupted. But, exceſſive as the rains ſometimes are, their bad effects are generally prevented by the keen ſharp winds and dry air that quickly follow, inſomuch, that a few days after it cannot be known that ſuch weather had prevailed. It accordingly ſeldom happens in Britain, that the active huſbandman is prevented by the inconſtancy of the weather, from ploughing the land and ſowing the ſeed in ſeaſon. Seldom is that ſeed killed in the earth, or when ſprung withered in its tender blade, either by untimely froſt or inclement winds. In ſummer, the verdure of our hills and luxuriancy of our crops are ſeldom blaſted by a long continuance of dry, ſcorching weather, or immoderate falls of rain. Sunſhine and ſhade, genial warmth and moiſture, ſucceed in grateful variety, and render our ſummer no leſs delightful to man than friendly to vegetation. The climate in harveſt reſembles that of ſpring, the weather ſuddenly ſhifting from ripening ſhowers and mild ſunſhine to heavy clouds and ſudden burſts of rain, that ſeem to threaten the promiſed harveſt. Yet often when the heart of the huſbandman is ready to deſpond, he beholds the ſeaſon return in all its beauty, and has reaſon to acknowledge with gratitude the truth, that ſeed-time and harveſt have not failed.

From autumn to the end of the year, the climate of Britain, is, he ſays, moſt variable, and its inconſtancy is the more ungrateful from the advanced period of the ſeaſon. Then the days, as well as nights, are liable to frequent changes, veering between froſt and thaw, ſnow and rain, clearneſs and fogs; while often obſcure and joyleſs rains deſcend, which deform the face of nature, and depreſs the ſpirit of man; yet it ſhould be remembered, that theſe rains fall at a period when the fruits of the year are ſecured, when nature repoſes (with the huſbandman) after labour, and when, from the ſhortneſs of the day, little can be done without, and men are diſpoſed to enjoy comfortable ſociety within doors. Philoſophers alſo maintain, that our rains in conſequence of proceeding more immediately from the ocean, are more pure, and more impregnated with ſalts, than the rains which fall in moſt other countries; and though ſometimes falling in prodigious quantities, yet tend to fertilize the ſoil. The climate of Britain in winter partakes of the ſame variableneſs that diſtinguiſhes it in other ſeaſons. Sometimes the weather is open and mild; at other times froſt ſets in, and is ſucceeded by heavy falls of ſnow which cover, for weeks, the ſurface of the earth. However much the inhabitants may then ſuffer from the inclemency of cold, it is generally underſtood that the effects of froſt and ſnow are, upon the whole, friendly to vegetation. Froſt, by expanding the water or moiſture contained in the ſoil, ſeparates the particles of earth from each other, and thus renders the ſoil more looſe, tender, and friable, than it would have otherwiſe been. This holds eſpecially in regard to tough clay, upon which froſt acts with a ſalutary effect, by reducing its ſtubborn nature and rendering it more fit for vegetation. The ſnows ſo frequent in Britain during winter, tend in various ways to fertilize the ſoil. Our winter ſnows, by covering the roots of vegetables, ſuch as rye, wheat, &c. preſerve them from the killing colds of the atmoſphere. By ſnow covering the ſurface of the earth, its heat is cheriſhed. Upon the principles of thoſe who make oil the food of plants, ſnow muſt neceſſarily, he thinks, be a great fertilizer of the ſoil, from the oily particles it contains. Beſides, ſnow, when it melts, moiſtens and ſeparates the ſoil which had been bound up by the froſt, and, as its water tends to putrefaction, it muſt, independently of the nitrous particles with which it is ſuppoſed to be impregnated, be greatly in favour of vegetation. In fine, ſays he, if the climate of Britain be leſs agreeable than ſome others, it has more variety." See Snow.

In regard to the influence of climate on the productions of the country, it is ſuppoſed that it is "from theſe the excellence or the defects of climate muſt be aſcertained. Theſe are evidences to which a ſafe appeal may be made. They are not, like natural cauſes, liable to be miſtaken or miſrepreſented, but are open to the inſpection of all. The productions dependent on climate, are plants, flowers, trees, grain of all kinds, nay animals, ſuch as men, horſes, cattle, ſheep, &c. Upon a fair compariſon of theſe with ſimilar productions of other climates, a juſt eſtimate of the excellence of the climate may be formed. It is true, the author ſays, that there are fruits of various kinds that cannot arrive at maturity in Britain. Some natives of the torrid zone, when imported here, quickly languiſh and die; others, when introduced with much foſtering care, may thrive for a ſeaſon, yet from the influence of the air are ſoon ſtinted in their growth, and degenerate. But ſuch fruits in general contribute only in a ſmall degree to the ſubſiſtence of thoſe who enjoy them, and may be regarded rather as luxuries than neceſſaries of life. Wheat, barley, oats, peas, beans, rye, cattle, ſheep, ſwine, poultry, &c. are the great articles which conſtitute the food of man; and theſe our climate is calculated to produce in plenty and perfection. Upon the whole, from the comparative mildneſs of our climate, from its varieties, by no means unfriendly to vegetation and the perfection of fruits, and from the productions which depend on it; it appears that in regard to this firſt and great natural advantage of a country, Great Britain has been favoured in a conſiderable degree."

With reſpect to the climate of Middleſex, it has been ſuggeſted by Mr. Middleton, that "the temperature of the atmoſphere, except, perhaps, ſo far as the influence of the London fires extends, is nearly the ſame through the whole county, there being no ſituation ſo much elevated as to produce the cold and thin air that we find in mountainous countries. In general it is healthy, owing to the greater part of the ſoil being naturally dry; and the more moiſt ſituations, being well drained, are conſequently free from thoſe unhealthy vapours which uſually ariſe from ſtagnant waters. The fires of London, in which are conſumed about 600,000 chaldrons of coals annually, have a ſenſible effect on the climate in its neighbourhood, by drying and warming the atmoſpherical air; which, being thus rarefied by heat, conſtantly paſſes upwards and makes way for a freſh ſupply to come in from every ſide. The moſt ſtationary winds are from the ſouth-weſt and the north-eaſt; all others are variable and unſettled. Thoſe from the ſouth-weſt are ſuppoſed to blow nearly $\frac{6}{12}$ths of the year, and thoſe from the north-eaſt

eaſt about $\frac{5}{12}$ths. The varying winds blow from all the other points of the compaſs about the other one-twelfth. Perhaps, he adds, it would be more accurate to ſay that winds from various points at and nearly the ſouth-weſt blow about 25, north-eaſt 20, and, from the reſt of the circle, nearly ſeven weeks in every year. The winds ſeldom blow with ſo much force in this diſtrict as to ſhake the grain out of the ripe ears of the ſtanding corn. The greateſt falls of rain generally come from the ſouth, and are moſt certain when the wind has paſſed through the eaſt to the ſouth In the ſpring-months the damps on low grounds are ſometimes congealed by cold, when there is no ſuch appearance on the hills, and thereby ſome of the young ſhoots of the more tender ſhrubs and plants are deſtroyed in the former, when no injury happens to thoſe in the latter ſituation. So great have been the extremes of heat and cold at ſome particular times, that on the 16th of July, 1793, the thermometer roſe as high as $83\frac{1}{2}^{\circ}$, and on the 24th of January 1795, it fell down to ſix degrees below 0; though this, perhaps, is the greateſt difference in reſpect of climate ever obſerved in this kingdom; happily, however, it never continues more than a day or two at ſuch extremes. The ſalubrity of any diſtrict is certainly affected, in a great degree, by the ſtate of the ſoil and ſhape of the ſurface of ſuch diſtrict; and hence it follows, that the natural climate of moſt or all countries may, unqueſtionably, be conſiderably improved by uſing the means beſt calculated to procure an equable degree of ſhelter, dryneſs, and moiſture; all which may be effected in bleak, dry, and comparatively barren ſituations, by dividing them into ſmall incloſures with broad hedge-rows and plantations, in belts of ſeveral yards wide; and in low flat ſituations, by draining off the ſtagnant water, by enlarging the incloſures, thinning and clipping the hedge-rows; in ſome inſtances by grubbing up not only theſe hedge-rows but alſo copſes, woods, and plantations; thus removing every obſtruction to a free circulation of air. This will neceſſarily abſorb and carry off the redundant moiſture, and conſequently render the climate ſalubrious and comfortable. Indeed too much attention cannot, he ſays, poſſibly be paid, in caſes of incloſures, plantations, &c. to the grand articles of drainage and ſhelter, and alſo to the nature and ſituation of the ſoil; as by a proper regard to theſe objects, not only the healthineſs of the climate, with reſpect to animals, will be promoted, but the fruitfulneſs of the ſoil will be increaſed in a degree not otherwiſe to be expected."

It has been fully ſhown that much advantage may, in many caſes of the culture of the ſoil, be derived from an intimate acquaintance with the nature of the climate, eſpecially as, in the improved ſtate of the art of agriculture, many of its operations are beſtowed upon ſuch plants as are exotic to the ſituation in which they are cultivated. The want of the knowledge of properly adapting the management of different articles of culture to the changes of climate has been often productive of diſappointment and failure in ſuch caſes as might otherwiſe have been of great benefit and importance to mankind. Daily experience fully ſhows that the vegetable productions of one climate may, by proper attention, be readily naturalized in another. The advances of agriculture, in this way, have been great, but much ſtill remains to be effected, which a better knowledge of the nature of climate may have the tendency of greatly facilitating and bringing forward.

CLIMATURE, a word ſometimes employed in much the ſame way with climate. It is a term frequently made uſe of by ſome agricultural writers, as Mr. Marſhall, in his "Rural Economies of the different Counties of the Kingdom."

CLIMAX, in *Ancient Geography*, a mountain of Aſia, in Piſidia, near the town of Selga. It advances towards the ſea of Pamphylia, leaving only a narrow paſſage, through which Alexander on foot conducted his army, according to Plutarch and Strabo.—Alſo, a mountain of Aſia in Phœnicia, placed by Strabo between the river Adonis and the town of Biblos.—Alſo, a mountain of Arabia Felix, according to Ptolemy.—Alſo, a caſtle of Aſia, in the maritime part of Galatia.—Alſo, a place of Peloponneſus, in Arcadia, near the town of Mantinæa, according to Pauſanias.—Alſo, a place of Africa, in the nome of Libya, between Pednopum and Siropum, according to Ptolemy.

CLIMAX, or *gradation*, in *Rhetoric*, a figure, whereby the diſcourſe aſcends, as it were by degrees. Such is that of Cicero to Catiline: "Nihil agis, nihil moliris, nihil cogitas; quod ego non audiam, quod etiam non videam, planeque ſentiam;" "thou doſt nothing, moveſt nothing, thinkeſt nothing; but I hear it, nay ſee it, and perfectly underſtand it." Thus, the ſame Cicero to Atticus: "Si dormis, expergiſcere; ſi ſtas, ingredere; ſi ingrederis, curre; ſi curris, advola." See ANTICLIMAX.

CLIMBER, in *Botany* See CLEMATIS.

CLIMBERRIS, or AUGUSTA, in *Ancient Geography*, formed from *Climberrum*, and called by Mela *Elimberris*, the capital of the Auſci in Gaul.

CLIMBERTUM, or GLINIBERRUM, a place of Gaul, between Lactura and Belſino.

CLIMBING PLANTS, in *Gardening*, are ſuch plants as aſcend either ſpirally round ſupports, or by means of claſpers and tendrils. They are either herbaceous or woody; and which, according to their mode of climbing, may be denominated *twining* climbers, *cirrhous* climbers, and *paraſitic* climbers.

The firſt ſort includes all ſuch as have winding ſtalks, and twiſt about any neighbouring ſupport, ſuch as ſcarlet kidney-beans, hops, and ſome ſort of honeyſuckle.

The ſecond kind comprehends all ſuch as aſcend by means of ſpiral ſtrings, iſſuing from the ſides of the ſtalks and branches, or from the foot-ſtalks of the leaves, and even from the leaves themſelves, twiſting about any thing they meet with, by which their ſtalks are ſupported and arrive at their proper height, ſuch as moſt of the pea tribe, cucumber, vine, paſſion-flower, and various others.

And the laſt plants are alſo of the ſame kind, but their claſpers plant themſelves as roots in the bark of the plants on which they aſcend, or in the crevices of walls or pales, thereby ſupporting themſelves, and mounting to their tops, as the ivy, Virginia creeper, radicant bignonia, and ſeveral others.

Some of theſe ſorts of plants, both of the herbaceous and ſhrubby kinds, are very ornamental. The principal of the herbaceous kind are, the everlaſting-pea, painted-lady-pea, ſcarlet and white kidney-bean, naſturtium, gourd, hop-plant, ſcarlet convolvulus, &c. but there are many others.

The chief of the ſhrubby kinds, or ſuch as have perennial ſtalks, are, the radicant and ever-green bignonia, climbing celaſtrus, different ſpecies and varieties of virgin's-bower, kidney-bean-tree of Carolina, ivy, Virginia creeper, many ſorts of honeyſuckle, paſſion-flower, many varieties of periwinkle, the vine, &c. but there are ſeveral others.

Many of the herbaceous climbers are very ornamental, and may be introduced in large borders, placing ſticks for their ſupport. The more tall growing ſorts may alſo be employed to run over arbours or rural ſeats in pleaſure-grounds, and other ſimilar purpoſes.

The ſhrubby ſorts are moſt of them proper furniture for ſhrubberies of conſiderable extent, in which they may be employed in different ways; ſome being diſperſed in the clumps, detached from other plants, placing tall, ſtrong ſticks for their ſupport; others placed in large borders and the boundaries of lawns, &c.; and ſome near hardy trees and large ſhrubs, to climb about their ſtems, or interweave in their branches and tops; in the ornamenting of naked or unſightly walls and other high buildings; and in decorating and forming rural arbours, where there is any kind of open-work for the branches to climb upon. They are likewiſe very uſeful, as they ſhoot very rapidly, and ſoon cover ſuch diſagreeable objects.

Theſe ſorts ſhould, many of them, be kept properly cut during the autumn and early ſpring months; that they may not ſpread out too much, and injure other plants that are near them.

CLIMIA of the Arabs. See Klimia.

CLINA, in *Ancient Geography*, a fountain of Aſia Minor, in the Leſſer Myſia; near the town of Cyzicus.

CLINCH, in *Geography*, a mountain of America, in the ſtate of Tenneſſee, which divides the waters of Holſton and Clinch rivers.

Clinch, or Peleson, a river of America in the ſtate of Tenneſſee, being a navigable branch of the Tenneſſee river; it riſes in Virginia, and, after its entrance into the ſtate of Tenneſſee, it receives Powel's and Poplar's creek, and Emery's river, beſides other ſtreams. Its courſe is S.W. and S.W. by W. through Powel's valley, an excellent tract of country, abounding with fine ſprings. Its mouth, which is 150 yards wide, lies 35 miles below Knoxville, and 60 above the Hiwaſſee. It is boatable upwards of 100 miles.

Clinch *of a cable*, in *Sea Language*, is that part of it which is bent about the ring of the anchor, and then ſeized or made faſt.

Inſide clinch is when the end of a cable is paſſed through the hawſe-hole, and reeved through the ring of the anchor; then paſſed round the ſtanding part, through the bight, and a circle, which is called the "clinch," formed of the ſame ſize as the ring of the anchor; a throat and end-band are then clapped on oppoſite each other, and a ſeizing of ſpun-yarn cloſe to the end. All other inſide clinches are ſtopped, ſimilar to the bends of this clinch, with ſmall rope or ſpun-yarn.

Outſide clinch only differs from an inſide clinch, by paſſing the end on the outſide, and not through the bight, for the more readily caſting it off.

Clinch *bolts*, in a ſhip, are ſuch as are clinched, or clenched, with a rivetting hammer at thoſe ends which come through. See Clenching.

CLINCHER *work*, or Clinker-*built*, the diſpoſition of the planks in the ſide of any veſſel, by which the lower edge of every plank overlays the next under it, like the ſlates on the top of a houſe.

This term is applied to boats that are covered with feather-edged boards lapping over each other; ſuch are generally ſharp-heads and ſterns.

CLINCHAMPS, in *Geography*, a town of France in the department of the Calvados; 5 miles S. of Caen.

CLINCHING, in *Sea Language*, a kind of ſlight calking uſed about the ports, on a proſpect of foul weather; it is done by driving a little oakum into their ſeams, that the water may not come in at them.

CLING, in *Geography*, a town and caſtle of Germany, in the circle of Bavaria, 4 miles E.N.E. of Waſſerburg.

CLINGEN, or Klingen, a town of Germany, in the circle of Upper Saxony, and county of Schwartzburg; 16 miles N. of Erfurt.

CLINIAS, in *Biography*, a Pythagorean philoſopher and muſician, who flouriſhed 524 years before Chriſt. As he was of a very cholcric diſpoſition, he is ſaid to have aſſuaged his paſſion by his lyre.

CLINIC, κλινικος, formed from κλινη, a *bed*, a term applied by ſome *Church-hiſtorians* to thoſe among the ancients who received baptiſm on their death bed. It was the doctrine of many of the fathers, that baptiſm abſolutely waſhed away all previous ſins, and that there was no atonement for ſins committed after baptiſm. On this account many deferred that ſacrament till they were arrived at the laſt ſtage of life, and were pretty ſafe from the danger of ſinning any more; and ſuch were called *clinici.*

Magnus, in the third century, made a doubt whether or not clinics were truly baptized, in regard the ceremony was only performed by aſperſion, inſtead of immerſion; he conſulted St. Chryſoſtom on the point, who replied to him, that the ſacrament does not waſh away ſin after the manner of a corporal bath; and ſhews from ſcripture that aſperſion is ſufficient. See Baptism.

Clinic, or Clinical, is an epithet applied, in *Medicine*, to every thing which relates to the treatment and obſervation of diſeaſes, at the bedſide of the ſick. Hence the terms clinical practice, clinical lecture, &c. Clinical lectures, or thoſe lectures which are given upon the caſes of diſeaſe, the progreſs of which has been daily obſerved and regiſtered at the bedſide of the patient, conſtitute the moſt valuable mode of teaching the art of medicine.

CLINKERS, among *Brick Makers*. See Brick.

CLINO, in *Geography*, a town of European Turkey, in the province of Theſſaly; 22 miles W. of Zeiton.—Alſo, a town of Germany, in the biſhopric of Trent; 22 miles W.N.W. of Trent.

CLINOIDES, in *Anatomy*, an epithet given to the four ſmall proceſſes of the *os* sphenoides, one of the bones of the cranium; ſo called, ſay ſome, from their reſembling the feet of a bed.

The word is formed of the Greek κλινη, *a bed*, and ειδος, *form*; either from the reſemblance which the three bones bear to the feet of a bed; or from the cavity they form, which reſembles a bed itſelf.

Theſe together form a little cavity, from its ſhape called *ſella turcia*, or *equina*; wherein is placed the pituitary gland.

CLINOPODIUM, in *Botany*, (κλινοποδιον, Dioſc. Beds-foot, ſo called from the flowers growing in whorls one above another, like the old-faſhioned, turned feet of beds.) Tourn. 92. Linn. Gen. 725. Schreb. 980. Willd. 1115. Juſſ. 115. Vent. vol. ii. p. 342. Claſs and order, *didynamia gymnoſpermia*. Nat. ord. *Verticillatæ*, Linn. *Labiatæ*, Juſſ. Vent.

Gen. Ch. *Cal.* Perianth one-leafed, cylindrical, ſlightly curved, two-lipped; upper lip wider, trifid, acute, reflexed, lower lip divided, ſlender, inflexed. *Cor.* one-petalled, labiate; tube a little longer than the calyx, gradually widened into the throat; upper lip erect, concave, obtuſe, emarginate; lower lip trifid, obtuſe, middle ſegment wider, emarginate. *Bractes* numerous, about the length of the calyx, forming an involucre beneath the whorl or head. *Stam.* filaments four, two longer covered by the upper lip; anthers roundiſh. *Piſt.* Germ ſuperior, four-parted; ſtyle filiform, ſtigma ſimple, acute, compreſſed. *Peric.* none. *Seeds* four, naked, attached to the bottom of the permanent calyx, which becomes a little expanded below, and contracted near the orifice.

Eſſ. Ch. Bractes numerous, forming an involucre under the whorl or head.

Sp. 1. C. *vulgare*, Linn. Sp. Pl. 1. Mart. 1. Lam. 1. Willd. 1. Flor Dan. tab. 930. Lam. Ill. Pl. 511, fig. 1. Eng. Bot. 1401. (C. *origano ſimile*; Bauh. Pin. 224. Tourn. 195. Acinos; Lob. Ic. 504. Wild baſil. "Whorls hairy; bractes briſtle-ſhaped; pedicels branched; leaves ſlightly ſerrated." *Root* perennial, fibrous or ſomewhat creeping. *Stems* ſomewhat undulated, but not regularly zig-zag. *Leaves* petioled, egg-ſhaped, rather obtuſe, a little hairy, with veins regularly fringed. *Flowers* purpliſh roſe-coloured, whorled, whorls terminal and axillary, few many-flowered; pedicels hairy; bractes hairy, ſhorter than the calyx; calyx ribbed, hairy; two lower teeth longeſt and moſt prominent; corolla twice as long as the calyx, handſome, with two hairy knobs at the orifice; ſegments of the lower lip rounded. The whole herb is aromatic, with a faint thyme-like odour. Dr. Smith. A native of England and other parts of Europe, on the borders of woods and in dry hilly ſituations; flowering in June. There is a variety raiſed by ſeeds from Canada which differs only in having flowers much ſmaller. Two other varieties were ſent to Miller from Carolina by Dr. Dale; the firſt, which he calls *humile*, is not more than half the ſize of the European ſort, dividing into many long ſide-branches; leaves ſmaller and rougher; whorls more numerous, with longer bractes; flowering in June and July. The ſecond, which he calls *carolinianum*, has ſtems almoſt round, the joints four or five inches aſunder, with two oblong leaves at each, hairy on their under ſide, on ſhort petioles; at the bottom of theſe there is a ſlender branch on each ſide, half an inch long, having two or four ſmall leaves ſhaped like the others. The flowers are white, in ſmall whorls, ſtanding thinly; bractes longer than the calyxes. It flowers in Auguſt. 2. C. *ægyptiacum*, Lam. 2. Willd. 2. (C. vulgare β, Linn. Sp. Pl. δ. Mill.) "Whorls axillary, diſtant leaves nearly entire, with a ſmooth ſurface." Lam. Nearly allied to the preceding, but conſtantly ſmaller, leſs villous and more branched. *Root* perennial. *Leaves* ovate, acute, a little ciliated at the edge, with a tint of violet when young. *Flowers* pale red, or fleſh coloured; whorls ſmall, looſe, hiſpid. A native of Egypt. Deſcribed by La Marck from a living plant. Willdenow, who profeſſes alſo to deſcribe from a living plant, aſſerts that the flowers are never in whorls, but always in terminal heads. 3. C. *incanum*, Linn. Sp. Pl. 2. Mart. 2. Lam. 3. Willd. 3. (C. menthæ folio, incanum; Dill. Elth. 87. tab. 74. fig. 85. C. majus virginianum; Moriſ. Hiſt. 3. p. 374. Scot. 11. tab. 8. fig. 4. C. Serpentaria dicta; Pluk. Mant. 51. tab. 344. fig. 7.) "Leaves tomentous underneath; whorls flatted; bractes lanceolate." *Root* perennial. *Stems* two or three feet high, erect, obtuſely quadrangular, clothed with a ſhort whitiſh pubeſcence, branched near the top. *Leaves* oppoſite, petioled, acutely egg-ſhaped, toothed, green above, whitiſh underneath, reſembling thoſe of mint; thoſe next the flowers almoſt always hoary. *Flowers* pale red, ſprinkled with purple ſpots, in two or three axillary whorls near the top of the ſtem; upper lip ſhort, entire. A native of Maryland, Virginia, and Carolina, flowering in Auguſt.

C. *africanum procumbens*; Pluk. See ANTHOSPERMUM *ciliare*.

C. *alpinum*; Pon. Bald. —— *alpinum hirſutum*; Bauh. Pin. Pluk. See BARTSIA *alpina*.

C. *amarici folio*; Pluk. See NEPETA *virginica*.

C. *anguſtifolium non ramoſum*; Pluk. Moriſ. See MONARDA *ciliata*.

C. *anguſtifolium virginianum*; Pluk. See MONARDA *punctata*.

C. *arvenſe ocymi facie*; Bauh. Pin. See THYMUS *acinos*.

C. *aſiaticum*; Lour. See HYPTIS *aſiatica*.

C. *auſtriacum*; Rom. See THYMUS *alpinus*.

C. *capitatum*; Swartz. Brown. See HYPTIS *capitata*.

C. *chamædrys*; Vahl. See HYPTIS *chamædrys*.

C. *creticum*; Alp. See SATUREIA *Græca*.

C. *fiſtuloſum pumilum*; Pluk. See ZIZIPHORA *capitata*.

C. *flore albo ramoſius*; Moriſ. Hiſt. See NEPETA *virginica*.

C. *foliis lanceolatis, capitulis terminalibus*; Hort. Cliff. See NEPETA *virginica*.

C. *foliis lanceolatis acuminatis*; Cap. Term. See THYMUS *virginicus*.

C. *foliis ovatis acutis ſerratis*; Hall. See THYMUS *alpinus*.

C. *foliis ovatis dentatis*; Hall. See THYMUS *acinos*.

C. *fruticoſum*; Forſk. See PHLOMIS *moluccoides*.

C. *hyſſopi latioribus foliis*; Pluk. See PHLOMIS *zeylanica*.

C. *luſitanicum ſpicatum et verticillatum*; Tourn. See CLEONIA *luſitanica*.

C. *majus virginiana*; Moriſ. See MONARDA *fiſtuloſa*.

C. *martinicenſe*; Jacq. See PHLOMIS *martinicenſis*.

C. *minus exoticum*; Pluk. See SATUREIA *Græca*.

C. *montanum*; Bauh. Pin. Bocc. See THYMUS *alpinus*.

C. *orientale, origani folio*; Tourn. See SATUREIA *Græca*.

C. *parvum ſinicum*; Pluk. See COMETES *alternifolia*.

C. *perenne pulegii odore*; Bocc. See THYMUS *patavinus*.

C. *pulegii anguſto rigidoque folio*; Pluk. See THYMUS *virginicus*.

C. *rugoſum*; Linn. See HYPTIS *radiata*.

C. *ſupinum incanum*; Anem. See ZIZIPHORA *acinoides*.

C. *virginianum anguſtifolium*; Moriſ. See MONARDA *punctata*.

C. *vulgare*; Lob. See THYMUS *acinus*.

CLINOVO, or KLIUNO, in *Geography*, a town of Turkiſh Dalmatia, generally uſed as a place of rendezvous in a time of war, and a depôt of arms and proviſions; 30 miles E.N.E. of Spalatro.

CLINTON, the moſt northern county of the ſtate of New York in America, bounded on the N. by Canada, E. by the deepeſt waters of lake Champlain, which line ſeparates it from Vermont, and S. by the county of Waſhington: ſeated on the lake Champlain and lake George, or lying about midway between Quebec and New York, at the diſtance from each of about 230 to 240 miles. It is divided into 5 townſhips, *viz.* Plattſburg, the capital, Crownpoint, Willſborough, Champlain, and Peru. The length from N. to S. is about 96 miles, and the breadth from E. to W., including the line upon the lake, is 36 miles. In 1796 the number of inhabitants was eſtimated at 6000, of whom 624 were intitled to be electors. The lands are generally of an excellent quality, and produce abundance of the various grains cultivated in other parts of the ſtate. The inhabitants manufacture earthen ware, pot and pearl aſhes, in large quantities, which they export to New York or Quebec. Their wool is excellent; their beef and pork inferior to none; and the price of ſtall-fed beef in Montreal, 60 miles from Plattſburg, is ſuch as to induce the farmers to drive their cattle to that market. The foreſts ſupply them with ſugar and molaſſes, and the ſoil is well adapted to the culture of hemp. The land carriage from any part of the country, in tranſporting their produce to New York, does not exceed 18 miles, the carrying place at Ticonderoga is 1½ mile; and from Fort George at the S. end of the lake of that name, to Fort Edward, the diſtance is but 14 miles; after which there are ſome ſmall obſtructions that are to be removed by the northern canal. From this country to Quebec are annually ſent large rafts; the rapids at St. John's and Chamblee being the only interruptions in the navigation;

tion; and theſe are not ſo great, but, at ſome-ſeaſons, batteaux with 60 buſhels of ſalt can aſcend them. Salt is ſold here at half a dollar per buſhel. The rivers which water this country are Saranac, Sable, and Boquet: the firſt of which ſupplies abundance of ſalmon, 4 or 500 of which may be taken in a day with ſpears and ſmall ſcoop nets. This fiſh is uſually caught here from May to November; it ſupplies excellent ſalted proviſion, and every cottager, by ſpending an hour in the evening, may obtain a ſufficient quantity for his family. In this country ducks, geeſe, pigeons, and other kinds of birds are plentiful.

Clinton, a townſhip in Dutcheſs county, New-York, ſituated above Poughkeepſie, which is large and thriving. It contains 4607 inhabitants, including 167 ſlaves, and 666 are electors. – Alſo a ſettlement in Tioga county, New York, bounded by Fayette on the N., Warren on the S. Green on the W., and Franklin in Otſego county on the E. At the N.E. corner Unadilla river joins the Suſquehannah, and the confluent ſtream runs S.W. to Warren.—Alſo, a plantation in Lincoln county, and diſtrict of Maine, 27 miles from Hallowell.—Alſo, a pariſh in the townſhip of Paris, 7 miles from Whiteſtown, which is a wealthy, pleaſant, flouriſhing ſettlement, containing ſeveral handſome houſes, a newly erected Preſbyterian meeting-houſe, a convenient ſchool-houſe, and an edifice for an academy delightfully ſituated.

Clinton's *Harbour*, lies on the N.W. coaſt of N. America, having its entrance in N. lat. 52° 12′. W. long. 136°., ſo called by captain Gray after governor Clinton of New York.

CLIO, in *Mythology*, one of the *Muſes*, daughter of Jupiter and Mnemoſyne, the goddeſs of memory, who preſided over hiſtory. The name is derived from κλεος, *glory*, or from κλεειν, to *celebrate*. In the portraits of Apollo and the Muſes, dug out of Herculaneum, Clio appears ſeated, and her head is crowned with laurels. In her left hand ſhe holds an open volume, in which ſhe is reading. On the outſide is written KLEIΩ ICTOPIAN, *Clio the Hiſtorian*; though it ſhould rather be tranſlated, *Clio invented Hiſtory*. At her feet are ſix other rolls, or antique volumes, incloſed in a cylindrical caſe. She is ſometimes repreſented with a lute in one hand, and in the other a plectrum, or quill. Mr. Spence gives the following account of her "Clio preſided over the nobleſt kind of poetry; her office was to celebrate the actions of departed heroes; who, therefore, has a roll, or book, in her hand, or elſe the longer holds a pipe, as in the relievo of the Muſes in the Juſtiniani palace at Rome. Horace, in ſpeaking of this pipe, ſeems to give it the ſhrillneſs of the trumpet, and, indeed, it is ſhaped much in the ſame manner with the trumpet, which the modern artiſts give to their figure of Fame. As Pindar, and ſeveral of the other old Lyric poets, dealt ſo much in celebrating the actions of departed heroes, this Muſe may, perhaps, have been ſometimes repreſented with a lyre too; though I do not remember to have ſeen any inſtance of it in the remains of the old artiſts. Statius makes her deſcend to lower offices, as if ſhe muſt preſide over any thing written in heroic verſe; and his miſtake, for it ſeems to be one, may be eaſily accounted for, from their looking formerly on every thing in hexameters as an epic poem." See Muses.

Clio, in *Zoology*, the name of a genus of worms, belonging to the order of *molluſca:* the body of which is oblong, and formed for ſwimming, and furniſhed with two oppoſite *alæ* of a membranaceous ſtructure: it has three tentacula, beſides two in the mouth. Gmelin enumerates 6 ſpecies, *viz* Caudata, Pyramidata, Retuſa, Borealis, Helicina, or ſnail ſlime-fiſh, and Limacina: all of which are found in the ocean

CLIP, in *Rural Economy*, a word uſed to ſignify ſhearing ſheep. And it alſo ſignifies the produce of wool, as the clip of any year implies the quantity that is afforded in it. See Sheep and *Shearing of* Sheep.

CLIPPING, the act of ſhearing ſheep. This ſort of buſineſs was formerly done in a longitudinal direction, but a later improvement is that of executing it in a circular method. It alſo ſignifies a ſheep-ſhearing. See Sheep and *Shearing of* Sheep.

Clipping the *Coin*. See Coin.

CLISOBORA, in *Ancient Geography*, a town of India, placed by Arrian among the principal towns of the Sureſenians. Pliny ſays that the river Jomanes paſſed between this town and Methora.

CLISSA, in *Geography*, a fortreſs of Dalmatia, taken from the Turks by the Venetians in 1684: 10 miles N. of Spalatro.

CLISSON, a town of France, in the department of the Lower Loire, and chief place of a canton, in the diſtrict of Nantes, ſeated on the Sevre; 5 leagues S.E. of Nantes. The place contains 1178, and the canton 6139 inhabitants: the territory includes 140 kiliometres and 7 communes. N. lat. 47° 5′. W. long. 1° 23′.

CLIST, a river of England, which runs into the Ex, a little below Exeter.

CLISTHENES, in *Biography*, an Athenian magiſtrate, who flouriſhed 510 years B.C. and introduced the mode of baniſhing by *Oſtraciſm*; which ſee.

CLITÆ, in *Ancient Geography*, a town of Aſia Minor in Bithynia, according to Ptolemy; ſituated towards the N.E. of Amaſtris.—Alſo, a place of Greece ſituated, according to Livy, near mount Athos, in Macedonia.—Alſo, the ſurname of the inhabitants of Cilicia Campeſtris, according to Tacitus; who ſays that they occupied the parts near the ſea, and mount Taurus, in that diſtrict of Aſia, which was ſubject to Archelaus, king of Cappadocia. When this king compelled them to pay tribute, they retired to mount Taurus, where they maintained themſelves under their chief Troſobor againſt the troops which he ſent againſt them.

CLITERIUM, or Clitorium, according to Pliny, a town of the Peloponneſus, in Arcadia.

CLITERNIA Larinatum, a town of Italy belonging to the Trentani, E. of Larinum, according to Pliny and Mela.

CLITERNUM, a town of Italy, ſituated in the country of the Equiculi, according to Ptolemy. Pliny calls the inhabitants Cliternini.

CLITHEROE, in *Geography*, a borough and market town of Lancaſhire, England, ſtands on the verge of that county, where it joins with Yorkſhire, and is diſtinguiſhed by its bold and inſulated rock of limeſtone crowned with the keep of an ancient caſtle. At the northern extremity of the town, is an old manſion called the Alleys, which was formerly the manor-houſe, and was ſurrounded by a deep moat. The town of Clitheroe is an ancient borough by preſcription, and made its firſt return of members in the firſt year of Elizabeth. The right of election is veſted in a peculiar kind of burgage-tenure, and the number of electors is forty-two. Here are a weekly market on Saturday, and three annual fairs. The townſhip contains 319 houſes, with 1368 inhabitants, and is 217 miles north of London. Whitaker's hiſtory of Whelley, 4to.

CLITIS, in *Ancient Geography*, a river of Gaul, ſuppoſed by ſome to have been the Clain.

CLITOMACHUS, in *Biography*, a native of Carthage, who, fond of learning in his early years, viſited Carthage for the purpoſe of attending the ſchools of the philoſophers. At Athens he became the diſciple of Carneades, and ſucceeded him in the chair of the New Academy. By diligent ſtudy he made himſelf maſter of the ſyſtems of the other ſchools; but profeſſed the doctrine of ſuſpenſion of aſſent, as it had been taught by his predeceſſor. Cicero ſays, that he wrote 400 books upon philoſophical ſubjects. At an advanced age he was ſeized with a lethargy; but when he in ſome degree recovered his faculties, he ſaid, "the love of life ſhall deceive me no longer," and laid violent hands upon himſelf. He held the office of preceptor in the Academy from the death of Carneades for 30 years, or till the 170th Olympiad, 100 years B. C. According to Cicero, he taught, that there is no certain criterion by which to judge of the truth of thoſe reports which we receive from the ſenſes; and that, therefore, a wiſe man will either wholly ſuſpend his aſſent, or decline giving a peremptory opinion; but that, nevertheleſs, men are ſtrongly impelled by nature to follow probability. His moral doctrine eſtabliſhed a natural alliance between pleaſure and virtue. He was a profeſſed enemy to rhetoric, and thought that no place ſhould be allowed, in ſociety, to ſo dangerous an art. Brucker's Hiſt. of Philoſ. by Enfield, vol. i. p. 253.

CLITON, or Clitor, in *Ancient Geography*, a river of Greece, in the Peloponneſus. It ran through Arcadia, and paſſed near the town of Clitor, according to Pauſanias.

CLITONES, the eldeſt, and all the ſons of kings. This word is often met with in our ancient authors.

CLITOR, in *Ancient Geography*, a town of the Peloponneſus, in Arcadia, ſeated on a river of the ſame name, S.W. of Luſſi; about 60 ſtadia from the ſprings of the river Ladon. Pauſanias ſays that Clitor, a very powerful ſovereign, built it, and gave it his own name. The principal temples of this town were thoſe of Ceres, Æſculapius, and Caſtor and Pollux. Theſe two laſt were denominated there "the great gods:" and their ſtatues were in bronze.

CLITORIA, in *Botany*, (from κλειω, *claudo, includo*, expreſſing the manner in which the eſſential organs of fructification are encloſed or ſhut up in the keel and wings of the corolla. Whatever may have been in the thoughts of Petiver, by whom the name was firſt introduced into botany; or of the illuſtrious naturaliſts, by whom it has ſince been continued, reformed, or ſanctioned, we cannot refrain from entering our decided proteſt againſt every attempt to aſſociate it directly with an anatomical term, to which, though derived from the ſame Greek theme, it has in fact only a very remote, factitious analogy. It is greatly to be lamented, that a fondneſs for theſe groſs alluſions ſhould ever have been indulged by any, who, in all other reſpects, have deſerved highly of natural ſcience, and whoſe ſplendid talents ſhould have rendered them far ſuperior to ſuch grovelling ideas By this conduct they have done all in their power to pollute a ſtudy, which is, perhaps, more than all others, ſuited to the lovelieſt part of the human race, and which, without concealing any eſſential part of the ſexual ſyſtem, may eaſily be ſo conducted, as not to excite an unpleaſant ſenſation in the moſt delicate female mind. We do not mean to exempt from the full ſeverity of this cenſure our great maſter, Linnæus, himſelf; for when, not only the purity of moral feeling, but alſo the common decorum of poliſhed life, is infringed, the *nullius in verba* of the poet will, we truſt, be uniformly our principle and our practice.) Linn. Gen. 869. Schreb. 1183. Willd. 1352. Gært. 866. Juſſ. 357. Vent. 3. 404. (ternate, Tourn.) Claſs and order, *diadelphia decandria*. Nat. Ord. *Papilionaceæ*, Linn. *Leguminoſæ*, Juſſ. Vent.

Gen. Ch. *Cal.* Perianth one-leafed, erect, tubular, five-toothed, permanent. *Cor.* papilionaceous; ſtandard very large, ſtraight, ſlightly emarginate, obtuſe, covering the other petals; wings oblong, ſhorter than the ſtandard, ſtraight, obtuſe; keel ſhorter than the wings, curved like a ſickle. *Stam.* nine, united, one ſeparate; anthers ſimple. *Piſt.* Germ very long, ſuperior, oblong; ſtyle aſcending; ſtigma obtuſe. *Peric.* Legume very long, linear, generally compreſſed, two-valved, terminated by an awl-ſhaped point. *Seeds* numerous, kidney-ſhaped. Corolla reſupinate, or inverted.

Eſſ. Ch. Standard very large, covering the wings.

Sp. 1. C. *ternatea*, Linn. Sp. Pl. 1. Mart. 1. Lam. 1. Willd. 1. Lam. Ill. tab. 609. Gært. tab. 149. fig. 3. (Phaſeolus indicus; Comm. Hort. 1. p. 47. tab. 24. Flos clitorides ternatenſium; Breyn. Cent. 76. tab. 31. Flos cæruleus, Rumph. Amb. 5. p. 56. tab. 31. Ternatea, Tourn. Act. 1706 p. 84.) "Leaves pinnated; leaflets inverſely heart-ſhaped; involucre two-leaved, roundiſh," Lam. "Leaves quinate-pinnated; peduncles axillary, one-flowered," Willd. *Root* perennial. *Stem* four or five feet high, herbaceous, twining, ſlender, branched. *Leaves* alternate, unequally winged; leaflets five or ſeven, veined underneath; with two briſtle-ſhaped ſtipules at the baſe of each pair of leaflets and two awl-ſhaped ones at the origin of the common petioles. *Flowers* large, blue, with a yellowiſh ſpot at their centre, generally ſolitary, on ſhort peduncles. *Legumes* three or four inches long, narrow, lenticular-compreſſed, without knots, or riſings above the ſeeds, terminated by the longiſh awl-ſhaped ſtyle, divided tranſverſely into many cells; partitions thin, formed from the internal white cellular membrane of the valves. *Seeds* ſolitary, from ſeven to twelve, ovate kidney-ſhaped, truncated at one end, rather compreſſed, ſomewhat gibbous on both ſides, ſmooth, cheſtnut-brown, Lam. and Gært. A native of the Eaſt Indies and Cochin-china; but the ſeeds were firſt brought to Europe from Ternate, one of the Molucca iſlands. There is a variety, figured by Rheed. Mal. 8. p. 69. tab. 38. with white flowers, and obtuſer leaflets, in which the flowers generally grow from three to five together, in ſmall axillary racemes. There is alſo a blue variety, with double flowers, an exuberance not common in this claſs of plants. 2. C. *heterophylla*, Lam. 2. Desfont. Annals of Botany, vol. i. p. 124. Ventenat Jard. de Celſ. tab. 26. "Leaves pinnated; leaflets quinate; ſome rounder, ſome lanceolate, ſome linear," Lam. *Stem* above ſix feet long, branched, climbing, filiform, ſlightly pubeſcent. *Leaves* alternate, lower ones ternate, middle and upper ones pinnated with an odd leaflet; leaflets from ſeven to nine, ſmall, ſmooth, oppoſite, terminated by a briſtle-ſhaped appendage, not unfrequently emarginate; ſtipules awl-ſhaped. *Flowers* azure blue, reſupinate, axillary, ſolitary, pendulous; peduncles a quarter of an inch long, very ſlender, ſlightly tumid at the ſummit; bractes four; two lower; two others ſuperior, forming a kind of involucre to the calyx, very ſmall, acute; calyx tubular, ſomewhat widened upwards, marked with five ſmall prominent lines, terminated by five egg ſhaped, acute teeth, the three upper ones the largeſt; ſtandard elongated, ſtreaked, convex outwards, emarginate at the tip, longer than the wings; wings brought cloſe together, obtuſe, with a very ſlender claw; keel not ſharp, formed by two contiguous petals, each borne on a pedicel; ſtyle ſomewhat geniculate; ſtigma pubeſcent, obtuſe. *Legume* about two inches long, linear, ſmooth, ſleek, flattened; pendulous, many-ſeeded. ending in a point; valves twiſting ſpirally after they have opened. *Seeds* from eight to ten, compreſſed. Desfont. A native of the Eaſt Indies, found by Sonnerat; and of the iſle of France, whence it was introduced into the French gardens by ſeeds brought by M. Coſſigny. 3. C. *multiflora*, Willd. 2. Swartz. Prod. 106. "Leaves pinnated; pairs of leaflets many,

many, ſilky underneath ; racemes axillary, many-flowered." *Root* perennial. A native of St. Domingo. 4. C. *Braſiliana*, Linn. Sp. Pl. 2. Mart. 2. Lam. 3. Willd. 3. (Planta leguminoſa braſiliana, Breyn. Cent. 78. tab. 32.) "Leaves ternate ; calyxes ſolitary, campanulate." Linn. *Stem* five or ſix feet high, twining. *Leaves* alternate on long petioles ; leaflets ovate-oblong, ſlightly veined, rather hard. *Flowers* large, purple, axillary, ſolitary, peduncled ; ſtandard much broader, and wings larger than in C. ternate ; leaflets forming the involucre of the calyx two, oval, oppoſite, membranous ; bractes on the peduncle of the ſame ſhape. A native of Braſil. There is a variety with double flowers raiſed by Miller from ſeeds ſent from India, but now loſt in the Engliſh gardens. 5. C. *calcarigera*, Saliſb. in Paradiſus Londinenſis, tab. 51. (C. virginiana, Linn. Sp. Pl. 3. Mart. 3. Lam. 4. Willd. 4. Brown. Jam. 298. Swartz. Obſ. p. 282. Clitorius alter trifoliatus, Clayton in Gron. Fl. Virg. ed. 1. p. 73. —— Fœnum græcum phaſeloides, Pluk. Alm. p. 175. Phyt. tab. 90. fig. 1.) "Leaves ternate ; calyxes in pairs, campanulate." Lam. "Leaflets in one pair, terminated by an odd one ; ſtandard ſwelling at the back into a ſolid ſpur, which preſſes upon the claw." Saliſb. *Root* perennial. *Stem* about three feet high, twining, ſlender, hairy. *Leaflets* egg-ſhaped, hairy, eſpecially near the margin. *Flowers* in ſhort ſpikes or racemes, ſeldom more than two-flowered ; bractes ſtriated ; calyx much ſhorter than in other clitorias, ſcarcely compreſſed. Standard externally of a dull yellow colour, pubeſcent ; internally lilac, with a yellow middle variegated with red ſtreaks, ſmooth, furniſhed with a ſolid ſpur juſt above the claw ; wings and keel pale lilac, adhering cloſely together ; nectary very large, like a ruffle. *Legume* narrow with prominent ſutures. *Seeds* brown, with a greyiſh cloud in the middle. A native of Virginia and the Weſt Indies. There is a variety, with narrow elongated leaves ; and another with ovate oblong ones figured by Dillenius. Hort. Elth. vol. i. tab. 76. Mr. Saliſbury obſerves, that though the leaves of this and the following ſpecies are ſaid by Linnæus to be ternate, they are truly pinnated ; for though conſiſting only of a ſingle pair of leaflets beſide the odd one, the two are placed upon the common petiole. Notwithſtanding our general unwillingneſs to change trivial names, we have been induced to adopt Mr. Saliſbury's as clearly-expreſſing a character peculiar to the ſpecies. 6. C. *mariana*, Linn. Sp. Pl. 4. Mart. 4. Lam. 5. Willd. 5. (Clitorius marianus, Petiv. Sicc. 243. n. 55. Gron. virg. p. 83.) "Leaves ternate ; calyxes cylindrical." Linn. Stem about five feet high, twining, weak. Leaflets narrower than in the preceding ſpecies, grayiſh underneath. *Flowers* axillary, of a pale blue colour within, whitiſh without ; ſtandard large. *Legumes* long, pointed, a little inflated. *Seeds* roundiſh. A native of North America. 7. C. *falcata*, Lam. 6. (Phaſeolus, Plum. MSS.) "Leaves ternate ; peduncles long, with about three flowers ; legumes narrow, ſickle ſhaped." *Stems* twining, ſlender, very long. *Leaves* alternate ; leaflets ovate, of a pleaſant green colour, reſembling the leaves of the orange tree. *Flowers* large, bluiſh or purple violet ; calyx oblong, almoſt funnel-ſhaped, with five acute ſegments, and an involucre reſembling another calyx at the baſe. *Legumes* narrow, compreſſed, with ſeveral apparent articulations. *Seeds* kidney-ſhaped, ſhining, white with a red umbilicus. Plum. MSS. A native of St. Domingo. 8. C. *galactia*, Linn. Sp. Pl. 5. Mart. 5. Lam. 7. Willd. 6. Brown. Jam. 298. tab. 32. fig. 2. (Phaſeolus, Sloane Jam. 1. p. 182. tab. 114. fig. 4.) "Leaves ternate ; raceme erect ; flowers pendulous. *Stem* about ſix feet high, twining, weak. *Leaflets* elliptic-oblong, obtuſe, ſometimes emarginate. *Flowers* reddiſh ; calyx ſhort, campanulate, four-toothed ; corolla a little papilionaceous ; all the petals oblong, narrow ; ſtandard a little larger than the others. *Legume* ſlender, cylindrical, pointed. A native of Jamaica, milky in all its parts. This ſpecies differs from all the preceding in the form and diſpoſition of its flowers, which rather diverge from the generic character.

Clitoria *foliis pinnatis, caule decumbente.* Hort. Cliff. Gron. Virg. See Galega *virginiana.*

Propagation and Culture. All the ſpecies are annual in England, ſo that unleſs the ſeeds ripen they are loſt, till they can be renewed by freſh ſeeds from their native climate. The ſeeds ſhould be ſown in a good hot-bed early in the ſpring, and the plants, when two inches high, ſhould be tranſplanted into pots, and treated like other ſimilar exotics. As they have climbing ſtalks, they will ſoon grow too tall for the common hot-bed, they muſt therefore be removed into the ſtove, and plunged into the bark.

CLITORIDIS *muſculus*, in *Anatomy*, a name given by Verheyen to the muſcle of the female *pudenda*, uſually called *erector clitoridis.* This is the only muſcle that is proper to this part ; the other, called the *inferior clitoridis*, being properly a *ſphincter vaginæ*, or, as Albinus calls it, *conſtrictor cunni.*

CLITORIS, one of the external organs of generation in the female ſex. See Generation, *Organs of.*

CLITORIUS, in *Botany.* See Clitoria.

CLITOW, in *Geography*, a town of Bohemia in the circle of Pilſen, celebrated for its rich ſilver mines.

CLITUMNO, a river of Italy, which paſſes by Spoleto, and joins the Tepino between that town and Perugia, anciently *Clitumnus.* The Clitumnus, according to Pliny, (l. viii. ep. 8.) was a fountain with many veins between Hiſpellum and Spoletium, from which at a ſmall diſtance aroſe a large and navigable river. Near it was an ancient and much revered temple, in which the god Clitumnus was placed, in a Roman habit, and where he iſſued oracles which manifeſted the preſence and power of the divinity. Round him were arranged ſeveral ſmall chapels, ſome of which had fountains and ſprings ; for Clitumnus was the father of many other rivulets which join him. A bridge ſeparated the ſacred part of his waters from the profane ; above this bridge people were allowed only to paſs in boats ; but below it they were permitted to bathe. This river flowed into the Tinia, now Tupino, and both together into the Tiber. It was famous, according to Virgil, (Georg. l. xi. v. 1447.) for its milk-white flocks and herds.

CLITUS, in *Biography*, an intimate friend of Alexander the Great ; the brother of his nurſe, who followed him in his conqueſts, and preſerved his life by cutting off the hand of Roſaces, when he lifted up an axe to kill him at the paſſage of the Granicus. Clitus, to whom Alexander was affectionately attached, being invited to ſupper with the prince, and heated with wine, inveighed againſt adopting the cuſtoms of the Perſians, and degraded the exploits of Alexander, in order to magnify thoſe of Philip, his father. Alexander was ſo enraged that he ſtruck him to death with a dart ; but ſoon recollecting himſelf, he regretted the loſs of his friend with ſuch grief, as to faſt three days and to form a purpoſe of ſtarving himſelf to death : but, by the interceſſion of his friends, he was diſſuaded from executing his purpoſe. Clitus was buried by Alexander in a very pompous manner.

CLIVE, Robert, baron Plassey, a celebrated Engliſh general, was born in the year 1725, at Styche, in Shropſhire. During the years devoted to education he exhibited no taſte for literature, but was characteriſed for a daring and adventurous ſpirit, almoſt incapable of reſtraint, and deſtitute of fear. When he was about 18 years of age, his father obtained for him the place of writer in the Eaſt India Company's pany's ſervice, and he arrived at Madras in the year 1744. In 1746 Madras ſurrendered to the French, and all the company's ſervants were made priſoners. The French commander in chief refuſing to ratify the terms of the capitulation, the Britiſh conſidered themſelves juſtified in breaking their parole; and among others, Mr. Clive, diſguiſed as a Moor, made his eſcape. Shortly after, he entered into the military ſervice, for which his temper and mind were well adapted, and in which he diſplayed great talents. He obtained, in the year 1747, an enſign's commiſſion in the Company's ſervice, and behaved with great valour at the ſiege of Pondicherry. He quickly obtained the rank of lieutenant, and in an attack upon fort Devi-Cotah, he ſolicited the command of the forlorn hope, though out of his turn. His requeſt was granted, and, at the head of about 30 Britiſh troops and 700 Sepoys, he advanced to ſtorm the breach. The Sepoys inſtantly fled, but the lieutenant and his handful of men puſhed on, and had ſcarcely arrived at the breach, when the enemy ruſhed upon them with ſo much fury, that three only, with their commander, eſcaped inſtant deſtruction. The whole column of European troops then advanced to the attack, lieutenant Clive ſtill in the firſt diviſion, and the fort was reduced. Peace immediately followed. He returned to the civil eſtabliſhment, and was ſoon appointed to the office of commiſſary to the troops. In 1751, Clive reſumed the military character, with a captain's commiſſion, and in this capacity he was employed to attack the city of Arcot, having under his command 210 Europeans, and about 500 Sepoys. Such were the reſolution, ſecrecy, and diſpatch, with which he conducted the enterpriſe, that the enemy knew nothing of his motions until he was in poſſeſſion of the capital, which ſurrendered without a blow. The inhabitants, expecting to be plundered, offered him a large ſum to ſpare the city, but they derived their ſecurity from the generoſity of the conqueror. He refuſed the proffered ranſom, declaring that thoſe who choſe to remain in the city ſhould be protected, and that the others might retire with all their effects, excepting proviſions, for which he promiſed to pay the full value. By this wiſe conduct he ſo conciliated the affections of the people, that they became his ſteady friends, and ſupplied him with exact intelligence of the enemy's deſigns. The town was ſoon inveſted by Raja Saib, at the head of a numerous army, and the operations of the ſiege were conducted by European engineers, but when they came to make their general aſſault, they were repulſed in every quarter with great loſs, and obliged to raiſe the ſiege with the utmoſt precipitation. On this relief captain Clive took the field, and was uniformly ſucceſsful over the enemy. After he had ſubdued all the force oppoſed to him, he returned to Madras, and from thence in 1753 he embarked for England. He was received with every demonſtration of reſpect and gratitude by the Eaſt India Company, who preſented him with a very valuable ſword richly ſet with diamonds. His ſtay in England was but ſhort, and he returned to India governor of St. David's, with the rank of lieutenant-colonel in the king's ſervice. After performing ſome important ſervices, he went to Madras in order to take the command of a ſuccour to be ſent to Bengal, where the nabob Dowlah had declared war againſt the Engliſh, deſtroyed their factories, and taken Calcutta. At this city and period the horrid tragedy of the black-hole was acted. See CALCUTTA.

Admiral Watſon and colonel Clive determined to revenge the cruelties inflicted on their countrymen at Calcutta. The admiral with his fleet proceeded up the river on the 28th of Dcember, and on the next day colonel Clive landed, and, with the aſſiſtance of the ſquadron, ſoon reduced and took poſſeſſion of the town. Clive then took the field with his force of 700 Europeans and 1200 Sepoys, and entrenched himſelf a few miles diſtant from Calcutta. The nabob immediately marched with an immenſe army, conſiſting of 20,000 horſe and 30 000 foot, beſides cannon and elephants, and encamped near Calcutta. Propoſals of peace were ſent to the Eaſtern prince; theſe being contemptuouſly rejected, colonel Clive determined to attack the nabob's camp, which he did with ſo much ſucceſs, as to oblige the nabob to ſue for peace; this was granted him upon terms highly advantageous to the intereſts of the Company. After the concluſion of the treaty, the Engliſh commanders proceeded to the attack of the French fortreſs and factory of Chandernagore, the reduction of which filled the nabob with new apprehenſions, and he threatened to join the French. The mutual injuries inflicted and ſuſtained between Sou-Rajah-Dowlah and the Britiſh being of ſuch a nature as to leave no room to hope for a continued peace, colonel Clive conceived the project of dethroning the nabob. In this ſcheme he had engaged Meer-Jaffier, a diſcontented courtier, who had retired from the palace to his reſidence in the country, from whence he tranſmitted diſpatches to colonel Clive, urging him to begin his march to Moorſhedabad. The colonel immediately put the whole army in motion, and with a firm reliance on his own talents, and on the valour of his troops, croſſing the Ganges, he advanced to Plaſſey, within a day's march of the capital, where he found the nabob encamped with a force of 70,000 men, in all the pomp of oriental magnificence. The number of elephants with their ſcarlet houſings;—the rich embroidery of their tents and ſtandards;—and the martial ſplendour of their cavalry, parading over the field with their drawn ſwords glittering in the ſun,—made a grand and awful, but very intereſting appearance. The nabob, on the firſt intelligence of the march of the Engliſh army, eagerly courted the ſupport and aſſiſtance of Meer-Jaffier, who took a ſolemn oath upon the Koran that he would be his faithful ſoldier. Though the army of the Eaſtern ſovereign was poſted on an eminence, colonel Clive advanced at the head of his troops, conſiſting of only about 3000 men, with great intrepidity to the attack. Such were the diſtruſt and deſpondency prevailing through the Aſiatic army, that ſcarcely any reſiſtance was made; and with a trifling loſs, in compariſon, of about 70 men, a moſt deciſive victory was gained; the camp, artillery, and ſtores of the enemy falling into the hands of the victors. Meer-Jaffier, who commanded the left wing of the nabob's army, took no part whatever in the action, but at the cloſe of the day he came over to the Britiſh. The conquered nabob fled to his capital, where he was betrayed and put to death. Colonel Clive now entered Moorſhedabad as conqueror at the famous battle of Plaſſey. The inhabitants of the city were ſufficiently numerous to have deſtroyed the Engliſh army with miſſile weapons only, but they were ſo intimidated by the ſuperior valour of their enemies, that they offered the commander large ſums to ſecure their property, which he did not accept, conſidering himſelf bound to protect them without a bribe. For the Company, he received of Meer-Jaffier, whom he had raiſed to the vacant throne, a crore of rupees, amounting to more than a million ſterling, as an indemnification for their loſſes at Calcutta. He alſo ceded to the company a conſiderable territory in the vicinity of the city. In conſequence of the battle of Plaſſey, colonel Clive was made governor of Bengal. Shortly after this the great mogul conferred on governor Clive the title of omrah of the empire, and he received a grant from Meer-Jaffier of lands, to ſupport his new dignity, worth about 27,000*l* per annum. Having raiſed the Eaſt India Company's affairs from almoſt the brink of ruin, to a highly proſperous ſtate, and having himſelf become great in wealth, in rank, and in celebrity, the governor returned to his native country in 1760. The following year he was created an Iriſh peer by the title of lord Clive, baron of Plaſſey.

Owing to new diſorders in India, and ſuch changes as led the directors to tremble for the ſafety of their acquired territories in that country, they again applied to lord Clive to accept the preſidency of Bengal, and the command of the troops in that province. In 1764 his lordſhip embarked for India, having been firſt created knight of the Bath. With him were aſſociated four friends, whoſe powers were ſo extenſive, that they ſurpaſſed and ſuperſeded every other authority in the Company's ſettlements. Before the arrival of lord Clive, affairs had taken ſuch a turn, that the eaſy taſk devolved upon him of ſettling terms with the country powers, which he rendered very advantageous to the Company, who had now the diſpoſal of all the revenues of Bengal, Bahar, and Oriſſa, deducting only about three hundred thouſand pounds for the uſe of the emperor. Lord Clive then ſet about the more arduous undertaking of reforming the abuſes among the Company's ſervants; he put the army eſtabliſhment upon a better footing, and introduced ſome good regulations into the conduct of the private trade, which, nevertheleſs, were not ſo ſtrict as to prevent oppreſſions among the natives.

In 1767, lord Clive returned to England, having contributed to the proſperity of the company in a moſt unexampled manner. Six years after this, a reſolution was moved in the Houſe of Commons to the following purport, *viz.* "That in the acquiſition of his wealth, lord Clive had abuſed the powers with which he had been entruſted." By the aſſiſtance of Mr. Wedderburne, afterwards lord Loughborough, he defended himſelf againſt all the charges brought againſt him, which at one time put on a very ſerious aſpect; at length the original motion was rejected, and it was reſolved, "That lord Clive had rendered great and meritorious ſervices to his country." Though he thus eſcaped a public proſecution, he, from this time, fell a prey to the moſt gloomy depreſſion of ſpirits, which, it has been confidently ſaid, reſulted from the recollection of his miſconduct in India, and which neither the wealth accumulated for his own uſe, nor the proſperity which he obtained for his employers, could ward off. At length, at the age only of 50, in November 1774, he put an end to his own life, leaving behind him five children and a widow, the ſiſter of Dr. Maſkelyne, the preſent aſtronomer-royal.

Lord Clive was of a reſerved temper, but among particular friends he was cheerful and even jocular; and in domeſtic life he was kind and amiable. He had, as we have ſeen, the fine talent of inſpiring confidence into thoſe under his command;—hence he was characteriſed by the great lord Chatham "the heaven-born general, who, with little experience, ſurpaſſed all the officers of his time." He repreſented the town of Shrewſbury in parliament from 1760 to 1774, but rarely ſpoke in the houſe, though upon particular occaſions he diſplayed great powers of elocution. By his will he bequeated 70,000*l.* to the invalids in the Company's ſervice.

CLIVERS, in *Botany.* See Galium *Aparine.*

CLOACA, formed from κλυζω, *I waſh away,* among the *Ancients,* was a ſubterraneous aqueduct, or common ſewer, for the reception and diſcharge of the filth of a city or houſe. Tarquinius Priſcus is ſaid (Liv. i. 38.) to have been the firſt who contrived *cloacæ* in ancient Rome, which extended under the whole city, and ſeparated into various branches. The arches which ſupported the ſtreets and buildings were ſo high (being in ſome places upwards of 100 feet), and ſo broad, that, as Procopius ſays, a man on horſeback might eaſily ride through them, even in the ordinary courſe of the channel, and a wain loaded with hay might paſs, and veſſels ſail in them. Hence Pliny calls them (xxxvi. 13.) "Operum omnium dictu maximum, ſuffoſſis montibus, atque urbe penſili ſubterque navigatâ." The principal ſewer, now exiſting, with which the reſt communicated was called "cloaca maxima," and was principally the work of Tarquinius Superbus (Liv. i. 56.). This was formed of large blocks of ſtone joined together without any cement, and covered with a triple vault compoſed of three ranks of vouſſoirs bonded with one another. It began in the Forum Romanum, meaſured 300 paces in length, and about fifteen feet in width, being in ſeveral places divided into three parts, forming a cauſeway on each ſide, and a channel in the middle; and emptied itſelf between the temple of Veſta and the Pons Senatorius. The cloacæ were at firſt carried through the ſtreets; but through the want of regularity in rebuilding the city, after it was burnt by the Gauls, they in many places paſſed under private houſes. There were as many principal cloacæ as hills. In the ſtreets, at proper diſtances, were openings for the admiſſion of dirty water, or any other filth, which perſons were appointed always to remove, and alſo to keep the cloacæ clean. This was the more eaſily effected by means of the declivity of the ground, and the plenty of water with which the city was ſupplied. In the time of the republic, about 400 years after the completion of the original drains, they were repaired by Cato the cenſor, and his colleague, Valerius Flaccus, who conſtructed ſeveral new cloacæ in thoſe parts of the city to which the old channels did not extend, as upon the Aventine, at an expence, according to Dionyſius of Halicarnaſſus, of 1000 talents. Agrippa diſtinguiſhed himſelf during his ædileſhip, by conſtructing cloacæ ſo long and numerous as to occaſion the obſervation of Pliny above-mentioned.

The care and inſpection of the cloacæ, which conſtituted one of the diſtinguiſhed and moſt celebrated monuments of Rome, on account of the grandeur and utility of the work, as well as the enormous expence that attended it, belonged to the cenſors and the ædiles till the time of Auguſtus, who appointed "curatores cloacarum" on purpoſe; and a tax called "cloacarium" was impoſed for keeping them in repair. The "ſervitus cloacæ" was the right of conveying a private common ſewer through the property of a neighbour into the "cloaca maxima" of Tarquin. The Romans had alſo their Cloacina, or goddeſs, who preſided over the cloacæ.

Cloaca, in *Comparative Anatomy,* imports that canal in birds through which the egg deſcends from the ovary in its exit. In this it is remarkable, that the part which is next the ovary is jagged, like the *morſus diaboli,* and fluctuates in the abdomen without any attachment to the ovary; hence anatomiſts have been ſomewhat puzzled to comprehend by what means the egg falls into the ovary. See Egg.

CLOAK Bay, in *Geography,* a bay on the N.W. coaſt of America, that ſeparates Queen Charlotte's iſles from North iſland; the middle of the entrance of which is ſituated in N. lat. 54° 10′. W. long. 133° 20′.

CLOATHING *the bolſters,* in *Rigging of Ships,* denotes laying ſeveral thickneſſes of worn canvas well tarred over them, to make an eaſy bed for the ſhrouds.

CLOATHS, or Clothes. See Habit. By ſtat. 6. Geo. I. c. 23. the wilful and malicious tearing, cutting, ſpoiling, burning, or defacing of the garments or clothes of any perſon paſſing in the ſtreets or highways, with intent ſo to do, is felony. This was occaſioned by the inſolence of certain weavers and others, who, upon the introduction of ſome Indian faſhions prejudicial to their own manufactures, made it their practice to deface them, either by open outrage, or by privily cutting, or caſting aquafortis in the ſtreets upon ſuch as wore them.

CLOCHE *Sujette a la Taxe Militaire.* From the moment a place that has ſtood the fire of cannon is taken, the inhabitants are obliged to re-purchaſe with money the bells of the churches and divers utenſils of copper and other metals. The ſum ariſing from this belongs to the commanding officer of artillery, who nevertheleſs frequently retains but a certain part of the ſaid ſum, leaving the remainder thereof to be divided in juſt proportions among the officers under his command. This at leaſt uſed to be the caſe.

CLOCK, Claas, or Nicholas, in *Biography*, a painter and engraver, native of Leyden, and ſcholar of Francis Floris. Amongſt his engravings, which are ſomething in the ſtile of Cornelius Cort, though coarſer in their execution, may be noticed a large print repreſenting the judgment of Midas, from Carlo Van Mandere, dated 1589, and the four Elements, half figures, dated 1597, which are probably from his own deſigns. Heinecken. Strutt.

Clock, in *Horology*, is a machine which meaſures, ſubdivides, and indicates the ſucceſſive portions of time with a degree of accuracy that has deſervedly given it the preference over the clepſydra, and brought it into general uſe for civil, domeſtic, philoſophical, and aſtronomical purpoſes; it is conſtructed of various materials, and after different models, to accommodate the views of various individuals; its value, therefore, varies from three half-crowns to one hundred pounds and upwards; but though every houſeholder almoſt is now in poſſeſſion of a clock, few individuals, comparatively ſpeaking, know either the theory of its action, or the ſubſerviency of the ſeparate parts of its mechaniſm to produce their deſtined effect; and yet, no inſtrument has been more the object of ingenuity, or the ſubject of ſcience, for two or three ſucceſſive centuries, than the machine in queſtion, before it attained its preſent moſt improved conſtruction. Its name is derived either from the German *die gloke* or *die kloke*, a clock, or from the French *la cloche*, a bell, againſt which it uſually ſtrikes the hour indicated.

In tracing the records of antiquity for the origin of the firſt horological machine, that had a ſuſpended gravitating body as a maintaining power, and a regulator of ſome determined ſhape and dimenſions to check its velocity at ſmall equidiſtant intervals, different authors have fixed upon different ingenious men as its inventor, and have quoted with ſome confidence paſſages from the more ancient writers in confirmation of their reſpective opinions: hence Archimedes and Poſſidonius before the Chriſtian æra, Boethius in the fifth century, or about the commencement of the ſixth, Pacificus about the middle of the ninth, Gerbert at the end of the tenth, Wallingford near the beginning of the fourteenth, and Dondi at the end of the fourteenth, have ſeverally been aſſerted to have been the firſt contrivers of a clock. The difficulty of aſcertaining the exact period when a regulated machine for meaſuring time without the aſſiſtance of water was firſt invented, ariſes from this conſideration, which has not been ſufficiently attended to; *viz.* the appellation *horologium* has by ancient writers been indiſcriminately applied to all inſtruments that had any thing to do with hours, whether regulated or not, ſuch as ſun-dials, clepſydræ, and inſtruments for merely repreſenting the motions of the heavenly bodies, like our orreries and planetaria; and, laſtly, clocks, or machines with a bell, to ſtrike the hours, placed in the ſteeple *(le clocher)*, of ſome abbey.

The ſphere of Archimedes, made two hundred years before Chriſt, as mentioned by Claudian, was evidently an inſtrument with a maintaining power, but without a regulator, and therefore would not meaſure time in any other way than as a planetarium, turned by a handle, meaſures, or rather exhibits, the reſpective velocities of the planetary bodies. The ſame may be ſaid of the ſphere of Poſſidonius eighty years before Chriſt, as mentioned by Cicero (De Natura Deorum), notwithſtanding the deference which is due to the opinion of Dr. Derham.

When Bernardus Saccus (Hiſt. Ticin. lib. vii. c. 17.) aſcribes the invention of clocks to Boethius in the year 510, he paſſes over that part of the quotation from Caſſiodorus, which ſays, "that the hours were determined *guttis aquarum*, by drops of water;" hence his horologium was evidently nothing more than a clepſydra. The authority upon which Pacificus, archdeacon of Verona, has been deemed the inventor of clocks in the year 850, is the ſubjoined portion of his epitaph:

> "Horologium nocturnum nullus ante viderat,
> En invenit argumentum et primus fundaverat;
> Horologioque carmen ſpheræ cœli optimum
> Plura alia graviaque prudens invenit."

Profeſſor Hamberger, in a paper read to the Society at Gottingen in 1758, (vide Beckmann, vol. i. page 419, et ſeq.) has given reaſons for believing this "Horologium nocturnum," as it is called in oppoſition to a ſun-dial, or horologium diurnum, to have been a clepſydra, notwithſtanding the "nullus ante viderat," for it was in the ninth century that Hildemar, ſpeaking of the Monks, in regard to their obſerving the hours, ſays, "he who wiſhes to do this properly muſt have "horologium aquæ," which is conſidered as a proof that clocks did not then exiſt. (Commentar. in Reg. S. Bened. cap. 8.) On the contrary, Bailly in his "Hiſtory of Modern Aſtronomy" (vol. i. p. 321.) aſſerts, that Pacificus was the inventor of a clock going by means of a ſuſpended weight, an eſcapement, and a balance; if this information be accurate, no doubt he was the firſt who is known to have made a clock; but F. Berthoud (Hiſtoire de la Meſure du Tems, tom. i. p. 49.) very properly obſerves, that the celebrated author has adduced no authority for the aſſertion he has uſed, and that he believes it to be inaccurate. With reſpect to Gerbert, who was made pope Silveſter II. in the year 999, Dithmar (Chron. lib. vi. p. 83. fol. 1580.) believes that his horologium was only a ſun-dial which he made at Magdeburg; his words are "Gerbertus, a finibus ſuis expulſus, Ottonen petiit imperatorem, et cum eo diu converſatus, in Magdeburg horologium fecit, illud recte conſtituens, conſideratâ per fiſtulam quadam ſtellâ nautarum duce." Here no wheels or weights are mentioned, but, on the contrary, his obſervation only of the pole-ſtar, which aſſiſted him in fixing the horologium or dial; nay, in Gerbert's book "De Aſtrolabio" he explains the method of erecting dials for all latitudes, but ſays nothing of any other kind of horologia. To what has been above remarked, concerning the different ſignifications of the word horologium, may be added what is ſaid by the anonymous author of the life of William Abbot of Hirſhau, who lived in the eleventh century, *viz.* "naturale horologium ad exemplum cæleſtis hæmiſpherii excogitâſſe," which expreſſion alludes to ſome piece of aſtronomical mechaniſm at that time invented; and according to the account of Trithemius reſpecting the horologium made in 1232, and ſent by the ſultan of Egypt to the emperor Frederic II. (Chron. Hirſaug. ad. h. a.) as well as from Leland's deſcription of Richard Wallingford's horologium, called Albion, (all by one) made in 1326, theſe muſt have been inſtruments claſſing rather with our orreries than our clocks; for the motions of all the heavenly bodies appear to have been conducted by the maintaining power, whatever it was, without any controlling or regulating mechaniſm. (Vide Tanneri Biblioth. Brit. Hibern. p. 629.) It may be further remarked here, that the words, "horologium dirigere," "ordinare," temperare," &c., which denote the office of the ſacriſtan, in the writings of the ſaid William Abbot of Hirſhau, evidently allude to the adjuſtments of the clepſydra. Hence it may be fairly inferred, that no one of the preceding contrivers of horologia was alone the inventor of a regulated clock: the invention was, no doubt, of monaſtic origin, or, at leaſt, intended firſt for monaſtic purpoſes, when the ſtated periods of prayer required the attendance of the monks by night as well as by day. That the horologium of Dondi, however, was a clock can admit of but little doubt; it was conſtructed at Padua about the end of the fourteenth century, by order of Hubert, prince of Carara; and the deſcription given of it by Petrus Paulus Vergerius (in Vit. Princip. Carrar. ap. Murator. tom xvi. p. 171.) is this; "Horologium quo per diem et noctem quatuor et viginti horarum ſpatia ſponte ſuâ deſignarentur, in ſummâ turri conſtituendum curavit." This ſpontaneous deſignation of 24 hours of day and night, by an horologium, placed on the ſummit of a turret or ſteeple, correſponds exactly to our church-clock; but ſtill it remains uncertain whether or not Dondi, who was afterwards called Horologius, was the original inventor. About the middle of the fourteenth century ſeems then to be the time that affords the firſt certain evidence of the exiſtence of a clock, or regulated horological machine, notwithſtanding the frequent mention of horologia in preceding ages, as applied to other horological inſtruments; and the following are ſome of the earlieſt authentic notices that hiſtory has recorded on the preſent ſubject.

1. In the "Chronica Miſcella Bononienſis" (in Muratori. tom. xviii. p. 444.) it is ſaid that the firſt clock at Bologna was fixed up in the year 1356.

2. About the year 1364, Henry de Wyck or Henri de Vic, a German artiſt, placed a clock in the tower of Charles V.'s palace. (Vide Moreri. Diction. art. Horloge du Palais.)

3. In Rymer's Fædera is mentioned the protection of Edward III. to three Dutchmen, Orlogiers, who were invited from Delf into England in the year 1368, from which time we may probably date the introduction of clock-work into England.

4. Conradus Daſypodius has given an account of a clock erected at Straſburg about the year 1370.

5. According to Froiſſard, Courtray had a clock about the ſame period, which was carried away by the duke of Burgundy in the year 1382.

6. Lehmann ſays that at Spire was a clock in the year 1395.

7. Nuremberg had a clock in 1462, Auxerre in 1483, and Venice in 1497; and it appears from a letter of Ambroſius Camaldulenſis (lib. xv. Epiſt. 4.) to Nicolaus of Florence that clocks began to be common in private familes on the continent, about the end of the fifteenth century. (Beckmann.) It is probable therefore, that clocks began to be general in England too about the ſame period, for we find in Chaucer, who was born in 1328, and died, as is ſuppoſed, in 1400, the following diſtich: *viz.*

"Full ſickerer was his crowing in his loge,
As is a clock, or any Abbey orloge."

The honourable Daines Barrington (Archeologia, vol. v. p. 415.) is indeed diſpoſed to believe that clocks were in uſe at the beginning of the fourteenth century, and quotes the following paſſage, as a proof, from the Italian poet Dante, who was born in 1265 and died in 1321.

"Indi come horologio che ne chiami,
Nel hora che la ſpoſa d'Idio ſurge
A mattinar lo ſpoſo, perche l'ami."

But we have ſeen that clepſydræ were called horologia, which had alſo ſometimes ſtriking mechaniſm; therefore the paſſage before us will apply with equal propriety to that inſtrument. The ſame author alſo ſuppoſes that the clock-houſe, near Weſtminſter Hall, was furniſhed with a clock in the ſixteenth year of Edward I., or in 1288 (vide Selden's Preface to Hengham), out of a fine impoſed on Radulphus de Hengham, chief juſtice of the king's bench, but there appears to be more of conjecture than proof in the detail. From the teſtimonies which have been here adduced reſpecting the origin of a clock, the concluſion to be drawn is, that this machine is neither of ſo ancient a date as ſome writers ſuppoſe, nor yet among thoſe more recent inventions which are placed in the laſt two centuries; and that the inventor is not certainly known. Fer. Berthoud, who has written more volumes on the ſubject of clock-work than any other man, concludes his reſearches with a belief, founded in ſtrong probability, that a clock, ſuch as that of Henry de Wick, is not the invention of any one man, but an aſſemblage of ſucceſſive inventions, each of which is worthy of a ſeparate contriver: for inſtance—1. Wheel-work was known in the time of Archimedes; 2. the weight applied as a maintaining power had at firſt a fly, moſt likely ſimilar to that of a kitchen jack; 3. the ratchet wheel and click, for winding up a heavy weight without detaching the teeth of the great wheel, was found the next indiſpenſable contrivance; 4. the regulation of the fly, depending on the ſtate of the air, was abandoned, and a balance ſubſtituted; 5. an eſcapement conſequently became neceſſary, which, in conjunction with the balance, conſtituted a more regular check upon the tendency which a falling weight has to accelerate its velocity, than a fly uſed as a regulator could of itſelf be; 6. the application of a dial-plate and hand, to indicate the hours, was the conſequence of the regularity introduced into the going part of the mechaniſm; and, laſtly, the ſtriking portion, to proclaim at a diſtance, without the aid of a watching-man, the hour that was indicated, completed the liſt of inventions. Such a ſucceſſion of ingenious contrivances, introduced by different men, to improve upon the firſt rude inſtrument, is perfectly analogous to the ſucceſſive improvements which the preſent clock has experienced, at different periods, ſince Henry de Wick's clock was conſtructed, which is the moſt ancient one of which we have a particular deſcription.

Deſcription of the Ancient Clock made by Henry de Wick.

Going Part.—*Fig.* 1, of *Plate* VIII. of *Horology*, repreſents, in profile, the movement of this clock, and *fig.* 2, the front view of the ſame inſtrument: A is a weight, ſuſpended by a chord, which is folded round a metallic barrel B, the arbor, *a a*, of which has its ends or pivots, *b*, *b*, paſſing through ſmall circular holes in the plates C C and D D, which, in this ancient clock, were of iron, the former being bent at right angles at the ends, and ſcrewed to the latter, inſtead of having pillars; theſe plates, when thus attached, conſtitute what is called the frame.

The action of gravity of the weight, A, has a natural tendency to fall towards the earth, and to carry along with it the whole mechaniſm, but the frame being fixed firmly on a ſupport is ſuſtained in its place; inſtead, therefore, of all the mechaniſm being pulled from its ſituation, the barrel, B, is pulled round to allow the cord to eſcape, and would move with an accelerated velocity, according to the laws of falling bodies, if it had not the wheel, F, with inclined teeth, beſt ſeen in *fig.* 5, pinned to it, which is called the ratchet wheel, and which has its motion ſtopped by the ſmall pointed piece of metal, *c*, called a click, inſerting its pointed end into a ſpace between two teeth, and kept to its place by a ſlender ſpring, *d*. This ſpring and alſo the click are ſcrewed to the wheel G, as may be ſeen in *figs*. 1, 2, and 5, which is not faſtened to the arbor of the barrel, conſequently, when the weight pulls downwards, the ratchet wheel puſhes the click, and with it the wheel G, but when the weight is taken off, and the ratchet wheel turned backwards, the wheel, G, keeps its poſition, by reaſon of the click ſliding eaſily along the ſloping ſides of the ratchet wheel, which it is allowed to do by being made to move freely on its ſcrew as a ſtud; this contrivance for moving the wheel, G, when the weight falls, and for leaving it at reſt when the weight is raiſed, is the mechaniſm both for winding up the weight, which is called the maintaining power, and alſo for tranſmitting this power to the wheel, G, when wound up: but, as the ſuſpended weight of this palace clock, of Charles V. of France, was too heavy to be wound up by the ſtrength of one man, the wheel Q. *figs*. 1 and 2, was fixed on the ſame arbor with the barrel, and the pinion, *n*, was applied to it, to be turned by a handle or key taking hold of its ſquare arbor at P, which additional wheel and pinion formed a kind of crane for elevating the weight, and the click held it in any ſtate of elevation.

The wheel, G G, having the motion of the barrel communicated to it by means of the click, tranſmitted it to the pinion, *e*, *fig*. 1, and conſequently to the wheel, H H, riveted on the ſame arbor *f f*; this wheel, H H, again tranſmitted the motion received to a lantern pinion, *g*, and conſequently to the wheel, I I, fixed on its arbor, which was called the crown wheel or eſcapement wheel (roue de rencontre): this laſt wheel by giving the pallets or ſhort levers, *h*, *i*, each a puſh alternately by two teeth, at oppoſite ſides of its circumference, and moving in oppoſite directions, one forward and the other backward, gave a vibratory motion to the vertical arbor, K, moving on two pivots, *l*, *k*; and as the regulator or balance was fixed on this arbor, it was thus made to vibrate backwards and forwards at every puſh of the crown wheel upon the pallets, which alternate motions of the balance were called vibrations or oſcillations, and their frequency was regulated by the ſmall weights, *m*, *m*, better ſeen in *fig*. 2, placed at their correſponding diſtances on the arms, L, L, of the balance, by means of little equidiſtant notches: if the vibrations were too quick the momentum of the balance was increaſed by removing the ſmall ſuſpended weights farther from the centre of motion, and *vice verſâ*. As the balance was neceſſarily heavy to counterpoiſe a large maintaining power, a ſlender cord, M, was ſuſpended from a ſmall cock, T, placed on the large cock, S, that preſerved the perpendicular direction of the arbor K, which cord bore the principal weight of the balance, and ſuffered it to vibrate without the whole friction which its weight would have occaſioned on the lower pivot.—The pallets were placed at about 90° from each other on the arbor or verge of the balance, ſo that when one of them was parting with its tooth of the crown wheel, the other was in a ſituation to receive the oppoſite one immediately; this action of the crown wheel upon the pallets, which eſcaped the teeth alternately, was called, and is ſtill denominated, the eſcapement, or by abbreviation, 'ſcapement of the clock: it is by means of it that the large weight is prevented from falling with rapidity to the ground, by receiving a check at every impulſe of the wheel of eſcapement on one or other of the two pallets; and the interval between two ſucceſſive impulſes was regulated by the time of a vibration of the balance, which period we have ſeen was adjuſtable. Thus the whole duration of a vibration was the meaſure of time, and the wheels and pinions were employed, firſt to tranſmit the maintaining power in order to overcome the obſtacles to motion which the balance met with from friction and reſiſtance of the air; and ſecondly to number the vibrations and indicate them in a viſible form by a hand, O, *fig*. 2, on a dial plate, not given in the figures, as they amounted to hours. The former of theſe offices of the wheel-work we have already deſcribed without attending to the numbers of the teeth into which the wheels and pinions were divided; but to comprehend the nature of the latter office, this conſideration muſt be taken into the account. The eſcapement wheel, I I, has one tooth completely eſcaping the pallets at two vibrations of the balance, which we will ſuppoſe adjuſted to be exactly equal to as many ſeconds of time; then on this ſuppoſition, the eſcapement wheel of 30 teeth will make one entire revolution in 60^s, or one minute, as will alſo its pinion, *g*, of 8, by reaſon of its being faſt on the ſame arbor; but as this pinion acts with the wheel, H H, of 60 teeth, only 8 of thoſe teeth will paſs the pinion in every minute, therefore as often as 8 are contained in 60, ſo many minutes will this wheel take to revolve in, which are 7½; its pinion, *e*, of 8 alſo revolves in 7½ minutes, on account of being on the ſame arbor, which pinion acts with the great wheel G G, ſo that eight of its teeth paſs in 7½ minutes; but its number is 64, or eight times eight, it therefore revolves in eight times 7½ minutes, *i. e.* in one hour exactly: hence as often as the cord is wound round the barrel, ſo many hours will ſuch a clock continue to go after winding. Now as the wheel, G G, revolves once in every hour, it is evident that the pinion, *d*, on its arbor, which projects through the frame, will turn round alſo in an hour. Its number of teeth is 8; therefore 8 × 12 = 96 is the number of teeth of the dial wheel, N N, which goes round along with the hand, *o*, placed on its arbor, in 12 hours. Thus while the train, as it is called, of wheels and pinions is tranſmitting the power of the ſuſpended weight forwards to the balance, it is alſo counting back again the number of vibrations to conſtitute an hour, and pointing out on the dial plate, by the addition of a hand, each ſucceſſive hour, as the vibrations accumulate. Should it be aſked here, why a large weight is neceſſary to actuate the wheel-work, the anſwer is, that the power of it is gradually diminiſhed as it approaches the regulator according to that law of dynamics, by which the force is known to be equal, whether a large weight moves with a ſmall velocity, or a ſmall weight with a proportionate great velocity, if there were no friction in the train, one ſixtieth part of the weight, hung on a ſimilar barrel placed on the crown wheel, would have the ſame effect on the balance, as the large weight itſelf in its preſent ſituation on the hour arbor; but then it would want winding up ſixty times in the ſame period in which it requires only once winding up with a large weight falling with diminiſhed velocity; ſo that convenience was the object to be attained in fixing upon a large maintaining power.

Clock Part, or *Striking Part*.—The ſtriking, or what is properly called the clock part of the antique piece of mechaniſm, which we are deſcribing, is, perhaps, the moſt ancient of any which is tranſmutted to us, and which therefore deſerves a particular detail, eſpecially as the ordinary Dutch clocks retain very nearly the ſame conſtruction to this day. We cannot give a better idea of this portion of the inſtrument, than by tranſlating F. Berthoud's account of it, from his "Hiſtoire de la Meſure du Temps," as we have done, with ſome verbal deviations, in our deſcription of the going part.

In *Plate* VIII. *figs*. 3 and 4 repreſent the wheel-work of the ſtriking part, adopted in Henry de Wick's clock: A and B, *fig*. 3, are the principal plates, or rather bars of iron; C and D, the connecting parts inſtead of pillars; the weight F, ſuſpended by the cord, that ſurrounds the cylinder G, is the maintaining power; and this cylinder has a rachet wheel fixed to it, like that in *fig.* 5, in the going part, and connected with a click faſtened to the wheel, H, *figs.* 3 and 4. for the purpoſe of winding up the weight; for performing which, a handle is put on the ſquare arbor of the pinion *a*, which acts with the remontoir wheel, I, faſtened to the cylinder. Wheel H has eight pins projecting from its plane at *b*, *c*, &c. which pins lift ſucceſſively a hammer that ſtrikes againſt the bell, which parts are not repreſented in the plate, but their principle may be readily conceived from the deſcription, which we ſhall hereafter give, of the ſtriking part of a modern clock. Wheel H drives the pinion *d* fixed on the ſame arbor with the wheel K, which again drives the pinion *e*, on the projecting arbor of which is fixed the fly L, the office of which fly is to regulate the interval between each blow of the hammer, which it does by means of the reſiſtance that its revolving wings, or fanners, meet with from the air.

The manner in which the reſpective number of blows of the hammer for each hour is regulated, is an ingenious invention, and is thus effected; the arbor of the firſt wheel, H, is made to project through the frame, ſo as to take a pinion, *f*, of eight leaves, to drive the wheel M of 78 teeth, which number is equal to 1 + 2 + 3 &c. + 12, or whole number of ſtrokes in 12 hours. On the wheel M is fixed another wheel, N, *figs.* 3 and 4, called the *count* wheel, which has 12 notches on the edge, at unequal diſtances, *viz.* at $\frac{1}{78}$, $\frac{2}{78}$, $\frac{3}{78}$, &c. of the circumference, correſponding to the hours 1, 2, 3, &c. to regulate the number of ſtrokes at each hour. Q, *fig.* 4, is a detent fixed on the arbor R of *fig.* 3, with its claw reſting on the edge of the count-wheel N; to which arbor a lever, T, is alſo fixed, reaching to the pins of the 12 hour wheel N of *fig.* 2, and likewiſe a ſhorter lever, V, within the frame directly above a ſingle tooth, *o*, on the arbor of the fly L. Now as the 12 hour wheel revolves by the going part, one of its pins catching the end of the lever T at every hour depreſſes it, and at the ſame time raiſes the claw or catch of the detent from the notch of the count-wheel, and alſo the ſhort lever V from its tooth *o*, by reaſon of the detent, and two levers, being all faſt to the ſame common arbor R: the weight F in this ſituation, makes the wheels run on till another notch of the count-wheel comes to the claw of the detent Q, when it again falls by the gravity of the load P, placed alſo on the ſame common arbor R, and filling the notch ſtops the count-wheel; at the ſame time, the ſmall lever V falls in the way of the tooth *o* of the fly, and arreſts the motion of the wheels within the frame; ſoon after which the fly alſo comes to reſt, partly by the reſiſtance of the air, and partly by a ſpring preſſing on the end of its arbor, round which it can revolve in a detached ſtate, like the fly of the chime mechaniſm, which we have before deſcribed.—The number of ſtrokes which the hammer makes when raiſed by the pins *b*, *c*, &c. depends on the diſtance between the two notches of the count-wheel, on which the claw of the detent reſts at the time. The ſame proceſs is repeated every time that one of the pins of the 12 hour wheel, depreſſes the end of the lever T, and detaches thereby the claw of the detent and tooth *o* of the fly arbor, ſo as to permit the weight F to actuate the wheel-work for the limited time of ſtriking.

We are not informed what are the numbers of teeth in the wheel-work of the ſtriking part contained within the frame, nor is it of much importance, as this movement has no other uſe, than that of regulating the reſpective velocities of the fly and pin wheel H, that raiſes the hammer; but when the wheel M has 78 teeth, as we have ſtated, it is neceſſary that the pinion *f*, that drives it, ſhould have juſt as many leaves as there are pins on the wheel H; otherwiſe one tooth of the wheel M would not correſpond to one ſtroke of the hammer againſt the bell, which is a neceſſary condition; the pinion *f* therefore has eight leaves, correſponding to the eight lifting pins of the wheel H, and 78 ſtrokes are given in a progreſſion increaſing by unity, during each twelve hours, after equal hourly intervals of ſilence.

Hiſtory of the ſucceſſive Improvements in Clocks.

The preceding account of Henry de Wick's rude clock muſt have prepared the reader for a deſcription of the ſucceſſive alterations and improvements which ingenious mechanicians and artiſts have deviſed in the clock during the laſt two centuries; for it muſt have occurred to him in the peruſal, that large iron wheels continually expoſed to the oxiding influence of the atmoſpheric air, in which unequal and ill ſhapen teeth were cut with the inaccuracy of a manual operation, were by no means calculated to tranſmit the maintaining power with perfect regularity to the balance, ſuppoſing it to have been a good regulator; but when it is further conſidered, that the alternate direct puſhes of the balance-wheel againſt the pallets muſt have produced jerks, and deſtroyed or greatly diſturbed the regularity of this moſt eſſential part of the mechaniſm, great accuracy was not to be expected in the indication of time; ſo that, as we ſee, even minutes were deemed too ſmall portions of time to be indicated by ſuch a machine. We find, notwithſtanding, that ſo early as the year 1484, Walther made uſe of a balance-clock for heavenly obſervations, as did the landgrave of Heſſe after him; and ſuch ſeems to have been the utility of the clock, thus early, for aſtronomical purpoſes, that Gemma Friſius propoſed a portable one to be uſed at ſea for aſcertaining the longitude by ſo ſoon as the year 1530. About the year 1560 Tycho Brahé was in poſſeſſion of four clocks, which indicated hours, minutes, and ſeconds, the largeſt of which had only three wheels, one of which was three feet in diameter, and had 1200 teeth in it, a proof that clock-work was then in a very imperfect ſtate. Tycho however obſerved, that there was an irregularity in the going of his clocks, which depended upon the changes in the atmoſphere; but he does not appear to have known how ſuch effect was produced. In the year 1577 Moeſtlin had a clock ſo conſtructed as to make juſt 2528 beats in an hour, 146 of which were counted during the ſun's paſſage over a meridian, or azimuth line, and determined his diameter to be 34′ 13″, ſo that the ſcience of aſtronomy began thus early to be promoted by the aſſiſtance of clock-work; and as clocks firſt promoted the ſtudy of aſtronomy, it will be ſeen by and bye that aſtronomy in its turn gave riſe to ſome of the moſt eſſential improvements in clock-work, and that, as the arts and ſciences were more and more cultivated, improvements in clock-work kept pace with them, and employed the talents of the moſt ingenious men of each ſucceeding age.

One of the firſt additions to the mechaniſm we have before deſcribed was what we call an alarum or larum, ſtill uſed in the Dutch wooden clocks, which contrivance took its origin from the circumſtance of prayers being uſed at ſtated periods in monaſteries by night as well as by day; the fervors of devotion were not found always unfettered by ſleep at the hour proclaimed by the bell, an invention conſequently became neceſſary to rouſe the ſleepy prieſt to his duty by a continued ringing in his ſtunned ears: for a deſcription of which mechaniſm we muſt refer to the article *Thirty-hours* CLOCK *with a Larum.*

It is not quite certain at what time exactly the bulky ſize of the ancient clock was reduced to a ſtate of portability, which muſt have conſtituted a real improvement, as the main ſpring muſt have been invented previouſly; the ſubſtitution of which for a large heavy body, as a firſt mover, conſtituted a ſecond æra in horology, from which we may date the origin of the fuſee, or mechaniſm for equalizing the variable power of a coiled ſpring; and from which our modern watches and chronometers of great value derive both their form and principle.

F. Berthoud (Hiſtoire de la Meſure du Temps, i. 79.) ſuppoſes that a portable clock muſt have been invented ſome time before the year 1544, which was that in which the Corporation of Maſter Clock-makers at Paris had a ſtatute enacted in their favour by Francis I. to this purpoſe, *viz.* "No one, of whatever ſtation, if he be not admitted a maſter, ſhall make, or cauſe to be made, clocks, alarums, watches, large or ſmall, or any other machine for meaſuring time, within the ſaid town, city, and precinct of Paris, on pain of forfeiture of the ſaid works, and of arbitrary penalty, &c." This ſtatute, however, inſtead of proving the origin of portable clocks, only proves that in the year 1544 they had begun to be commonly made in France, and probably had been introduced from Germany, which country, no doubt, was the nurſe as well as mother of horology. Indeed we have lately been favoured with the ſight and examination of a portable clock, at preſent in the poſſeſſion of Mr. Peckitt of No. 50, Old Compton ſtreet, which, from an inſcription engraven in the Bohemian language, appears to be much older than the ſtatute above quoted: it was made in the year 1525 by Jacob Lech of Prague, and differs in its conſtruction from De Wick's clock, in that it has a ſpiral ſpring, with a fuſee of ſoft metal, and a ſcrew inſtead of notches at the ends of the double levers of the balance, with tapped weights of lead for the adjuſtment to time, with the addition of ſome wheel-work, to ſhew the motions of the ſun and moon, in an engraven ecliptic, and alſo a contrivance to ſtrike one at every hour. The wheels are of iron, and retain certain punched marks of diviſion which prove that they have been cut with a file by hand; and the levers being faſt to the arbor or verge of the pallets, will vibrate either in a horizontal or vertical poſition. A catgut was originally the band of the fuſee; but the introduction of a modern metallic chain unfortunately has deſtroyed nearly three out of the eight ſpiral threads at the ſmaller end, ſo that inſtead of going 48 hours, *viz.* ($8^{thr} \times 6^{h}$), the remaining five threads will allow the piece to go only 30 hours, or $5^{thr} \times 6^{h}$, which it now does, though irregularly, with vibrations of nearly one ſecond each by eſtimation. Beckmann, in his "Hiſtory of Inventions," mentions this clock as having been the property of Mr. Ferguſon, at whoſe ſale the preſent proprietor purchaſed it in the year 1777, and he intends, we underſtand, to bequeath it to the Britiſh Muſeum, where, no doubt, it will be conſidered as a great curioſity. On examination of the wheel-work, we found the moon's train to be $\frac{12}{6} \times \frac{82}{6} = \frac{984}{36}$ of a day $= 27^{d}\ 8^{h}$ for a periodic revolution, and the ſun's $\frac{984}{36} \times \frac{81}{6} = \frac{79704}{216} = 368$ days, the inaccuracies of which trains prove that planetary mechaniſm in clocks had at that period made no great progreſs towards perfection.

But the portable clock of which we have here given a ſhort notice, we have reaſon to believe, was not among the firſt that were made, for at firſt the ſpiral ſpring was folded in a box, the arbor of which had the great wheel on it, and the irregularity of its action was in ſome meaſure equalized by a ſecond ſpring, which, being diſpoſed in a certain curve, oppoſed the principal ſpring when wound up, and acted in the ſame direction with it when its intenſity began to remit; this piece of mechaniſm, which was a German invention, preceded the invention of the fuſee, and was called *ſtack-freed.* Berthoud has given a drawing and deſcription of a portable clock, probably by Gourdain, without a fuſee; and ſome of the modern French watch-makers have probably borrowed from it their idea of making a watch go well without a fuſee. For the ſhape and uſe of which equalizer of irregular power, ſee the article Fusee.

When the ſize and weight of a clock were reduced, the quantity of friction was ſo diminiſhed, as to allow the thread of ſuſpenſion, on the verge of the balance, to be abandoned, which circumſtance gave riſe to a new poſition of the balance, the verge of which was now placed horizontally upon its pivots, which were a little flattened, ſo that the weight might be ſupported by its edge; and this contrivance was called the *knife edge* ſuſpenſion, a ſpecies which F. Berthoud has pronounced ſuperior to the ſuſpenſion with a ſlender ſpring, to which the Engliſh artiſts are much more partial, though it does not appear that their partiality is founded on any thing like impartial experiment.

Such was the ſtate of clock-work when Galileo, the celebrated philoſopher and mathematician to the duke of Florence, obſerved, that two lamps, or other heavy bodies, ſuſpended by ſtrings of the ſame length, made their vibrations in long or ſhort arcs, very nearly, if not exactly, in the ſame ſpace of time; this iſochronal property he publiſhed at Paris in a treatiſe, called "L'Uſage du Cadron ou de l'Horloge phyſique univerſelle," in the year 1639, which explained, in 15 chapters, its uſe in philoſophy, aſtronomy, muſic, phyſic, &c. and though he never applied the pendulum as a regulator to ſuperſede the balance in clocks, yet we may date from his diſcovery a third æra in clock-work, namely, the origin of the pendulum clock, which continues in uſe in our day; the idea of the iſochroniſm of a detached pendulum at leaſt was his, and the inveſtigation of the law, by which bodies fall in free ſpace, was applied by him to determine the lengths of two pendulums, that ſhall vibrate in times that are in a given ratio to each other.

It has been a ſubject of great contention, who had the honour to be the firſt artiſt, or mechanician, who applied a pendulum to clock-work; without pretending to decide the conteſt, which, at this diſtance of time, can be determined only by hiſtorical evidence, we will briefly lay before the public the pretenſions of different men to this invention, and leave the reader to judge, from ſuch facts as we have been able to collect on the ſubject. Bernard, one of the profeſſors of aſtronomy at Oxford in the laſt century, has aſſerted, that the Arabians, beſides having clepſydræ and ſun-dials, made uſe of pendulums in aſtronomy long before this period, as we know Riccioli, Tycho Brahé, Langrenus, Vendelin, Merſenne, Kircher, Hevelius, Mouton, and Galileo himſelf, did in a detached ſtate; but we do not find that any of them uſed it in conjunction with wheel-work. According to Becker (Bailly's Hiſt. of Modern Aſtron.), Juſte Birge, a native of Switzerland, in the year 1552, and who was Rothman's ſucceſſor at the obſervatory at Caſſel, from 1590 to 1597, was the firſt who applied a pendulum to a clock, which application, however, he never publiſhed to the world, that we can learn, and which, therefore, if the fact be true, never benefited the world.

According to profeſſor Venturi (Eſſai ſur les Ouvrages phyſico-mathematiques de Leonard de Vinci), Sanctorius applied a pendulum to clock-work ſome time before the year 1625, in which he publiſhed his "Commentarii in Avicennam," and deſcribed ſeveral inſtruments which he had explained to his auditors 13 years before, in his lectures read at Padua.

Vincentio Galilei, ſon of the famous Galileo, is alſo ſaid

(Exper. de l'Acad. del Cimento) to have made a pendulum clock, ſuggeſted by his father's diſcovery, ſo early as the year 1649, at Venice; but Chriſtian Huygens, the juſtly celebrated mathematician and philoſopher of Zuylichem, conteſted the honour of priority of the application with him, which conteſt gave riſe to that excellent treatiſe on clock-work, "De Horologio Oſcillatorio," which laid the foundation of moſt of the ſubſequent improvements in horometrical machines, and in which it appears indubitably, that he made, or directed the making of, a pendulum clock before the year 1658. From comparing what has been adduced by theſe two contending mechanicians, an impartial reaſoner is led to conclude, that Vincentio Galilei may have applied, in a rough mechanical way, not made generally known, ſuch a pendulum to clock-work as proved no mean ſubſtitute for the balance; but that Huygens applied it in a more ſcientific and maſterly manner, and probably without any knowledge of what his opponent had previouſly done; hence the honour of the invention, as it has been called, has been generally attributed to Huygens.

But whilſt we have ſtudiouſly avoided entering into a minute diſcuſſion of all the proofs that have been adduced in favour of each of theſe foreigners, to ſubſtantiate their reſpective claims to originality of project, with reſpect to the pendulum, we ſhould act in oppoſition to our feelings as Engliſhmen, as well as to our profeſſions of impartiality, if we did not here avail ourſelves of ſome documents that have recently fallen into our hands, which bear the marks of authenticity, and from which it appears, that neither Vincentio Galilei, nor yet Huygens, was the firſt who adapted a pendulum to a clock, but that an artiſt in London, named Richard Harris, invented and made a pendulum clock about eight years before either of them dated their claims; an engraven plate, bearing date "Great Ruſſel Street, Dec. 21, 1798," is at this time hanging in the veſtry room of St. Paul's church, Covent Garden, of which the annexed is a verbal copy, *viz.*

"The (new) turret clock, and bells of this church, were made A.D. 1797, by Thomas Grignon, of Great Ruſſel Street, Covent Garden, the ſon and ſucceſſor of Thomas Grignon, who, A.D. 1740, brought to perfection what the celebrated Tompion and Graham never effected, *viz.* the horizontal principle in watches, and the dead-beat in clocks, which dead-beat is a part of the mechaniſm of the turret clock. Thomas Grignon, ſenior, made the time-piece in the pediment at the eaſt end of this pariſh church, deſtroyed by fire A.D. 1795. The clock fixed in the turret of the ſaid (late) church, was the firſt long pendulum clock in Europe, invented and made by Richard Harris of London, A.D. 1641; although the honour of the invention was aſſumed by Vincenzio Galilei, A.D. 1649, and alſo by Huygens in 1657. This plate is here affixed by Thomas Grignon of this pariſh, the ſon of the above Thomas Grignon, as a true memorial of praiſe to thoſe two ſkilful mechanicians, his father and Richard Harris, who, to the honour of England, embodied their ideas in ſubſtantial forms that are moſt uſeful to mankind."

In order that the reader may judge for himſelf, what degree of credit is to be attached to the preceding memorial, the writer of the preſent article pledges his honour to the public, that the following extract, which, on inquiry, is Mr. Grignon's authority for attributing the invention of the pendulum to Richard Harris, is copied verbatim from a manuſcript marginal note, written in page 12 of an old book, at preſent in his poſſeſſion, called "Eſſayes of Natural Experiments made in the Academie del Cimento, under the protection of the moſt ſerene prince Leopol, of Tuſcany, written in Italian by the ſecretary of that academy, and tranſlated by Richard Waller, F.R.S. London, 1684."

(*Copy of the Extract.*)

"The great clock belonging to Covent-Garden, has a long pendulum, and was made by Richard Harris of London, in the year 1641, which was eight years before Vincenzio Galilei put his father's obſervations into practice, as appears by the date 1649.

"The ingenious Mr. Huygens applied the pendulum to a clock in the year 1657, and attributed the invention to himſelf, which created a diſpute between him and Vincent Galileo; this laſt affirming that he had put it in practice in 1649; and the reaſon of Richard Harris's not appearing, (which would have decided the controverſy,) in all probability was, that he being only a private workman was entirely unacquainted with any diſpute which might happen between Vincent Galileo and Mr. Huygens; or he might be dead before the diſpute aroſe, it being ſixteen years after he made the ſaid church clock."

The manuſcript of which this is an exact copy bears every mark of the antiquity aſcribed to it by the preſent Mr. Grignon, who is reputed to be a man of veracity, and who moſt poſitively aſſerts it to be his father's hand-writing, as indeed it appears to be, when compared with ſome other of his papers which we have ſeen. It may not be foreign to the ſubject to add here, that the late Mr. Grignon, who died on April 4, 1784, aged 71, was a good mathematician as well as an excellent workman, and was patronized by Archibald, duke of Argyle. He was an intimate friend of James Ferguſon and other ſcientific men of his time, and one of the firſt members of the Society of Arts in London, to which ſociety he preſented a regulator in the year 1759, which is yet in one of the rooms at the Adelphi, and which has the improved dead-beat eſcapement, and very high numbers in the wheel-work to avoid friction, which was another idea of his own. The peculiar properties of this clock, however, ſeem not to have been noticed by, or even perhaps known to any of the preſent members of that numerous ſociety, ſo as to become an object of particular attention. Mr. Grignon, notwithſtanding, aſſures us, that it will keep the ſame time whether its maintaining power be four or twelve pounds, which property he aſcribes principally to his father's improvement of Graham's dead-beat eſcapement.

From this account of Harris's clock, we confeſs ourſelves diſpoſed to contradict the generally received opinion, aſſerted by other authors, that Fromantil, the Dutchman, was the firſt who made pendulum-clocks in England ſo late as the year 1662; one of which was given by biſhop Ward to Greſham College, Oxford. Indeed Dr. Hooke, as great a genius as any we have mentioned, made a pendulum-clock, we find, in 1658, for Dr. Wilkins, afterwards biſhop of Cheſter, which was prior to Fromantil's clocks, and ſome authors have been diſpoſed to make him the inventor of the pendulum as a regulator.

The pendulum being once applied to clock-movements, was found to be a regulator ſo much ſuperior to the old balance, that Gemma Friſius's idea of making a marine or nautical time-piece was attempted to be realized by the ingenious Huygens, of which attempt we have already ſpoken under the word CHRONOMETER, where we entered into a detail of the merits and conſtruction of various pieces of mechaniſm uſed for the determination of a ſhip's longitude. It may not be improper, however, to ſay further of Huygens' marine-clock, that its pendulum vibrated more ſlowly as it approached the equator, proving, as Picard has ſince aſſerted from experiments made in 1669, the ſhape of the earth to be that of an oblate ſpheroid. But Huygens, whoſe induſtry was equalled only by his ingenuity, ſoon diſcovered that the iſochronal property aſcribed to the pendulum by Galileo, was only true in circular arcs, when the length of the arc of vibration remained the ſame; for that long circular arcs required ſomewhat more time for a vibration than ſhort ones, ſo that variations in the maintaining power produced variations in the time indicated, by altering the length of the arcs of vibration. This diſcovery preſented a ſerious difficulty, and gave riſe to one of the moſt ingenious contrivances ever introduced in the mechaniſm of a clock, though practical experience ſoon proved it to be of little or no uſe; we mean the contrivance of two cycloidal cheeks at the point of ſuſpenſion conſidered as evolutes of a cycloid, round which the thread by which the pendulum was ſuſpended was bent, and occaſioned, as we have before noticed under the word CHRONOMETER, the ball to move in the involute of the ſaid curve, which Huygens firſt demonſtrated to be itſelf a cycloid, poſſeſſing theoretically this peculiar property, amongſt others, that a heavy body deſcending along it from any given point therein, will deſcend to the loweſt part in the ſame time that any other heavy body will fall from any other higher or lower point thereof; whence it was concluded, that a pendulum, vibrating in ſuch a curve, would regulate a clock in the beſt poſſible manner with any maintaining power whatever. The idea was truly ingenious, and the mechaniſm equally ſo, as we have ſaid, in theory; nay, the pendulum really moved in a cycloid by this contrivance, but then the alternate puſhes of the balance-wheel againſt the pallets were communicated by means of an intermediate lever, called the fork, (which was another invention of our author) to the pendulum, which additional force ſo greatly diſturbed the natural power of gravity, that the pendulum attached to clock-work was no longer poſſeſſed of the iſochronal property which it poſſeſſes when moving in a cycloid in a detached ſtate, with all its weight collected in one point, as the theory ſuppoſes; beſides, the moiſture of the atmoſphere affected the pendulum's ſtring of ſuſpenſion, and what had not been obſerved ſufficiently at that time, the metallic rod itſelf elongated with heat, ſo that the cycloidal cheeks were at length found to be of no benefit as an auxiliary to the natural pendulum, and have therefore been abandoned.

After the length of a ſecond's pendulum was aſcertained by Huygens to be 3 feet 8½ lines, old French meaſure, and after he had propoſed it as an univerſal ſtandard of meaſure, we find that aſtronomers began to aſcertain the right aſcenſion of the ſtars by it, and alſo the equation of time, that Hipparchus had ſpoken of long before, which application made it neceſſary that there ſhould be ſome contrivance for winding up the maintaining power of the clock during the time that it continued to go, otherwiſe the quantity of the earth's rotation, that might take place during the act of winding up, muſt have been allowed for by conjecture; hence the endleſs chain with a detached ratchet, was invented for this purpoſe by Huygens; which is ſtill in uſe, we believe, in ſome few aſtronomical clocks. The ſame author was probably the contriver of our preſent dial-work, for changing the hour into 60 minutes by the addition of another hand at the centre of the clock-face; and a circular pendulum was likewiſe invented and applied, as he ſays, with ſucceſs to ſome of his clocks, the principle of which was, that as the ball of the pendulum revolved in an horizontal circle, when ſuſpended by a vertical axis, the centrifugal force and power of gravity ſo counteracted each other, as to produce an equable motion, while the arbor revolved without an eſcapement. We are not informed why this pendulum has not been imitated.

The next invention worthy of notice in clock-work, was the mechaniſm of *repetition*, by means of which the clock is made to obey the pull of a perſon in bed, who, from any cauſe, may wiſh to know the hour which was laſt ſtruck; this ingenious contrivance, in a great meaſure, has ſuperſeded the uſe of the ſtriking-work with the count-wheel, and was the invention of Barlow, a London clock-maker, about the latter end of the reign of Charles II. *viz.* in the year 1676.

The noiſe which this curious piece of mechaniſm made in the world, ſet ſeveral ingenious artiſts to making repeating apparatus, paricularly Quare, in London, and Julien Le Roy, Collier, Larçay, and Thiout, on the Continent (Machines approuveés, tomes v. and vi.). Nearly about the ſame period, we find that the compariſon of the earth's rotation with the regular motion of a pendulum clock, produced a deſire to indicate not only *mean* but *equated* time on the dial-plate, by various contrivances, which, by the bye, were by no means calculated to improve the regularity of the going part, but only added to the complexity of the machine, and introduced unneceſſary and variable friction. We know not certainly who was the firſt to execute the equation work, but, according to Sully, an Engliſh clock-maker, who ſettled at Paris (Regle artificielle du Temps, ed. 1717), the firſt equation clock which is recorded, was ſent from London to Charles II. king of Spain, before 1699. This contrivance, which was more curious than uſeful, cauſed a great number of attempts to produce the ſame effect: father Alexander, a Benedictine, preſented a project of this kind to the Academy of Sciences at Paris, in 1698: Le Bon, a Pariſian clock maker, preſented another, which was much admired, to the ſame ſociety, in 1717; which was alſo done by Julien Le Roy, in the ſame year, at Paris; and to theſe names we may add thoſe of Thiout, a curate of St. Cyr, Ducheſne, Kriegſeiſſen, Enderlin, L'Admiraud, Paſſemant, Rivaz, Berthoud, and others, who have beſtowed much time on a ſubject which requires only the inſpection of an equation table, and which, therefore, our Engliſh artiſts now think an expenſive trifle, ſcarcely worth their notice, any further than as a matter of curioſity.

The equation mechaniſm naturally led to the practice of making clocks to go a month, three months, and even a year, with one winding up; likewiſe to the introduction of mechaniſm to ſhow the ſun and moon's riſing, culminating, and ſetting, and planetary motions in general. Indeed Oronce Finée, mathematician to the French kings, Francis I. and Henry II., had made a planetary clock ſo early as 1553, concerning which, and the theory of the planetary motions, he publiſhed a Treatiſe, at Paris, in 1557; and the automaton of Huygens, made in 1703, was properly a planetary clock, and one of a very ingenious conſtruction.

We come next to an important improvement, which, like moſt other real improvements in the art of meaſuring time accurately, belongs to the Engliſh, we mean the introduction of the anchor pallets, which, even Berthoud confeſſes, was a contrivance of Clement, a London clock-maker, in the year 1680 (ſee Smith's Horological Diſquiſitions, London, 1698); the advantage of this eſcapement, with an horizonal arbor for the ſwing-wheel, as it is called, over that of the crown-wheel eſcapement, is, that it will admit the eſcape to take place with a ſmall angle of vibration, ſo as to prevent the maintaining power from acting on the pallets a long time by a direct puſh; as was the caſe with the crown-wheel eſcapement; beſides, a ſhort arc of vibration in a circle is ſo like a cycloid at the loweſt point, that a ſhort arc, with a heavy ball on the pendulum, ſoon began to be adopted generally, to the excluſion of the cycloidal cheeks, which, had they poſſeſſed their theoretic property in practice, would now have been of little value with a vibration in ſhort arcs, even if the ſuſpenſion thread had been ſtrong enough to bear a heavy weight, and at the ſame time ſufficiently flexible. This change in the clock eſcapement introduced the cuſtom of ſuſpending the pendulum from a cock, by means of a piece of watch ſpring, which was another important invention of Clement, according to Smith's authority. It may be proper to obſerve here, that the truly ingenious Dr. Hooke too claimed the reputation of being the inventor of the anchor eſcapement, and affirmed, ſays Sully, that he had ſhown to the Royal Society a pendulum with a ſimilar eſcapement, ſoon after the fire of London, in the year 1666, as we have ſeen, when we treated of *Chronometers*, that he alſo conteſted with Huygens and Hantefeuille the honour of having been the inventor of the balance-ſpring of watches.

But whether Clement or Hooke were the inventor of the anchor eſcapement, it was ſoon found that a clock of this conſtruction gained time conſiderably by an addition to the maintaining power, or, which may be conſidered as the ſame thing, by diminiſhing the weight of the pendulum ball, the cauſe of which is the recoil, or retrograde motion, occaſioned in the ſwing wheel, which, oppoſing the natural vibration, ſhortened the arc in the aſcent; the ſeconds pendulum, with this eſcapement, was called for the firſt time, the royal pendulum.

Such was the ſtate of clock mechaniſm, and ſuch were the alterations and improvements therein, at the concluſion of the ſeventeenth century, or beginning of the eighteenth, which period conſtitutes a fourth epoch in the hiſtory of clock-making. The expanſion of metals by heat had been known ever ſince the year 1648, but the ingenuity of art had not yet deviſed a remedy for the alternate elongation and contraction of the pendulum rod in ſummer and winter reſpectively, though the uſe of the clock in aſtronomy imperiouſly demanded ſome compenſation: this honour fell to the lot of our celebrated George Graham, who, in the year 1715, ſucceeded in his attempt to preſerve the diſtance from the point of ſuſpenſion to the centre of oſcillation of a pendulum unaltered, notwithſtanding it was expoſed to all the variations of temperature incident to our climate; the compenſation was produced, as will be more particularly deſcribed under the word Pendulum, by means of mercury encloſed in a cylindrical glaſs veſſel, guarded by a frame, and ſubſtituted for the ball of a metallic pendulum rod, ſo that while the rod of metal, conſtituting the verge of the pendulum, lengthened downwards, the column of mercury lengthened upwards, which was an original and truly ingenious idea. Pendulums of this conſtruction, when well adjuſted, have been found to meaſure time with a degree of accuracy far beyond what the former pendulum had any pretenſions to, for a continued length of time: the principal objection to its general adoption was its liability to break in carriage, or by other accident:—but Graham, feeling the force of this objection, took a wide view of the ſubject, and, looking round for other reſources, ſuggeſted the idea of uſing the oppoſite expanſions of different metals as a means of compenſation in a pendulum, which idea was immediately adopted by Harriſon, at that time an obſcure carpenter in Lincolnſhire, at a village called Barton; who, overcoming all the difficulties attending his retired ſituation, which is the property of a great genius, aſtoniſhed the world by the production of the grid-iron pendulum; a pendulum which is not liable to the objection of want of portability, and which has till lately been generally adopted in aſtronomical clocks of the beſt conſtruction. For its deſcription we muſt again refer to the article Pendulum. Still, however, a better eſcapement than the common anchor eſcapement was wanting; for it was not ſufficient to have obtained an invariable pendulum in point of effective length, while its natural iſochronal property, ariſing from gravity alone, continued to be greatly diſturbed; *viz.* while alternate additions and ſubtractions of force were derived, and that often unequally, through the medium of the train of wheel-work to the eſcapement, from the maintaining power firſt, and thence improperly modified to the pendulum itſelf. Accordingly, we find Graham, about this time, becoming the inventor of the dead-beat eſcapement, and alſo Harriſon of a ſilent eſcapement, which will go without oil; both of which are ſpecimens of great originality of contrivance, as will be ſeen when we come to deſcribe them in their proper place: the former of them has proved itſelf of ſuch great utility, that it has been adopted in the generallity of regulators or clocks for aſtronomical obſervations, in conjunction with Harriſon's grid-iron pendulum, moving with a heavy ball in a ſmall arc of vibration: of this kind is the clock at the Royal Obſervatory, at Greenwich, of the accuracy of which it has been affirmed, that it ſeldom gains or loſes, on an average, more than one ſecond of time in five days. To avoid the wearing out of the parts moſt in action, and the influence of friction, the beſt clocks of this conſtruction, like the one we have juſt mentioned, have pallet wheels of hardened and poliſhed ſteel with pallets of ruby or agate, which require little or no oil: this kind of ſubſtance, we believe, was firſt uſed in time-pieces by a Frenchman, De Baufre, about the year 1704. The pivot holes alſo are ſometimes buſhed with jewels, to avoid the production of verdigris, and the clammineſs of thickening oil; but the conſequent additional expence ſeems to be hardly compenſated by ſuch a refinement as the laſt.

Harriſon was alſo, as we have ſeen before, the inventor of the auxiliary ſpring and additional ratchet on the barrel arbor, which is a much neater way of making the clock go during winding, than that of Huygens by means of an endleſs chain, or of the forcing elaſtic bolt, which has been made to ſlip into a tooth of one of the wheels, and to puſh it forwards during the act of winding and for ſome minutes after.

We might now ſuppoſe that the clock has arrived at its *ne plus vltra*, with reſpect to further improvements, but ſtill we find ſo many ſucceſſive alterations, if not improvements, in the eſcapement, and mode of compenſating the pendulum's expanſion, that to notice all the fanciful minutiæ that have been magnified into importance by different modern artiſts, would be to write a long volume on the ſubject. We will, however, out of the great variety of horological contrivances in this century, ſelect thoſe which have originality and utility to recommend them to public notice, and paſs in ſilence, for the preſent, over the inventions of chimes, organs, cuckows, planetary motions, atmoſpherical winding-up, mercurial mover, &c. &c. as objects of fancy more than of real uſe in clock-work. (For the two laſt ſee "Machines Approvées.") Among the contrivers of detached and other clock *eſcapements*, as will hereafter be ſeen under this word, we may place Grignon, Mudge, Cummins, Nicholſon, &c. in London; and on the Continent Julien le Roy, Peter le Roy, Sully, Du Tertre, De Bethune, Le Paute, Amant, Robin, Berthoud, &c. all of whom have merited commendation for ingenious contrivances in their conſtruction of this moſt ſcientific part of the clock. The principal inventors of compenſation pendulums, (which will be deſcribed under the word Pendulum,) after Graham and Harriſon, have been, in France, Regnauld, Deparcieux, Julien le Roy, Caſſini, and Berthoud; and in England, Ellicot, Cummins, Nicholſon, and Troughton, the laſt of whom has very recently made ſuch a diſpoſition of the grid-iron pendulum, by means of concentric tubes of braſs containing within them the rods of iron, as gives it the appearance of an ordinary ſimple pendulum rod; and his accurate mode of adjuſting for temperature by a delicate ſpirit-level pyrometer, lately invented, bids fair for introducing this elegant pendulum into general uſe in clocks which profeſs to be accurate; indeed, we know, that many pendulums of this conſtruction have already been made for obſervatories both public and private.

We might mention here various curious as well as uſeful engines, tools, pyrometrical, and other inſtruments, which owe their origin to the ſucceſſive improvements in clock-work, but we think the ſubject of ſufficient importance to demand a ſeparate account of theſe. We muſt not, however, paſs in ſilence over ſome other real improvements connected with the pendulum, one of which is, fixing the ball at the centre of oſcillation, inſtead of ſupporting it by a tapped nut at the lower extremity, the latter of which methods is only uſeful when a ſimple ſubſtance, ſuch as metal, wood, glaſs, &c. is uſed for a rod; for in theſe caſes a ſpecies of compenſation is effected by the upward expanſion of the ball; in ſome of which caſes a pin, paſſing through a point of the ball between the centre and lower extremity, will be ſtill better. In thoſe conſtructions where the ball itſelf is not eaſily adjuſtable, a ſecond light ball is made to ſcrew up and down a projecting piece of the rod below the heavy ball, to adjuſt for time, and ſometimes a micrometer-ſcrew is adapted for meaſuring the quantity of the adjuſtment; this is an idea, no doubt, borrowed from Huygens, whoſe clock had a ſecond adjuſtable weight on the body of the rod to anſwer the ſame purpoſe, which circumſtance we omitted to mention before. The improved ſuſpenſions, however, have rendered theſe ſecondary balls in many clocks ſuperfluous, which requiring the clock to be ſtopped for their adjuſtment were inconvenient; in theſe ſuſpenſions the adjuſtment for rate is made by a micrometer-ſcrew at the cock or top of the pendulum, even while going, to which mechaniſm alſo is added a lateral adjuſtment for putting the pendulum into beat, inſtead of bending the fork as is practiſed in ordinary clocks. Laſtly, the modern practice of fixing the cock to the ſolid wall or other ſteady ſituation, and allowing the pendulum to find its own perpendicular line before it be fixed in that ſituation, is among the real improvements of this art, and cannot be too much recommended. But, notwithſtanding all theſe, and doubtleſs other improvements in the art of clock-making, one deſideratum yet remains to be diſcovered; *viz.* a ſimple ſubſtance that is *not expanſible* by heat, for the rod of the pendulum; we think that pyrometrical experiments, on different ſubſtances of nature and combinations of art, have not yet been ſufficiently extended, and we beg leave to ſuggeſt an opinion, for which we are indebted to Mr. Troughton, that tobacco-pipe-clay, or the compoſition of Wedgewood's thermometer, if properly baked, may prove on trial to afford a very ſimple rod, at leaſt for a half-ſeconds pendulum; particularly if a metallic cap, cemented or otherwiſe faſtened to its upper extremity, ſhould be furniſhed with a knife-edge ſuſpenſion, which the celebrated Berthoud, as we have ſaid, affirms has leſs friction than the ſlip of watch ſpring; but if the latter be preferred, we preſume the compenſation for it, and alſo for the argillaceous rod, if it ſhould require any, may be made by pinning the ball a little below the centre to the lower extremity of the rod, and then the adjuſtment for time may be as uſual at the cock, with lateral ſcrews to cloſe the ſlit when the adjuſtment is complete. From the experiments which we have made with wooden pendulums, we find that they are more affected by moiſture than by heat, and are therefore not to be depended on.

Turret Clock of the Royal Palace at Hampton Court.

After having given a hiſtory of the principal improvements made from time to time in clock-work, we propoſe to deſcribe, individually, ſo many clocks of different conſtructions, in ſucceſſive order, as will enable the reader to form a competent judgment of their properties and relative merits, which office we undertake with the more pleaſure when we reflect that the Engliſh language is yet without a book deſcriptive of the various conſtructions of a machine, which, in one form or other, is now in the poſſeſſion of almoſt every houſe keeper.

According to Dr. Derham, the oldeſt Engliſh clock extant is in a turret of the royal palace at Hampton, conſtructed in the year 1540, which time was in the reign of king Henry VIII. by a maker whoſe initials are N. O. When we conſider that this clock contains mechaniſm for repreſenting the motions of ſome of the heavenly bodies, and that the celebrated Copernicus was living at the time of its date, and had not publiſhed his book "On the Revolutions of the Celeſtial Orbs;" when we reflect alſo, that more than a century elapſed after this time before the pendulum was applied as the regulator of clocks, theſe conſiderations appear ſufficiently intereſting, to induce a minute examination of the wheel-work of this ancient clock, particularly of that part of it which conſtitutes its celeſtial mechaniſm.

Fig. 1, of *Plate* X. is the calliper of the wheel-work which produces the celeſtial motions, taken from Dr. Derham's "Artificial Clock-maker," publiſhed in 1714 (third edition), whoſe account we will firſt copy in his own words, and then make ſome obſervations on the value of the wheel-work. The Hampton Court clock, ſays the Doctor, "ſhews the time of the day, and the motion of the ſun and moon, through all the degrees of the zodiac, together with the matters depending thereon, as the day of the month, the ſun's and moon's places in the zodiac, moon's ſouthing," &c.

"To ſhew how completely (for that age) the wheel-work is laid under the moving part of the dial-plate, I have given the calliper thereof, which repreſents the ſeveral wheels and pinions only which lie under the dial-plate, and drive the ſeveral motions in this manner. In the centre of all, both the dial-plate and its wheel-work are placed on a fixed arbor, which hath a pinion on the end of it, which drives both the ſolar and lunar motions, by means of a large wheel of 288 teeth turning round upon it once in 24 hours, which large wheel is drawn round by a pinion of 12, fixed on the arbor of the great wheel within the clock, which turneth round once in an hour. The wheel 288 thus turning round in 24 hours, carries about with it the wheel 37, and its pinion of 7 leaves, as alſo the other prickt (dotted) wheel, and its pinion, on the other ſide. The pinion 7, of the wheel 37, drives another wheel of 45 teeth, which carries round the moon's ring or circle. On the oppoſite ſide the aforeſaid pinion 8 drives round the prickt wheel, whoſe pinion drives a wheel of 29 teeth, whoſe pinion, of 12 leaves, drives round the wheel 132 that carries the ſun and the zodiacal matters."

"Theſe were the numbers of the wheel-work (continues the Doctor) remaining in the year 1711; but the prickt wheel and pinion were taken out formerly by ſome ignorant workman that was not able otherwiſe to amend the clock;

but were ſupplied, and the whole movement repaired lately, by that ſkilful artiſt, Mr. Lang. Bradley, in Fenchurch Street, London." (p. 121, 122.)

This deſcription gives a clear idea how the movements were actuated; but the numbers of the dotted wheel and pinion being unknown, leave the ſolar movement incomplete, thus $\frac{*}{8} \times \frac{29}{*} \times \frac{132}{12}$, ſo that the exact value of this original combination of wheels and pinions for the annual motion unfortunately cannot be with certainty known; though there is no difficulty in aſcertaining a wheel and pinion to be ſubſtituted, to complete the wheel-work for either a ſolar or a civil year.

The wheel-work for a lunation, however, is entire, namely, $\frac{37}{8} \times \frac{45}{7}$ or $\frac{1665}{56}$ of 24 hours, which will be found to be equal to $29^{d}\ 17^{h}\ 34^{m}\ 17^{s}.14$, which is too long a period by $4^{h}\ 50^{m}\ 14^{s}.31$. This exceſs, in the ſhort ſpace of one lunation, it will be remarked, is very conſiderable; and it will be inferred from hence, either that a ſynodical revolution of the moon was not at that time well aſcertained in England, or that the inventor of the aſtronomical movement was unable to calculate numbers more accurate to repreſent it by wheel-work. We are of opinion, notwithſtanding, that neither of theſe was the caſe, and our reaſon for ſuch an opinion is founded in theſe three conſiderations; firſt, great ingenuity is ſhewn in the diſpoſition of the wheel-work, ſo great indeed, that it will be ſeen hereafter, that Mr. Ferguſon has evidently copied it in the dial-work of his principal aſtronomical clock; ſecondly, the calculations have evidently been made for a lunar day, and not for a lunation, becauſe the moon's age is indicated by the difference between the ſolar and lunar apparent daily motions, that is, by the ſolar hand pointing to the moveable lunar dial-plate, and not by a lunar index pointing to a graduated fixed plate; and, thirdly, the length of the lunar day was not aſcertained with accuracy by any means ſo remotely as a lunation, on account of a deception that exiſted in the determination. Let us examine theſe conſiderations a little more cloſely; as the large wheel of 288, which revolves in the ſpace of 24 hours, carries both the ſolar and lunar movements along with it, except the pinion of 8, which remains always immoveable in the centre, it follows, that, becauſe this great wheel revolves from weſt to eaſt, the wheel of 37 borne by it, and connected with the fixed pinion, will revolve in the ſame direction the ſpace of 8 teeth out of 37 in every 24 hours; alſo the pinion of 7, fixed on the centre of the wheel 37, will, by the ſame connection, be carried $\frac{8}{37}$ of 7 teeth in the ſame time, but the ſecond wheel of 45 will revolve in a contrary direction, or from eaſt to weſt in each 24 hours, the ſpace $\frac{8}{37}$ of $\frac{7}{45}$ parts of a ſolar day, which, reduced into a ſimple fraction, is $\frac{56}{1665}$ of 24 hours, or 48.432432, &c. minutes, ſo that the falling back of the wheel of 45 in every revolution of the large wheel occaſions the moon's daily ſpace on the dial-plate to be equal to 48.432432 minutes on the contiguous ſolar face of 24 hours, and, if we divide the whole of 24 hours, or 1440 minutes, by this quantity, we ſhall have $\frac{1440}{48.432432} = 29^{d}\ 17^{h}\ 34^{m}\ 17^{s}.14$ for the lunation, as before.

In order now to ſee how large the day's ſpace for the moon's age ought to be on the moon's plate, we muſt divide 1440, the minutes in a day, by 29.53058, the days in a lunation, and the quotient 48.76301 will be the number of the minutes that the moon's plate ought to loſe, with reſpect to the ſolar index, in a natural day, which quantity differs from what the wheel-work effected only .33057, or very nearly ⅓d of a minute's motion in every 24 hours, which would be deemed very inconſiderable at a time when the clock itſelf muſt have been without ſuch a regulator as would make it go truly for any length of time; the inventor, therefore might not think it neceſſary to calculate a more accurate movement.

But there might be another cauſe of error in the calculation ariſing from the aſſumed data; it appears, as we have intimated, that for a conſiderable time after the period in queſtion, though the length of a lunation was known pretty accurately, yet the length of an exact lunar day was not properly apprehended; even Benjamin Martin among other aſtronomical writers (Inſtitution of Clock-work, vol. ii. p. 412.), who had lunar tables before him, has inconſiderately but erroneouſly aſſerted, that the moon paſſes the meridian on each day at a mean rate about $48\frac{7}{10}$ minutes later than on the preceding day; it is true, indeed, that the difference between the ſun's and moon's daily mean motions in the ecliptic is 12° 11′ 27″, which ſpace anſwers very nearly to $48\frac{3}{4}$ of time, but then, as we have already ſeen, this is the diſtance between theſe two heavenly bodies at the end of a ſolar day after new moon, and not at the inſtant when the moon tranſits the meridian the firſt time after, as has been falſely concluded; for during the time that the earth is revolving on its axis the ſpace of 12° 11′ 27″ or $48\frac{3}{4}$ minutes of time, the moon continues her advance from the ſun, and gets as much farther as correſponds to 1.643 minutes more; and laſtly another ſmall advance is made whilſt the earth is revolving this laſt ſpace; and ſo on till the moon is found on the meridian: the aggregate of the moon's daily advance from the ſun and of all the ſucceſſive proportional parts may be thus aſcertained at one operation; becauſe a ſynodical revolution of the moon is performed in 29.53058 days, and becauſe the moon paſſes the meridian leſs frequently by once than the ſun does in that time, let 1440 be divided by 28.53058, and the reſult will give the lunar day equal $50^{m}.472$ or 50 minutes and 28.32 ſeconds. Mr. Ferguſon, however, has diſcriminated between a lunar day, and the time anſwering to the moon's daily motion added to a ſolar day, one being a corrected and the other an incorrect period; in conſequence of which we find the annexed note in page 116 of his "Tables and Tracts," *viz.* "It is generally believed that the moon revolves from the meridian to the meridian again in 24 hours 48 minutes, but that is a miſtake: for if ſhe did, there would be 30 complete days from change to change."

We repeat, therefore, that a miſapprehenſion of this nature was very likely to be productive of an error in the calculation of a movement which was intended to repreſent the moon's meridian paſſages: and let it be recollected, that what has been here ſaid reſpecting the two lunar periods $48^{m}.76301$, and $50^{m}.472$, will be ſerviceable in aſcertaining the moon's age and the tides at any place; the former, being the moon's daily motion in ſolar time, applies to calculations of the moon's age; and the latter, being the exact length of a lunar day, applies to the aſcertaining of the tides, which diſtinction, we think, is not generally made.

After the writer of the preſent article had made the preceding calculations and obſervations on the original conſtruction of the aſtronomical clock at Hampton Court, he felt an inclination to inſpect the preſent clock, that he might know what the ſolar movement is, which Bradley is ſaid to have ſubſtituted, when a wheel and pinion of the original movement were loſt; accordingly, on the 8th of May 1802 he embraced an opportunity which occurred, of gaining permiſſion to aſcend to the lofty ſituation in which this clock is placed, which enterprize was attended with ſome perſonal danger; but it proved on a minute and careful examination, that the whole of both the annual and lunar movements are different from the original ones recorded by Dr. Derham.

The lunar movement is $\frac{59}{10}+\frac{45}{9}=29\frac{1}{2}$ days and the annual one $\frac{73}{12}+\frac{42}{7}+\frac{150}{15}=365$ exactly. The preſent central pinion is a double one conſiſting of a 10 and a 12, fixed as the former one of 8 is deſcribed to have been, and pinned together; they are made of box, as are alſo the pinions of 7 and 9, to prevent their cankering, or oxiding, as it is now called, and both the trains are arranged as already deſcribed. The wheel of 42 is made of braſs; but the reſt, being very large, are made of iron. The great wheel of 288, which connects the clock-work with the aſtronomical movements, appears to be the only portion of the original work, both by its marks of antiquity and the number of its teeth, which are cut on the inner edge of its circular part; there are two croſs bars riveted to this indented rim to carry the heavenly movements, and as there is no counterpoiſe to theſe, it was ſuſpected at the time that their riſing and falling weight would alternately accelerate and retard the going of the clock, which is connected with it by means of an horizontal arbor about 3 yards long by eſtimation: accordingly, on inquiry, it turned out that the time of the day indicated is ſometimes 5 minutes or more too back, and again as much too forward on the ſame day, every day, which circumſtance had not before been accounted for. Indeed our author had made a memorandum, before he ſaw this clock, merely from conſidering its conſtruction in Dr. Derham's account, that moſt probably this would be the caſe, unleſs there ſhould be ſome counterpoiſe.

The inſcription "L. Bradly, 1711," was marked on the frame of the going part of the clock, which has evidently been new, either all of it at that time, or ſome part of it ſince, ſo that what the original regulator was, does not appear, nor are the initials "N. O." to be found at preſent. There are three barrels and weights, one for the going part which has a very heavy long pendulum; one for the ſtriking part; and one for ſtriking the quarters: the preſent eſcapement is a pair of pallets acting alternately into pins projecting from the plane of a wheel with an horizontal arbor, which kind is now pretty common in England, and, according to Berthoud, was invented by M. Amant, a clock-maker of Paris, late in the eighteenth century. (See ESCAPEMENT.)

In Groſe's Antiquities it is ſaid that this clock, conſidered as an aſtronomical clock, was invented by Tompion; but this account cannot be true, becauſe that famous artiſt lived in Dr. Derham's time, a century and half after the original conſtruction; he may in all probability have been employed in making ſome of the alterations either in the aſtronomical or going part, which circumſtance has given riſe to this account.

The hand and divided circles are in the following order on the face, *viz.*

1. or inmoſt ſmall circle—twice XII for ☾'s ſouthing:
2. Moon's age $29\frac{1}{2}$:
3. Ecliptic with ſigns and days of the month:
4. Sun and hour hand revolving in 24 hours:
5. 24 hours marked I. II. &c.

The moon's phaſe is ſhewn by a circular hole cut on the hour index covering more or leſs of a blackened plate placed under it on the lunar dial.

The going and ſtriking parts of the clock before us have nothing particular in them to require our further notice.

A Thirty-hours Clock, with a'Larum and Count-wheel ſtriking Work.

An ordinary 30-hours houſehold clock has uſually a ſeconds pendulum, 39.14 inches long, in the latitude of London, as meaſured from the point of ſuſpenſion to the centre of oſcillation, according to a mean of five determinations, and is contained in a caſe of wood of correſponding length reſting on the floor of the room where it is placed; its going and ſtriking parts are actuated by two ſeparate ponderous bodies, the cords or chains of which go reſpectively round two diſtinct pullies, with pins inſerted into their grooves, to hold the cords or chains from ſlipping in a detached ſtate, without taking the pullies along with them; and in the act of winding up every morning, or every evening, as may be the cuſtom, each ponderous body, uſed for actuating the wheel work, is drawn up ſeparately and ſucceſſively; the ſtriking mechaniſm in moſt of the modern clocks is of the kind deſcribed hereafter and ſeen in *Plate* XII. known by the name of the rack and ſnail ſtriking part; but as the older clocks and ſome few of the modern ones are made with the count-wheel ſtriking mechaniſm, we propoſe to deſcribe, in the firſt place, a clock with ſtriking mechaniſm of this kind in its moſt improved ſtate, together with an alarum, or 'larum, for rouſing a perſon from ſleep at a given hour, and alſo a ſimple method of making the clock go while it is under winding. *Plate* IX. of *Horology* ſhows a perſpective view of a clock of this kind in *fig.* 1. where the covering parts are removed, ſo as to allow an exhibition of all the parts of the mechaniſm in their reſpective ſituations, which, we believe, has never been properly done before. The frame of this clock is nearly a cube made of ſix plates of braſs, with four pillars at the corners connecting the top and bottom plates, and the bell is mounted over the frame, as repreſented in the figure; there are beſides, within the frame, two pair of croſs bars of braſs, one pair holding the going part, and the other holding, ſeparately from the going part, the ſtriking part of the mechaniſm; all which are too plainly ſeen to require particular reference to the drawing. In a common 30-hours clock that indicates ſeconds, the centre wheel arbor uſually carries the minute hand, and revolves in an hour, and with pinions of 8 this wheel has 64 teeth, and the ſecond wheel 60, with a ſwing wheel of 30; but with pinions of 6 the centre wheel has 48 teeth, and the ſecond wheel only 45, with a ſimilar ſwing wheel for the common anchor pallets; but the clock before us does not ſhew ſeconds, and conſequently has higher numbers in its train, and a pendulum ſhorter than a ſeconds pendulum: the firſt wheel, *a*, on which the pulley for winding up the going part is fixed faſt without a ratchet in this conſtruction, for a reaſon to be explained by and bye, is aſſumed as revolving in two hours in order that the fall of the ſuſpended weight may not be ſo great as it would have been if it had revolved once in an hour; this firſt wheel of the train has 80 teeth, and drives the pinion of 8 on the arbor of the ſecond wheel, *b*, which has alſo 80 teeth, impelling a ſecond pinion of 8 on the arbor of the ſwing wheel, *c*, which has 45 teeth; the ſwing wheel therefore makes 100 revolutions $\left(\frac{80}{8}\times\frac{80}{8}\right)$ while the firſt wheel revolves once; *i. e.* it revolves once in 50 minutes, and therefore is not proper for carrying a ſeconds hand; but the 45 teeth of the ſwing wheel do not all completely eſcape the pallets of the anchor in leſs than 90 (45 × 2) vibrations of the pendulum; hence 50 × 90 = 4500 are the vibrations per hour, and as the lengths of all pendulums are inverſely to each other as the ſquares of their vibrations per hour, the pendulum before us muſt neceſſarily be 20 inches long, for as the ſquare of 4500 : the ſquare of 3600 :: $39^{in.}14 : 20^{in.}$, very nearly. The pallets are of the recoil kind (ſee Escapement), and have an arbor of great length, with a crank in the middle of it nearly, to avoid the fly of the ſtriking part which comes through an aperture in the top plate; the inner end of the pallets arbor has its pivot inſerted into a piece of metal, *d*, on the top plate, and the outer end of the ſame has its pivot paſſing through a cock, *e*, on the ſame plate, which cock alſo bears the pendulum by a ſlip of watch main-ſpring; the pendulum receives its impulſe from the crutch, not ſeen, attached to the protruding portion of the ſaid pivot. What we have ſo far deſcribed conſtitutes what is called the going part, ſometimes alſo called the watch part of the clock, from its watching the lapſe of time. The firſt wheel, *a*, which revolves once in two hours, is not placed in the centre, but a little below, and has its ſtrong arbor paſſing through the croſs partition bar, *ff*, of the interior frame work, and receiving a wheel of 40 teeth, and alſo a pinion, *b*, of ten leaves, which are attached together and inſerted on this arbor by friction; the wheel of 40, which, we have ſeen, revolves in two hours, drives a concealed pinion with a long tube, called the cannon pinion, the place and ſize of which are aſcertained by dots at *k*; on the tube of this pinion, which has 20 teeth, and which therefore revolves in an hour, is placed the minute hand, *n*, the end of the tube being ſquared to admit the ſquare aperture of the hand; the pinion of ten leaves, which alſo revolves in two hours, drives the wheel, *i*, of 60 teeth in twelve hours, the tube of which admits on its circular part the hour hand, *m*, which conſequently revolves in 12 hours $\left(2 \times \frac{60}{10}\right)$; this work is denominated the dial-work, being that which regulates the relative velocities of the two hands as ſeen in *fig.* 3. The next portion that offers itſelf for deſcription is the 'larum portion, which has an immediate connection with the dial-work, and has the time of its going off limited thereby. On the tube of the 12-hours wheel, *i*, is placed looſe, or at leaſt ſo tight only as friction will fix it, the ſmall plate, *o*, pointed to by the tail of the hour hand, *m*, which ſmall plate has 12 hours engraven on it, and a pin inſerted into it behind, which comes in the way of the lever *p* every 12 hours; this pin is put into a certain ſituation with reſpect to the hour of 12, and the end of the lever, *p*, alſo. in order that the pin may catch the ſaid lever at a certain hour placed under the tail of the hour hand at any time previouſly to the hour intended; the conſequence is, that when the 12-hour wheel has revolved far enough to preſent the pin of the ſmall 'larum dial borne by it to the end of the lever *p*, this lever is elevated a little, and as its arbor, *q*, has its pivots running in the interior frame work of the going part, a ſecond lever, *r*, on the ſame common arbor, is alſo at the ſame time elevated from the pin, *t*, of an eſcapement crown wheel, *s*, better ſeen detached in *fig.* 2, at which inſtant the ſmall weight of the 'larum pulls the pulley on the back of the eſcapement wheel, *s*, of the 'larum, and gives it a rotatory motion as long as the weight continues to fall. The eſcapement wheel here mentioned has coarſe teeth of the ſerrated kind, which act with two pallets on the perpendicular arbor *w*, in the ſame way that the pallets of a common watch act, except that the latter are on a horizontal arbor, and have their frequency regulated by the vibrations of the balance; whereas here there is no regulator, but the pallets go and come alternately as faſt as the impelling weight can force them to move; on the top of the perpendicular arbor of theſe pallets is fixed a hammer with two faces within the bell, repreſented by dots, which moving backward and forward from one interior ſide of the bell to the other, with the force communicated to the pallets by the pallet-wheel, make a reiterated noiſe, the intenſity and continuance of which are ſufficient to diſturb the repoſe of a ſound ſleeper. When the weight has drawn up all the cord, it is only neceſſary to pull it up again, and the lever, *r*, acts as a detent with the pin, *t*, of the pallet-wheel, till the pin of the 'larum dial, ſet to any given hour, ſhall again detach it, when the ſame continued noiſe will be reſumed.

The laſt portion of the clock is the ſtriking portion, which alſo has a connection with the dial work; the wheel, *g*, which revolves in the ſpace of two hours, has two pins at the diſtance of a ſemicircle from each other, behind the wheel as ſeen in the figure; one or the other of theſe two pins at the end of each hour ſeiſes the end 1 of a tail piece attached to the long horizontal arbor 2 3, which reaches the whole depth of the two internal frames; this long arbor has another bar 4, or detent, which reaches far enough to fall in the way of a pin in the wheel 7, or warning wheel, ſo as to arreſt the motion of the ſtriking movement when in its quieſcent poſition. Parallel to the long arbor, and above it, is another but ſhorter arbor 5, turning by its pivots in the interior frame of the ſtriking part; this ſhort arbor 5 has a bent lever 6 by which it may be raiſed by the contact of the detent 4 of the long arbor 2 3, and alſo two catches or detents 7 and 8, all fixed at right angles to the axis of motion; the detent 7 falls into a notch made in a hoop placed faſt to the wheel marked 13, thence called the hoop-wheel or detent-wheel ſometimes, which revolves once at every blow of the hammer, and the ſecond catch 8 falls ſucceſſively into 12 notches cut at unequal diſtances on the edge of plate 11, called the locking plate, which is fixed faſt to the wheel marked 12, called the count-wheel, becauſe its teeth count the ſtroke-ſpaces between the notches of the locking-plate that are placed reſpectively at $\frac{1}{78}$, $\frac{2}{78}$, $\frac{3}{78}$, &c. of the circumference of the plate from each other, as explained when we deſcribed the ancient clock of Henry de Wick. The wheel 9, firſt actuated by the cord or chain paſſing round the third pulley faſtened to it, has 12 pins for raiſing the tail-piece 10, of the hammer, the arbor, *l*, of which is ſeen in the figure; the ſpring of the hammer tail is concealed from view, but the ſhaft of the hammer is ſeen paſſing through an opening in the top plate at 16, and the head of the hammer is repreſented within the bell, where it ſtrikes, by a dotted deſign above 16. The pin-wheel or ſtriking-wheel 9 has 60 teeth, and drives a pinion of 10 leaves on the arbor of the hoop-wheel 13, behind the croſs piece of the frame work; the hoop-wheel has 70 teeth driving a pinion of 7 leaves on the remote end of the arbor of the warning wheel 7, of 56 teeth; which wheel again impels the pinion 14, of 7 leaves, on the arbor of the fly, one half of which is ſeen through an opening in the top plate at 15. On that end of the arbor of the pin-wheel which paſſes through the back part of the frame-work is inſerted a pinion of 12 leaves, called the pinion of report, driving the counting wheel 12 of 78 teeth. The action of the ſtriking part is thus:—

One of the pins in the two-hour wheel, *g*, firſt lifts the tail 1, of the long lever 2 3, and with it the detent 4, the warning wheel 7 is not yet at liberty, but begins to revolve the inſtant that this detent has raiſed the curved arm 6 over it, which arm raiſes with it both the catches or detents 7 and 8, that leave the hoop-wheel 13, and alſo the count-wheel

12, under the command of the ſuſpended weight; the motion of the wheel 7, however, does not proceed far till its detent 4 is raiſed into the way of its pin, and the motion of it is arreſted; the noiſe of this temporary motion of wheel 7 is called the warning, and the wheel itſelf the warning-wheel; preſently the pin of the 2-hours wheel, *g*, drops from the end of the tail 1 of the arbor 2 3, and this tail as well as detent 4 reſume their quieſcent poſition; during the temporary motion of the warning wheel 7, the hoop-wheel, and alſo the locking-plate attached to the count-wheel, had moved far enough to take the notches from the claws of their reſpective catches or detents 7 and 8, the moment, therefore, that the detent 4 takes its quieſcent poſition, the warning-wheel is again at liberty, as are alſo the hoop-wheel and count-wheel; the whole movement, conſequently, now proceeds, and the pin-wheel raiſes the hammer tail as often as the pins meet with it, until the detent 8 meets with a notch to receive it into the locking-plate, at which inſtant all motion is at an end, and the detent 7 of the hoop falls alſo into its notch, and holds the whole movement firmly in a quieſcent ſtate, till the ſecond pin of wheel *g* again detaches the detents, and renews the ſame proceſs; which happens at the concluſion of every hour.

From this account of the movement of the ſtriking part, and of the other auxiliary parts of this mechaniſm, it is eaſy to apprehend the reaſon of the numbers of teeth fixed upon in their different wheels and pinions; for firſt, becauſe there are 12 pins in the ſtriking or pin wheel, it is neceſſary that the pinion of report on the ſame protruding arbor ſhould have 12 leaves, in order that every tooth of the count-wheel, which counts a ſtroke of the hammer, ſhould have its motion correſponding with that of the pins reſpectively; but in twelve hours there are 78 ſtrokes, therefore 78 teeth in the count-wheel, one of which meaſures the firſt interval on the locking plate; two of which the ſecond; three, the third, and ſo on till the laſt ſpace between the notches is meaſured by twelve teeth of this wheel; again, as the pin-wheel has 60 teeth and twelve pins, each pin is removed from the next $\frac{60}{12} = 5$ teeth; if the hoop-wheel, or detent-wheel were neceſſarily obliged to have an exact revolution at every ſtroke of the hammer, the pinion on its arbor driven by the pin-wheel muſt neceſſarily have five leaves only; but when the teeth are not laid very deep into one another, the play will allow the hoop-wheel to have only one revolution in two ſtrokes, which is the caſe before us, where the pinion has ten leaves; the pin-wheel, however, might very well have had 96 teeth, and the pinion in queſtion 8 leaves, and then there would have been an entire revolution of the hoop-wheel at each ſtroke. We have ſeen that the count-wheel revolves once in 12 hours and that the pin-wheel revolves in $\frac{78}{12}$ of this time, or makes $6\frac{1}{2}$ turns; but if the number of pins had been 13, and the pinion of report alſo 13, the time of a revolution of theſe would have been $\frac{78}{13}$ of 12 hours, or one in two hours, which is the caſe with the great wheel of the going part, and the two movements would, in that caſe, have been more uniform with reſpect to the calculations of continuance. It is of but little importance what the numbers of teeth be in the two remaining pinions and warning wheel, as they only regulate the velocity of the fly, provided the teeth are numerous enough to act without much friction.

As we mean not to introduce any other clock with the count-wheel mechaniſm after the preſent one, it may be proper to notice here, that when this kind of ſtriking work is uſed in an eight-days clock, or other clock of longer continuance than 30 hours, another wheel and pinion, called in ſuch caſe the great wheel and its pinion, muſt be placed on the end of the barrel, or fuſee, accordingly as a weight or ſpring is uſed for the maintaining power; and the number of teeth of this additional wheel will depend partly on the number of leaves of the pinion and partly on the number of coils of the cord or chain on the barrel, or fuſee, as the caſe may be; which never can be difficult to determine when it is known in what time the pin-wheel revolves, and what the continuance of the clock is required to be; for inſtance, if the pin-wheel revolves with 13 pins in two hours, $\frac{72}{12}$ will be the wheel and pinion to make the barrel or fuſee turn once in 12 hours, and 16 turns will be ſufficient for a continuance of eight days.

The manner in which the clock in queſtion may be placed to go well, is ſhown in *fig.* 3, where A is a bracket fixed to a ſolid wall, to hold the frame containing the works, which are here ſuppoſed to be without a caſe; the face or dial requires no explanation after what we have ſaid of the ſmall innermoſt circle or 'larum dial; nor have we any particular remarks to make on the pendulum, or its rod, in this clock, which profeſſes not to meaſure time alike under the variations of atmoſpheric temperature; but the manner in which one ſuſpended weight impels both the going and ſtriking movements, the former even while winding, is ingenious and deſerves attention. Huygens long ago propoſed and indeed actually uſed an endleſs cord with a detached ratchet, ſo applied that one half of the weight continued always to impel the going movement of his clock, and a detached ratchet gathered up the expended portion of the cord once in 24 hours. (See Clock-*work*.) The preſent contrivance is evidently borrowed from his invention, but its application ſerves two diſtinct purpoſes, one half of the weight impels the going part, and the other half the ſtriking part of our preſent clock, in the manner following;—The pulley of the going part we have ſaid is fixed faſt to the arbor of the great wheel and always revolves along with it, but the pulley of the ſtriking part, like the pulley of the 'larum, has a rachet formed of a click taking hold of one of the croſſes of the pin-wheel, ſo that it will move back without this wheel, but not forwards; the cord, which has its ends nicely united, goes over both pullies, firſt over the ſtriking pulley, as Huygens's does over the detached ratchet, and down the loweſt plate of the clock frame; it then paſſes under the running pulley, *a*, which has the weight hung to it, and up again over the going pulley; thirdly, it comes down again through the ring of lead *b*, which is only a dead weight to ſtretch the cord over the pulley of the ſtriking part; and, fourthly, aſcends again over the ſtriking pulley, where the ends meet; the clock is wound up by pulling the cord, *c*, downwards, till the principal weight is raiſed to the bottom of the bracket, while one of the cords of the running pulley continues to act with half of the whole weight on the pulley of the going part the whole time; ſo that this power, when duly drawn up, is not only equivalent to both the movements, but is perpetual, as well as invariable in its intenſity.

Eight-days portable Clock with repeating Mechaniſm.

A portable eight-days clock differs from an ordinary 24-hours clock principally in five reſpects: in the firſt place, it is actuated by a ſpring; ſecondly, it has a ſhorter pendulum; thirdly, it has conſequently a higher train; fourthly, it requires a fuſee; and, laſtly, it has frequently a crown-wheel eſcapement; in ſhort, it may be conſidered as a watch on an enlarged

enlarged ſcale, except that it has uſually the ſtriking mechaniſm, which is introduced in the repeating watches only. In the clock, which we propoſe here to deſcribe, we have ſubſtituted the ſwing-wheel with an iſochronal eſcapement, for the crown-wheel eſcapement, which we are of opinion ought to be baniſhed from all clocks and watches entirely, as being too much the ſlave of the maintaining power. It will not be neceſſary to render our deſcription of the clock before us very long, as we mean to make it the ſubject of analyſis under our ſubſequent article Clock-*movement.*

Plate XI. of *Horology* preſents a perſpective view of a portable eight-days clock, deſigned and callipered agreeably to the numbers and directions given in the article juſt mentioned, which conſtruction we have preferred deſcribing here, in order that the reader may there ſee our reaſons for every part of the mechaniſm, if he wiſhes for ſuch explanation: let it however be underſtood, that we by no means hold out the preſent clock as a model for others to follow, but give it as one of the hundred different varieties or more that might be deviſed to anſwer the ſame purpoſe.

Plate XII. exhibits the dial-work and ſtriking part, including the repeating mechaniſm of the ſame clock, which we ſhall deſcribe in its turn.

Fig. 1, of *Plate* XI. expoſes to view the interior face of the back or pillar plate A A A A, and the wheel-work contained within the frame; B, B, B, B, B, are five pillars ſcrewed into the back plate, and tapped at their projecting ends to receive five fixing ſcrews, when the front plate is put in its place to complete the frame: there are two barrels with main-ſprings, C and D, of which C is for the going part, and is cloſed with its cap; but D, which is the barrel for the ſtriking part, is left open, to ſhow the coils of the main-ſpring contained in it. There are alſo two fuſees, E and F, attached to their reſpective great wheels; E the fuſee of the going part, and F that of the ſtriking part. G is the centre or hour wheel of 64 teeth placed partly behind the great wheel of 96, by which its pinion of 8 is actuated; hence the fuſee revolves in $\frac{96}{8}$ of an hour, or once in 12 hours, ſo that the 16 ſpiral grooves, filled by the gut, allow the continuance to be juſt eight days. The ſecond wheel H, of 60 teeth, has its pinion of eight impelled by the centre wheel, and in its turn impels the pinion of 8 on the arbor of the third wheel of the train, I, which is here alſo the eſcapement wheel; the revolutions therefore of the arbor of wheel I are $\frac{64}{8} \times \frac{60}{8} = 60$, while the hour-wheel revolves once; conſequently this arbor, which revolves in $\frac{1}{60}$ of an hour, is proper for carrying the ſeconds-hand round in a minute. The eſcapement-wheel has 60 teeth, and the pendulum vibrates twice in every ſecond; but one tooth does not eſcape the pallets of the anchor K, until two vibrations have been completed; conſequently 60 teeth eſcape, *i. e.* the eſcapement-wheel makes one revolution in 120 vibrations, or in the ſpace of one minute: hence the clock before us indicates half-ſeconds. The ſquare ends of the two fuſees are oppoſite two holes in the clock-face, at each ſide of the centre of the circles of indication, (which are too well known to need deſcription), but a little below it, and the ſame handle fits both ſquares: L is a jointed lever fixed to the interior ſide of the front plate called the guard-gut, or ſimply the guard, the uſe of which is to prevent the chain or gut from doing more than juſt fill the ſixteen grooves of the fuſee in winding; M is a ſpring alſo faſt to the interior ſide of the front plate, which preſſes the lever L towards the middle of the fuſee, and keeps it there till the chain or gut, meeting with it, drives it back again, in the act of winding, ſo far till the claw *o* is preſented to the beak or catch of the end piece N, which then ſtops the further motion of the fuſee and limits the quantum of chain to be wound up. Theſe pieces L and M conſtituting the guard, being attached to the front plate, are taken off with it, when the frame is diſmounted, but we have put them into their places in a detached ſtate in our figure, to ſhow more evidently the nature of their office. O is the arbor of the warning piece, which will be deſcribed in its place preſently. The wheels P, Q, and R, with their reſpective pinions, conſtitute the movement of the ſtriking part, and the fanner S regulates the velocity with which they move. The wheel P has eight pins which lift the croſs piece *t*, of the arbor T, eight times in each revolution of the wheel P; theſe elevations of the piece *t* occaſion ſo many portions of a revolution of the arbor T, which arbor has its pivot projecting to V, behind the frame, and carrying on its ſquared projection the hammer V, *fig.* 2; the hammer is conſequently raiſed every time a pin of wheel P moves the piece *t;* W is a long and ſtrong ſpring, called the hammer-tail-ſpring, attached to the back plate of the frame, and preſſing with its upper extremity under the croſs pin, paſſing through a hole in the arbor T, near the face of the back plate; ſo that when the hammer is raiſed at any time, the ſpring W urges it back again with a ſmart blow, and makes it ſtrike the bell behind the frame, which is concealed from the ſight in our figure; but leſt the blow ſhould be too ſtrong, a counter ſpring, U, is fixed to the contiguous pillar, which breaks the violence of the blow, and makes the hammer return ſmartly to its place when the blow is made; this ſpring, U, alſo ſerves as a guard, in caſe a ſtroke of the hammer ſhould be made when the bell is taken off at any time. The fuſee F is provided with a guard ſimilar to that of the fuſee E; and the vane of the fly or fanner S is kept to the arbor, on which it is placed, by the friction of a preſſing ſpring, ſo that it will go round either with or without the arbor, the latter of which is the caſe only after the ſtriking has ceaſed, till the momentum of the fly has been annihilated by the reſiſtance of the air.

Fig. 3, is a portion of the top of the exterior face of the back plate of the frame, conſtituting the ſuſpenſion of the pendulum: *a* is a bridge, or double cock, in which the projecting pivot of the pallet's arbor is ſupported; *b* is a ſmall cock over this, or may form a part of the ſame, the protruding part of which is ſlit with a ſaw, to allow the ſlip of watch main-ſpring, *f f,* to paſs; by which the pendulum rod is ſuſpended; and *c* is a thumb-ſcrew to cloſe the ſlit, and clamp the piece of ſpring when the true length of the pendulum is aſcertained; the upper end of the ſpring, *f f,* is borne by the bearing piece *d* above the frame, to which it is uſually made faſt by a pin paſſing through the piece *d,* and a hole in a piece of braſs pinned to the extreme end of the ſpring; the apparatus for raiſing and lowering the piece *d* is better ſeen in *Plate* XII. to which the reader is now deſired to turn for the remainder of the deſcription; only let him bear in mind that the effective length of the pendulum is meaſured from the inferior edge of cock *b,* in *Plate* XI. to the centre of oſcillation of the bob, and that the quantum of this meaſure is adjuſted by the elevation or depreſſion of the piece *d,* while the ſlit of the ſtationary cock *b* is not cloſed by the thumb-ſcrew *c;* which adjuſtment may be made while the clock is going, provided the ſlit be again cloſed by the thumb-ſcrew, otherwiſe the effective length of the pendulum will be meaſured from the piece *d,* and will remain the ſame whether this piece be raiſed or depreſſed.

The bearing piece *d*, *Plate* XII. is the remote end of a tranſverſe lever, *c d*, moveable like the teleſcopic tube of a tranſit-inſtrument on two pivots, *a b*, of an axis ſupported by two ſmall cocks, *a* and *b*, clearly ſeen in the figure, ſo that when the pivots are ſtrong and without play in their holes, it is evident that the end *d* can have no lateral ſhake, provided the bar *c d* has no ſpring, *i.e.* provided it be ſtrong ; alſo when the interior end *c* is fixed with reſpect to elevation, the exterior bearing end muſt be alſo fixed ; the contrivance therefore for elevating or depreſſing the end *d* in the body of the clock caſe at any time may be as well applied to the end *c* in the front of the frame ; for a depreſſion of one end of the lever *c d* always produces a correſponding elevation of the other, and *vice verſâ*, ſuppoſing the axis exactly in the middle ; but when the axis is out of the middle of the lever, an elevation or depreſſion of either end is in proportion to its diſtance from the axis of motion directly. At *e* is a circular plate of braſs, better ſeen detached in *fig.* 4, called the *riſe* and *fall*, with an arbor ſquared at the projecting extremity, oppoſite a perforation on the face or dial of the clock, to receive a key of regulation ; this circular plate, which is pivoted into the cock *f* attached to the front plate of the frame, has a ſpiral aperture through which a round pin in the end of the lever, *c d*, paſſes ſo as juſt to go in without ſhake ; hence, whenever the plate *e* is turned by the key one entire revolution, the pin of the lever, which paſſes through the ſpiral aperture, aſcends or deſcends from one end of the ſpiral to the other, and at the ſame time depreſſes or raiſes the bearing end, *d*, a proportionable quantity and with it the bob of the pendulum, as may now be eaſily apprehended ; the condition, therefore, with reſpect to the regulation, is, that one turn of the plate, *e*, ſhall effect as great a change in the length of the pendulum, as ſhall be requiſite to bring the clock to a true rate, or keep it ſo when adjuſted, where the pendulum has a compenſation for temperature, or is made of a ſubſtance that alters its dimenſions but little with the variations of temperature of the atmoſphere. In ordinary clocks of this conſtruction, with a ſimple metallic rod for the pendulum, the ſlit may be ſo nearly cloſed at all times as juſt to allow the thin ſpring of ſuſpenſion to paſs, in which caſe the frequent adjuſtments for rate may be made without opening the caſe ; but when the pendulum is of any of the beſt compenſating kinds, it will be better to cloſe the ſlit by the thumb ſcrew *c* in *Plate* XI. after the adjuſtment for rate is completed.

Thoſe parts of *Plate* XI. which are viſible in *Plate* XII. are marked with the ſame letters over again, and therefore need not be again deſcribed, but will be of ſervice to elucidate the relative poſitions of thoſe parts, now that the frame is exhibited as mounted. We will begin our deſcription of the ſtriking and repeating work, with the arbor of the centre wheel, G, the end of which is ſeen within at the projecting end of the ſquared part of the tube, or cannon, of the pinion ſeen in *fig.* 2, called the cannon pinion ; the tube of this pinion is put tight on the arbor of the hour wheel, which we have alſo named the centre wheel, and has a ſpring placed on the hour wheel arbor, preſſing its poſterior ſurface ſo as to force it forwards againſt the croſs-pin that keeps the hands on ; this action of the ſpring occaſions ſo much friction, that though the tube is carried round by the hour arbor, yet it is capable of being moved round, by its hand placed on the ſquare end, independently of this arbor, for the purpoſe of ſetting the hand to the requiſite minute in the divided circle of 60 ſpaces, uſually figured with the Arabic characters : the cannon pinion, as it is called, has 40 teeth, and impels a ſimilar pinion, *g*, round alſo in an hour ; this pinion, *g*, which is called the pinion of report, has a pinion of 6 on its arbor, and is pivoted into the cock, *h*, ſo that the ſmall pinion of 6 alſo revolves in an hour ; this pinion of 6 again impels the wheel *i* of 72 teeth in $\frac{72}{6}$ of an hour, *i. e.* in 12 hours ; this 12-hour wheel has alſo a tube, ſurrounding the tube of the cannon pinion, but in ſuch a way, that a third tube, attached to the bridge, *k*, and ſeen in a detached ſtate in *fig.* 5, is interpoſed between the ſaid two tubes of the cannon pinion and 12 hour wheel; the uſe of which third fixed tube, is to prevent the friction that would neceſſarily take place, if the two revolving tubes had been in contact, and had preſſed on one another, while their velocities are to each other as 12 to 1 : on the exterior tube of the 12-hour wheel, the hour hand is inſerted, which indicates the hour among the Roman figures ; and it is obvious that whenever the minute hand carries the cannon pinion round, the pinion of report, *g*, alſo moves the ſame quantity, and by means of the ſmall pinion of 6, the wheel *i* at the ſame time muſt move $\frac{1}{12}$ of the ſame ſpace, and conſequently the two hands are ſo connected, that one cannot move without the other, ſuppoſing them both to be faſt to their reſpective tubes ; but the hour hand is put on the round part of its tube, and kept to it by mere friction, and therefore may be put to any hour without carrying the minute hand round many revolutions ; and yet when once placed right, it preſerves its relative velocity, as though it were more firmly attached to its tube. *l* is the arbor of the ſeconds-hand, which we have ſeen revolves in a minute, and which meaſures the 120th part in its divided ſmall circle, on the face of the clock, at ſo many vibrations of the pendulum, or at ſo many half-ſeconds. To the 12-hour wheel, *i*, is pinned faſt an indented ſpiral piece of metal, called the ſnail, the ſhell of which it reſembles in ſome meaſure, which ſnail conſequently revolves likewiſe in 12 hours ; the indentations appear to the eye to be irregular, as to their relative extents, but each ſubtends an angle of $30°\left(\frac{360°}{12}\right)$ ſo that one indentation, whether near to the centre of motion, or remote from it, is exactly the meaſure of an hour's motion of the 12-hour wheel. The ſteel piece, *m n*, is called a rack from the teeth on the croſs-piece, *m*, the lower croſs-piece of which is called the rack-tail ; this rack is moveable on a pin or ſtud at the lower angular point, near which the horſe-ſhoe ſpring, *o*, called the rack-tail-ſpring, preſſes to keep a pin on the remote end of this tail, againſt that indentation of the ſnail, which happens to be contiguous to it ; this pin is hid from the ſight, but the place may be ſeen on the extremity of the tail where it is inſerted. On the lever between *m* and *n*, is a bend to prevent its touching the winding arbor F of the fuſee, belonging to the ſtriking part ; alſo at *m* is a ſtrong ſteel pin, projecting from the rack. Above the rack is a horizontal ſteel bar, *p q r*, moveable round a ſtud at *r*, which is called the hawk's-bill, from the bill or angular piece at *q*, that catches the teeth of the rack. The piece *s* is fixed to the protruding pivot of wheel Q. *Plate* XI. near its lower extremity, and revolving with it gathers up a tooth of the rack at each revolution, on which account it is called the *gathering pallet*, the catch of the hawk's bill having a contrary ſlope, gives way in the mean time, and comes back again by its own gravity. The pinion of the pin-wheel, P, which has 64 teeth and eight pins, has eight leaves, and therefore revolves once every time that the hammer of the bell is lifted ; but we have ſaid that its gathering pallet takes up a tooth of the rack at each revolution of its arbor, conſequently a tooth of the rack is gathered up at every ſtroke of the hammer, when the ſtriking part is in motion. The angular piece, *t u v*, moveable round an arbor, denoted by O, in *Plate* XI. is called the *warning-piece* ; its lower

lower end, *v*, falls in the way of a pin in the ſmall hour-wheel, *g*, and its bent end, *t*, paſſes through an aperture, *w*, in the front plate of the frame, and is preſented to the pin in one of the croſſes of the wheel R, of the ſtriking movement within the plate, ſo as to reſtrain the motion of this movement when in its quieſcent ſituation. The action of the different parts may be thus explained; whenever the hawk's-bill, *q*, is lifted from the teeth of the rack, the ſpring, *o*, preſſing againſt a pin near its tail, makes it fall back till it meets with ſome obſtacle to arreſt its motion, that obſtacle would be the pin, *x*, in the front plate, if there were no other interpoſed before it had fallen ſo far back, but if the ſnail is in any other poſition than that, wherein its neareſt indentation towards the centre is contiguous to the pin of the rack-tail, the tail-pin of the rack will fall upon the edge of the ſnail before the rack has fallen back to the pin, *x*, and all the teeth of the rack will not paſs the catch of the hawk's-bill in this caſe, but juſt ſo many as there are indentations or ſteps counted from the remote angular point of the ſnail to the ſtep on which the tail pin reſts; in the preſent poſition, in the plate, the tail-pin is reſting on the ſtep ſix of the ſnail, which denotes that ſix ſtrokes will be given by the hammer, or that ſix teeth of the rack are to be gathered up by as many revolutions of the hawk's-bill; but we ſee that only five teeth remain to be gathered up of the rack; hence we know that the clock has ſtruck one out of ſix, and is in the act of ſtriking; accordingly, we ſee that the pin in the hour-wheel, *g*, has juſt raiſed the warning-piece and permitted it to go again; the clock will therefore now continue to ſtrike till the upper end of the gathering pallet, *s*, falls on the projecting pin, *m*, of the rack, which will be as ſoon as the laſt tooth of the rack is drawn up to the hawk's-bill, in which ſituation the wheel, Q, cannot revolve any farther till another hour has elapſed. After another hour is paſt, the pin of the wheel. *g*, will elevate the warning.piece, *v*, the bent end, *t*, of which will firſt be raiſed out of the way of the pin of the wheel R, and the fly will run on a revolution or two, with a whiſtling noiſe, *i. e.* the clock will *give warning*; but the end, *p*, of the hawk's-bill has not yet been raiſed far enough by the preſſure of the end, *t*, of the warning-piece, to make the catch, *q*, clear the teeth of the rack, therefore the rack cannot yet fall back; preſently, however, the hawk's-bill is lifted high enough by the pin of the pinion of report, *g*, which has a ſlow motion; the rack falls back till its tail-pin reſts on ſtep ſeven nearer the centre, which has now arrived at the point of contact, and therefore ſeven teeth of the rack paſs the catch, *q*, in the fall of the rack, and the hour of ſeven is now ſtruck before the tail of the gathering pallet, *s*, falls again on the pin, *m*, of the rack, and ſtops the ſtriking; at the ſame time the bend of the warning-piece catches the pin of the wheel R, and ſtops the fly; and in this way any number of hours will be ſtruck by the hammer on the bell that the ſnail regulates, which we have ſaid revolves once in every 12 hours; and if any other cauſe than the pin of the hour-wheel, *g*, ſhould lift the warning-piece within the hour, counting from warning to warning, the ſame number of ſtrokes will be repeated, though it ſhould be a hundred times or more. To convert this ſtriking mechaniſm into repeating mechaniſm, therefore, it is only neceſſary to place a lever, *y*, to revolve round a ſtud on the front plate of the frame at the point *y*, with a ſlender ſpring, *z*, over it to bring it back to its original ſituation, when the end placed under the warning-piece is elevated by depreſſing the exterior end, which may be done by pulling a ſtring down which is tied to a hole in this end, as repreſented in the figure; and as often as the ſtring is pulled, ſo often will the clock repeat the ſtrokes of the current hour. There is yet remaining the three armed piece, 1 2 3, undeſcribed, called *ſtrike* or *ſilent*, the uſe of which is explained by its name; this piece is differently made in different clocks; in the clock before us it is moveable on a ſocket, riveted to the end, 3, of one of its arms, round a ſtud in the front plate of the frame, and as the ſocket has ſcarcely any ſhake, the other two ends, 1 and 2, move always in the ſame plane; at the end marked 1, is a pin projecting above the upper circumference of the face or dial of the clock, ſo that it may be moved to the right or left at pleaſure, when the glaſs-door is open; the end marked 2, has a ſlope, like a wedge, on that ſide which is next to the plane of the frame plate, and the end of the arbor, O, in *Plate* XI. of the warning-piece, projects ſo far as to touch the inclined plane; this arbor of the warning-piece has ſome ſhake, in the direction of its length, within the frame, and its poſterior pivot paſſes between the prongs of a forked ſpring, X, which, reſting againſt the ſhoulder of the pivot, puſhes it cloſe to the interior ſide of the front plate of the frame, where a ſimilar ſhoulder ſtops it; when the pin, at 1, is puſhed to the right, the wedge of the end, 2, puſhes the arbor back, notwithſtanding the forked ſpring, X, juſt deſcribed, and the end, *v*, of the warning-piece, being carried with its arbor nearer to the frame than it otherwiſe would be, falls in the way of the pin of the hour-wheel, *g*, and the clock conſequently ſtrikes the hour regulated by the ſnail; but when the pin, at 1, of the ſtrike or ſilent, is puſhed to the left, the end, 2, is withdrawn from the pivot of the arbor on which the warning-piece is faſt, the ſpring, X, in the frame puſhes it forward ſo far, that the end, *v*, of this warning-piece is clear of the pin of the hour-wheel, *g*, which wheel therefore continues to revolve from hour to hour in a ſtate completely detached from the mechaniſm of the ſtriking part, which we have been deſcribing. Sometimes there is a hand moveable in a ſmall circle in the dial, which anſwers the ſame purpoſe as the pin at 1; (See CLOCK-*work*,) but this is generally the caſe when there is no circle for the ſeconds, or when there is ſome other circle to which it is intended to correſpond, for the ſake of uniformity, which is generally attended to in the dial-work of every clock.

Laſtly, the four holes in the front plate denoted by the letters Z, Z, Z, Z, are the holes in which the pillars of the dial, or face, are inſerted and pinned within the frame by metallic pins going acroſs the ends that paſs through the plate of the frame; ſo that the face is thus firmly attached to the frame, and then the frame to the caſe, which preſerves the wheel-work from duſt, and the touch of ſuch perſons as might otherwiſe ſatisfy their curioſity at the expence of ſome of the more delicate parts of the workmanſhip. Indeed, many of the ornamental portable clocks have caſes of glaſs, with various devices, ſuch as are calculated to recommend them to the fancy rather than the judgment of their purchaſers, who wiſh to adorn thereby their chimney-pieces. In the formation of theſe ornamental caſes, ſpar of different colours, or moulu, and various other ſuperb materials are uſed, agreeably to the taſte of the artiſt who is employed in ſuch manufactory.

A portable clock, ſuch as we have here deſcribed, is eaſily converted into a clock with a long caſe, and a ſuſpended weight for the maintaining power, by ſubſtituting a cylindrical barrel for the fuſee on the arbor of the great wheel, on which barrel the chain is wound, inſtead of being made to ſurround the fuſee; for, as a ſuſpended load acts at all times with the ſame power, it is neceſſary that the barrel ſhould have the ſame diameter at every part of it. Of this conſtruction are the eight days houſehold clocks in general uſe. Alſo by introducing a wheel and pinion between the great and centre wheels, the clock may be made to go a month or more, and by introducing two ſuch wheels and pinions, it may be made to go a year at one winding up, with a maintaining power proportionably great.

Eight-days portable Clock, with Chimes and repeating Mechaniſm.

Under our article Chimes, we gave a deſcription of the chime-barrel, hammers, and bells of a chime-clock, in a detached ſtate, but referred to our preſent article for their connection with the ſtriking part of the clock, which could not there be ſufficiently explained; as we have now ſhown the manner in which the modern ſtriking part is conſtructed, and have alſo explained the nature of its action, we propoſe to reſume the ſubject of chimes, for the explaining of which in the beſt manner, we have thought it neceſſary to deſcribe here at full length, a portable chime-clock with a ſhort pendulum, for which purpoſe we have introduced two ſeparate views in *Plates* XVI. and XVII. of *Horology*, which, we truſt, will enable us to make all the mechaniſm, complex as it may appear, ſufficiently intelligible to any one who has read and underſtands the ſtructure of the eight-days clock that has been juſt deſcribed. *Plate* XVI. is a repreſentation of the three movements of a chime-clock, when the front plate of the frame is taken off; the eye being placed perpendicularly over the mechaniſm when viewed; we have retained the ſame letters of reference as we uſed in *Plate* XI., as far as they will go, and have ſupplied the deficiency from the Greek alphabet, which are uſed for the movement of the chimes, ſo that the reader will ſee, by a *coup d'oeil*, the arrangement of the movements, even without the help of a deſcription, if he recollects the parts of the clock deſcribed in *Plate* XI. A, A, A, A, ſtand at the four corners of the back plate of the frame, on the interior ſurface; B, B, B, B, are the places of the four pillars; C the ſpring barrel of the going part; D that of the ſtriking part, and α that of the chime portion; E is the great wheel and fuſee of the going part, F thoſe of the ſtriking part, and β thoſe of the chime part; N in each the catch of the guards reſpectively; G, H, and I, are the wheels which, with their reſpective pinions, conſtitute the train of the going part, of which H is the contrate wheel, and I the balance wheel, with its lower pivot reſting on the ſmall cock or potence K; the pallets cannot be well ſeen in this plate, but are viſible in *Plate* XVII.; P, Q, and R, are the wheels of the ſtriking movement, having each a pinion on its arbor, and S is the pinion of the fly ſeen at S in *Plate* XVII. The wheel P has the eight pins for lifting the hammer, the arbor and levers of which are at T; the arbor of Q carries as before the gathering pallet for drawing up the rack of the ſtriking part, and R has the pin for catching the bent end of the warning piece; W is the hammer tail ſpring, and U the counter ſpring, which are ſomewhat differently placed here from what they are in *Plate* XI., but act in a ſimilar manner. The wheels marked with the Greek characters γ, δ, ε, ζ, are thoſe of the chime movement, with their reſpective pinions; δ is the wheel on the arbor or axis of the barrel, which has the lifting pins for moving the hammer tails when they ſtrike the bells, as has been already explained under our article Chimes of a *clock*; θ is placed near the hammers, ι on the bell of ſmalleſt diameter, and κ at the ſprings which bring the hammers back after each blow, and hold them in a ſituation to be caught by the pins of the revolving barrel.

Let us turn now to *Plate* XVII., where we have a perſpective view of the whole frame and mechaniſm before the front plate, with the ſame letters of reference, as far as they go, as in *Plate* XII., and alſo as in *Plate* XVI., and where the Arabic figures are put to the mechaniſm of the chimes that connects them with both the going and ſtriking parts of the clock. In this plate, which is intended to explain the ordinary chime-work of a clock, the parts of the mechaniſm which effect this purpoſe are ſo diſpoſed as to be nearly all ſeen in their reſpective places of action. A, A, are placed on the back plate of the frame; B, B, B, B, are the four pillars of the frame; C, D, and α, are three ratchet wheels for adjuſting and preſerving the intenſities of their reſpective main-ſprings, and are placed before the front plate on the ſquares of their barrel arbors, as in any other portable or ſpring clock; E, F, and β, are the arbors of the three fuſees for the key that winds them up; L and L are the parts of the two guards which are attached to the front plate, on the interior ſide, out of ſight, the ſituation and action of which were explained under *Plate* XI, and the end of the third guard is hid by the ſnail. K is the bridge of the dial-work, concealed from ſight, ſuch as is ſeen at the bottom of *Plate* XII., in *fig.* 3; I is the crown-wheel and pallets, to the verges of which the crutch of the pendulum is faſtened behind the frame; and S is the fly of the ſtriking part, held by a ſmall ſpring croſſing the middle of its arbor near S, by ſimple friction. The cannon pinion is hid from ſight behind the 12-hour wheel *i*, but the pinion that acts with it, of the ſame number of teeth, is ſeen at *g*, which is called the pinion of report, and has a pinion of 6 on its arbor pivoted into the cock *h*, and driving the 12-hour wheel of 72 teeth, as in the preceding clock; the ſnail, however, of the ſtriking part, is not here on the 12-hour wheel as before, but is attached to a ſtar, or wheel with 12 pointed teeth, at *l*, one of which teeth is actuated each hour by a pin in the cannon pinion, and the foot, *f*, with a ſlender ſpring, *e*, preſſing againſt its leg, the heel of which is placed between the two neareſt teeth of the ſtar, not only prevents their backward or forward motion during the lapſe of each hour, but alſo yielding to the impulſe given by the pin of the cannon-pinion at the end of each hour, allows the tooth to paſs the heel, and then returns to its original ſituation by the force of the ſpring *e*, at the ſame time puſhing on the ſtar the exact ſpace of one interval, ſo that when the ſtar moves at all, it muſt neceſſarily move juſt one twelfth part, and remain in that ſituation together with its ſnail, for the ſpace of a whole hour before it is moved again, which is an eſſential condition where the ſtriking part repeats the hour; otherwiſe the following inſtead of the preceding hour might be ſtruck by the clock during each latter half-hour of the day. The tail of the warning piece does not here reach to the pin in the pinion of report as in our former ſtriking work, explained in *Plate* XII., but has the chime-mechaniſm interpoſed; in conſequence of which arrangement the chimes play firſt; and then ſet the clock a ſtriking when they have ceaſed, at the end of every hour; for this purpoſe two ſeparate racks with their reſpective ſprings, catches, and gathering pallets, &c. are neceſſary in this machine, which may have their reſpective offices thus explained: The pinion of report, *g*, goes round in an hour, as we have ſeen before, and has 4 pins which raiſe the croſs lever, 1, of the hammer, 1, 2, every quarter of an hour, a little before its completion; at the ſame time that the croſs lever, 1, is lowered, the end, 2, of the hammer is depreſſed, and its tail-piece in contact with the ſpring, 3, is raiſed, by reaſon of its being placed behind the ſtud which is at the centre of motion; the ſpring, 3, conſequently is raiſed alſo from its ſtate of reſt, ſo that when the pin of the pinion of report lets go the lever, 1, this ſpring, 3, preſſing back the hammer-tail, makes its head, 2, ſtrike a projecting pin near the claw of the detent or catch, 7, after which it falls back again by its own weight; this ſtroke of the hammer is powerful enough to drive the claw of catch 7 from the teeth of the chime-rack, 4, which therefore immediately falls back, by the force of its ſpring, 6, preſſing on its projecting end beyond the ſtud, round which its motion is performed, until its tail, 5, falls on the neareſt of the four ſteps of the ſmall ſnail of the quarters attached to the pinion of report; in this fall as many teeth of the chime-rack paſs the claw of the catch as there are ſteps in the ſmall ſnail, counted from its remote angular point to the end of the tail-piece of this rack; the greateſt fall of the rack is the ſpace of four teeth, when its tail reſts on the ſtep neareſt the centre of the ſnail for the firſt quarter of an hour, and when its lever falls back againſt the pin, 11, in the front plate of the frame; in the mean time the ſupporting bar, 8, moveable on a ſtud near its lower extremity, having been forced back by the long tail of the gathering pallet, 10, of the chime movement, now returns by the action of its ſpring, 9, preſſing its tail-piece below the centre of motion, and preſents its head to a ſecond pin in the catch, 7, nearer its centre of motion, contiguous to the figure 7, ſo that when the catch, 7, falls back by its own weight after it has been ſtruck by the hammer, 2, its ſecond pin falls on the head of the ſupport, 8, where it remains until the rack of the chimes has its tail placed on the ſtep of the ſmall ſnail; the chime movement, being at liberty as ſoon as the tail of the gathering pallet, 10, falls from a pin behind the chime-racks, not ſeen in the drawing, runs on, and preſently the ſaid tail of the pallet puſhing againſt the inner ſide of the ſupport, 8, diſengages the ſecond pin of the catch 7, the claw of which now falls again into the teeth of the rack, and holds the rack while the pallet has drawn it home again, *i. e.* till the tail of this pallet falls on the concealed pin on the back of the chime-rack, the chime-barrel in the mean-time revolving and raiſing the hammer-tails of the eight concentric bells fixed on a common arbor at 1, and ſupported by a bar attached to the front plate of the frame. This proceſs is repeated three times at the quarters 1, 2, and 3; but when the hour is completed nearly, the fourth proceſs does not ſtop here; for as the chime-ſnail now permits the rack belonging to it to fall back by its ſpring, 6, the ſpace of four teeth, the pin in the left hand end of this rack ſtrikes the tail, *p*, of the hawk's-bill, *q r p*, moveable on a ſtud at *r*, and thus raiſes the catch-or bill, *q*, from the teeth of the ſtriking rack, which now falls back as far as its ſnail, *l*, will allow its tail, *n*, to come towards its centre; when the hawk's-bill is lifted in this manner it puſhes up the bent end, *t*, of the warning-piece from the pin of the wheel, R, in the frame, (*Plate* XVI.) and the fly makes two or three revolutions or more, which motion produces the noiſe of warning, but the little ſpring, 13, immediately puſhes the warning-piece down again into the way of the pin of wheel R, the motion of which is thus preſently ſtopped: the chimes of the hour are now going on while the four teeth of its rack are in the act of being drawn home, and when the fourth tooth of this rack is brought back, the chime-pallet falls on the concealed pin of the rack behind it, and nearly at the ſame time the pin of the rack in front, which puſhed down the tail, *p*, of the hawk's-bill, now raiſes the tail, *v*, of the warning-piece, *t v*, and conſequently depreſſes the end, *t*, of the ſame ſo far, that the pin of the wheel R is again free, and the ſtriking of the clock goes on as in the uſual ſtriking part, till the hour regulated by the 12-hour ſnail is counted by the proper number of ſtrokes; after which the tail of the gathering pallet, *s*, of the hours falls on its reſting pin behind the hour rack, *m n*; it being a matter of no importance on which face of the rack this pin is fixed; nor yet on which ſide of the bill, *q*, the gathering pallet is placed, provided there be the proper number of teeth in the rack to be drawn up by the pallet. The four holes, *a*, *b*, *c*, *d*, are to receive the four pillars of the dial; the horizontal lever, *y*, taking the pin of the catch 7, may have its tail, *z*, pulled by a ſtring coming through the caſe, to make the chimes repeat, and the hour alſo at any time during the firſt quarter after ſtriking; and, laſtly, the pin of the lever 14 15, or ſtrike and ſilent, by being puſhed to the right or left, will bring the heel of the part 15 to a pin in the middle of the hammer lever, 2, or remove it therefrom accordingly as the chimes and ſtriking are to be in uſe, or the contrary. After what we have already ſaid about trains, we think it not neceſſary to particulariſe the numbers of teeth in the wheel-work.

A Clock without Dial-work, by Dr. Franklin.

When clocks had begun to be common, and a variety of complicated contrivances had been introduced into the different conſtructions, it was at length deemed deſirable to ſimplify the mechaniſm; and various attempts have been made to conſtruct a clock with as few wheels and pinions as poſſible. The late Dr. Franklin, and the late Mr. J. Ferguſon both ſucceeded in diminiſhing the uſual number of wheels and pinions to three of the former and two of the latter, notwithſtanding hours, minutes, and ſeconds, were all indicated by their contrivances; we propoſe to deſcribe them in ſucceſſion, and ſhall begin with Dr. Franklin's firſt, as being prior in point of time. *Fig.* 1, of *Plate* XVIII, of *Horology*, will explain ſo much of Dr. Franklin's clock, in queſtion, as is neceſſary for conveying a ſuitable idea of its conſtruction. The face, or dial plate, is perfectly repreſented, and the dotted circles denote the wheels and pinions in the frame behind the face, on a ſuppoſition that the face and front plate of the frame are tranſparent; which mode of repreſentation not only places every wheel and pinion in its own place, but ſhows their reſpective diameters as well as if a ſecond figure had been uſed for this purpoſe, as has hitherto been uſual, when this clock has been deſcribed by other writers. The great wheel, A, of 160 teeth, goes round, by means of the cord with a ſuſpended weight ſurrounding a pulley attached to it, in four hours; this wheel drives a pinion, B, of ten leaves, in $\frac{10}{160}$ of four hours, or one quarter of an hour; on the arbor of this pinion is the ſecond wheel, C, of 120 teeth, actuating a ſecond pinion, D, of 8, in $\frac{8}{120}$ of a quarter of an hour, which is one minute, and together with it, on the ſame arbor, the third wheel, E, of 30 teeth, in the ſame time; this third wheel is the uſual ſwing-wheel of an ordinary 30-hours clock, and has a ſeconds pendulum, ſuſpended in the uſual way from a cock, by a piece of the main-ſpring of a watch. Theſe are all the wheels and pinions made uſe of in the clock. The face is occupied by a ſpiral line, as ſeen in the figure, and has the hours denoted by the Roman characters, which count from XII, in the order I, II, III, &c. as the ſpiral goes, placed at intervals of a quadrant from each other; theſe hours, as well as the 60 minutes, placed four times over in a ſurrounding circle and denoted by the Arabic characters, are pointed to by a hand, P, placed by friction on the round part of the protruding arbor of the great wheel, A, that revolves in four hours. In the preſent ſituation of this hand, the time indicated is forty minutes paſt one of the three hours which it has laſt paſſed. *viz.* XII, IIII, or VIII, and it is preſumed that a miſtake of four hours can hardly happen whenever the clock is examined. The ſmall hand at D indicates ſeconds in the uſual way, and therefore requires no explanation. There can be no doubt but that a clock thus conſtructed will meaſure time as well as any other clock with a ſimilar pendulum, provided it be well made. The objections which have been alleged againſt this conſtruction are, that it is poſſible a perſon awaking in the night, and examining ſuch a clock, may miſtake his time four hours very eaſily; and that that it will require being drawn up by its cord once every day, unleſs, indeed, the fall of its ſuſpended weight ſhould be made much greater than is uſual, or even convenient, in the generality of houſes. The writer of the preſent article had ſome years ago a clock, conſtructed nearly ſimilar to the preſent one, but its great wheel revolved once in every three hours, which allowed larger minute ſpaces in the ſurrounding circle, and required an additional ſpiral line; for the Roman figures were four deep at each third part of the circle; its uſe was to keep in motion the ſyſtem of Jupiter and his four ſatellites, which it did very well; an endleſs cord, with a detached ratchet, being applied to produce continual motion during winding as well as at other times. We do not learn, however, that Dr. Franklin's clock has been frequently copied.

A Clock with only three Wheels and two Pinions, by Mr. J. Ferguſon.

We have ſaid that Mr. J. Ferguſon alſo contrived a clock to ſhow hours, minutes, and ſeconds, with only three wheels and two pinions; his principal object was to obviate the objections we have ſtated to Dr. Franklin's clock; *fig.* 2 of *Plate* XVIII. gives a ſimilar repreſentation of Mr. Ferguſon's clock, as *fig.* 1 does of Dr. Franklin's: the great wheel, A, of 120, revolves in 12 hours attached to the pulley, round which the cord of the weight is ſtretched; this wheel drives the pinion, B, of 10 leaves, in $\frac{10}{120}$ of 12 hours, or in an exact hour, which is the value of this fraction; the ſecond wheel C, which revolves alſo in an hour, and which has alſo 120 teeth, drives the ſecond pinion D, of 6 leaves, in $\frac{6}{120}$ of an hour, or in three minutes; conſequently the pallet-wheel of 90 teeth, placed on the arbor of this latter pinion, revolves alſo in three minutes; the pallets of the anchor eſcapement, which act with this wheel, give an impulſe to a ſeconds pendulum at each vibration, as is uſual when the ſwing-wheel has only 30 teeth. The hours are marked in Roman characters, on a circular plate that is inſerted by friction, on the arbor of the 12-hour or great wheel, about three of which hour figures appear always through an aperture cut through the dial below the pinion B: and a fleur-de-lis, deſigned on the dial, ſerves as a hand to point to the hour to be indicated. We ſee no reaſon why a circle, a little ſmaller than the plate of the hours, might not have been marked with the Roman characters on the dial itſelf, within the circle of minutes, with a hand placed on the arbor of the 12-hour wheel to point to it as uſual, which method is certainly more ſimple, inaſmuch as that the circular ſmall plate would have been diſpenſed with and alſo the aperture in the dial. There is alſo another circular plate, divided into 60 three times over, and marked with the Arabic figures, placed by friction on the arbor of the three minute or pallet-wheel F, which is pointed to by another fleur-de-lis on the dial, as ſeen through another aperture of one third of a circle in length; this large plate, borne by the pivots of the pallet-wheel, muſt have been very injurious to the performance of the clock before us, where the power is diminiſhed in the ratio of 720 : 3, ſuppoſing the pallet wheel no bigger in diameter than the pulley, and that independently of friction; the inertia of ſo much matter as the ſeconds plate muſt contain, to be overcome at the return of each vibration, muſt have required a large maintaining power; an objection of which the inventor himſelf acknowledges the exiſtence; this objection, however, might very eaſily have been obviated, for a circle as large as the divided plate might have been drawn on the upper half of the dial, and would have admitted of ſimilar diviſions and figures to which a hand, borne by the pallet-wheel arbor, would have pointed, and indicated the ſeconds as truly as they are at preſent. The inventor, not aware of ſo ſimple a reſource, propoſes to get rid of the force of the objection by omitting the ſeconds altogether, as being of no real ſervice except in aſtronomical clocks; but why attempt the introduction of ſeconds at all, when ſtudying ſimplicity, if they are of no uſe? Mr. Ferguſon has alſo allowed another objection to his conſtruction, from which Dr. Franklin's was exempt, namely, that when the minute hand is at any time adjuſted, it does not alter the hour plate, which muſt have a ſeparate rectification, for effecting which conveniently he had 12 holes drilled in the ſmall 12-hour plate at equal diſtances, to receive the end of a pin whenever the hour-plate required adjuſtment; the ſeconds plate muſt alſo have been ſubject to a ſimilar inconvenience. Mr. Ferguſon has himſelf candidly ſtated one other objection to his clock, that ſeems to afford a better proof of his candour than of his judgment in clock-work, which is, that he ſuppoſes the total arc of vibration of the pendulum muſt be too ſmall with ſuch diminutive teeth as the highly numbered pallet-wheel afforded, and ſeems to have thought that a large arc is better than a ſmall one, by reaſon of the greater momentum of the pendulum, notwithſtanding he mentions a cycloidal arc as that in which all lengths are equally iſochronal: the fact however is, as is now univerſally allowed and proved in practice, that a ſmall arc near the point of the pendulum's quieſcence approximates the neareſt of any other part of a circular vibration to a cycloidal one, and that the momentum, which is not acquired by velocity, may and ought to be made up by the weight of the ball, moving in nearly as ſmall an arc as the eſcapement will admit, to ſuſtain a continuance of the vibration.

A Clock for exhibiting the apparent daily Motions of the Sun and Moon, and State of the Tides, &c. by Mr. J. Ferguſon.

Among the other ingenious contrivances, deſcribed in Mr. Ferguſon's "Select mechanical Exerciſes," is the clock of which we have juſt given the title, the ſimplicity of which has recommended it to the notice of various writers and compilers of dictionaries, and induces us to give it a place in our collection. *Fig.* 3. of *Plate* XVIII. is a reduced copy of the dial of the clock under our preſent conſideration, *fig.* 4. the dial-work, or wheels and pinion connected with the going part of a common 30-hours, or eight days clock, and regulating the motions of the different hands, plates, and contrivances for repreſenting the ebbing and flowing of the tide at any given place. The pinion of 19 leaves, in *fig.* 4, is attached to an arbor which revolves in eight hours, by its connection with the wheel-work within the frame, which revolution may be effected by a wheel of 64, taking into a pinion of eight leaves on the centre wheel arbor; then, as three times eight are 24, three times 19 are 57; the wheel of 57 conſequently revolves in 24 hours, with its centre in the centre of the dial; a ſecond wheel of 59 teeth (*viz.* $29\frac{1}{2} \times 2$) is alſo actuated by the ſame pinion of 19 in $\frac{59}{19}$ of 8 hours, which time is $24^h\ 50^m$ 526, or $24^h\ 50^m\ 31^s.58$; this wheel is of preciſely the ſame diameter as the wheel of 57 teeth; and theſe two wheels, which are all that are neceſſary for producing the relative aſpects on the dial, may be called, that of 57 the *ſolar*, and that of 59 teeth the *lunar* wheel. The lunar wheel, which lies next to the clock frame, has a ſolid arbor, but the ſolar wheel, which covers it, has a tube juſt fitting this arbor, and turning on it without ſhake; the tube is ſhorter than the arbor and carries the ſmall circular plate repreſented by *fig.* 5, that has the 24 hours in Roman characters, and within theſe the 29½ days ſpaces of the moon's age in Arabic figures; all equally divided; the attached piece, S, is the ſun's repreſentative, which thus revolves from the upper XII. in *fig.* 3, to the ſame again in 24 ſolar hours. On the face of this ſmall revolving dial is put a darkened ring, gradually increaſing in breadth half way round, and as gradually decreaſing the other half way. Over this revolving plate of 24 hours and 29½ days is placed another ſmall plate (marked twice with the words *high water*, and as often with the words *low water*, alſo with *moon's age*, &c. as ſeen in *fig.* 3.) upon the arbor of the lunar wheel, ſo as to be adjuſtable on its round part by friction merely; this lunar plate has an aperture near its circumference, through which appear about five hours on the ſolar hour plate, and alſo a ſmall circular hole, within the former, as it regards the centre of motion; this plate has, moreover, the figure of an ellipſe darkened on it, which is nearly covered by a ſmaller circular plate, with concentric circles, borne by a ſupporting wire attached to it at one end, and at the other, when bent a little, to the principal dial-plate near the lower XII., as ſeen in the figure. The uſe of the ſmall circular hole in the lunar plate is to ſhow the phaſe of the moon in any part of its ſynodic revolution; for when in the ſituation F, *fig.* 5, as it regards the ſolar plate, no part of the darkened ring appears; which phænomenon denotes full moon a little ſhort of the fifteenth day's age; when it is at N, the dark part of the ſolar plate or ring covers it entirely at 29½ days age, which poſition denotes new moon, and at 90° from theſe ſituations at both ſides, one half is dark and the other half light, which aſpects denote the quadratures. The ſun, S, attached to the ſolar plate is the index for ſolar time marked on the large hour circle of the principal dial, and the moon, M, pointing to the ſame, indicates the 24th parts of the earth's rotations, as they relate to the moon, which may be called ſo many lunar hours; 24 of which by this mechaniſm, we have ſeen, is upwards of 50½ ſolar minutes longer than 24 ſolar hours. From the ſmall circle of the moon is carried a ſtraight wire over the hours of the ſolar plate, to indicate the mean time of the moon's mean paſſage over the meridian on any day of her age; and at the ſpace of 2½ hours behind is another ſimilar one, to point out the time of a mean high water at London Bridge, which might be ſet to a diſtance, behind or before, correſponding to any other place on the globe, that has two tides in ſomewhat leſs than 25 hours. The ſtationary ſmall plate in the centre is intended to repreſent the earth, and the dot, L, between the fiftieth and ſixtieth parallel of latitude, repreſents London, with reſpect to which place the poſition of the ellipſe or tide-piece is altering its poſition viſibly every hour, agreeably to the words marked on the lunar plate. On the back of this lunar plate is likewiſe another ellipſe of ſolid braſs D, placed concentrically, which, revolving with it, lifts the lever E, moveable on a ſtud at F, when either of the ends comes in contact; but when the ſides are preſented the ſaid lever falls below the horizontal poſition; when this lever, F, is thus raiſed and lowered, twice in each lunar day, it carries with it the attached plate, H, above it, when kept in a perpendicular poſition by the four friction rollers, R, R, R, R, which plate has the ſea painted on it, as ſeen in *fig* 3, over the dial at H. The repreſentation of the phænomena depending on the relative poſitions of the ſun and moon thus ſimply effected, affords a pleaſing object for the eye at a trifling expence; but we are not to expect great accuracy when we conſider how many equations are required to reduce the mean places of thoſe two luminaries, particularly of the latter, to the true apparent places. Mr. Ferguſon made this mechaniſm ſo as to be capable of being actuated by a watch on the fuſee arbor of which a pinion of 20 was placed to drive a wheel of 40 round, on the arbor of which 40 was fixed the pinion of 19 that has been deſcribed as revolving in 8 hours, which it would do in this caſe, provided the fuſee itſelf revolve, as is uſual in common watches, in the ſpace of four hours.

There is, however, an inaccuracy in the numbers of the wheel-work adopted in the dial work of this clock, which would render it too imperfect to be uſed for a conſiderable length of time without a new rectification, even provided the motions of the ſun and moon, or, more properly ſpeaking, of the earth and moon, were quite equable, as the conſtruction ſuppoſes, which inaccuracy may thus be explained; as the pinion of 19 drives both the wheels of 57 and 59, when the former has performed a revolution in a ſolar day, the latter falls two teeth ſhort of a revolution, which it completes not until two teeth of the ſecond revolution of the wheel 57 have been again impelled, ſo that in every 24 hours the little moon loſes $\frac{2}{59}$ of its revolution, which is a part of a relative retrograde motion, as it regards any point, for inſtance the upper hour XII. in the ſolar plate; ſo that as often as 2 are contained in 59, ſo many day-ſpaces muſt there be on the ſolar plate, figured in a retrograde direction, as the figures regard the principal plate; but the value of $\frac{59}{2}$ is 29½ exactly, which number of days meaſures the lunation according to theſe wheels exactly; there is, therefore, a monthly error of $44^{m}\ 3^{s}$ almoſt, which will amount to nearly an entire day in the ſhort ſpace of about 32 lunations.

But there is, moreover, a practical objection to the two wheels, 57 and 59, being both driven by the ſame pinion of 19, which is, that being of the ſame diameter, the diſtance between their teeth is not the ſame in both, one being $\frac{1}{57}$, and the other $\frac{1}{59}$ of a ſemicircle, ſuppoſing their teeth and ſpaces to be reſpectively equal to one another, but if both wheels are cut in the cutting-engine by the ſame cutter, the inequality will fall in the teeth entirely; in either caſe the action of one of the wheels muſt be bad if the other is properly proportioned, and periodic jerks will be the conſequence, which, in wheel-work going by a clock or watch movement, ought to be avoided. Whether or not Mr. Ferguſon had the dial of the Hampton-Court clock in his eye when he contrived the ſimple mechaniſm of this clock, we will not undertake to affirm, but we think it extremely probable that he had, particularly as he has copied the poſition of the annual train in another of his clocks, as we ſhall have occaſion to ſhew, under our article Dial-*work*. Being in the habit of calculating numbers proper for repreſenting given periods of time in clocks, watches, orreries, &c. we have turned our thoughts towards the improvement of this clock, as well as of other pieces of mechaniſm, ſo far as relates to accuracy, and beg leave to lay before the reader the alteration that has occurred to us, for rendering the clock before us more perfect than it is in the ſtate we have deſcribed it.

When deſcribing the Hampton-Court clock we endeavoured to prove that when the moon's age is indicated by the difference of the velocities of the two hands, moving in the ſame direction, and repreſenting the ſun and moon, the latter ought to paſs the XII. o'clock point, on each day $50^{m}.473$ nearly later than on the preceding day; but by

Mr. Ferguſon's calculations we ſee the daily retrogradation is 50^{m}.526, and the difference .053 amounts to an entire day's motion in a little more than 952 days, or ſomewhat upwards of 32 lunations, as we have ſtated. What therefore we want, in this caſe, is a couple of diviſible numbers that ſhall be to each other very nearly in the ratio of 24^{h} to 24^{h} 50^{m}.473, which numbers, by a peculiar arithmetical proceſs, become familiar to us by practice, we have determined to be 2368 : 2451. Theſe are the neareſt poſſible numbers that can be got without aſcending higher in the ſcale of continual ratios, and are luckily capable of reduction into compoſite numbers thus; 2368 taken as a product is equal to 74 × 32 and 2451 = 57 × 43; therefore the train $\frac{43}{74} \times \frac{57}{32}$ will be the wheel-work required; the ſolar wheel of 74 teeth being made to revolve with a tube as an arbor in 24 hours, by the clock-movement, muſt impel the wheel of 43 placed on a ſtud, or otherwiſe on the front plate of the frame, at one ſide of it, and this wheel of 43 muſt have the next driver, 32, pinned to it, to impel the laſt wheel, 57, or lunar wheel, placed on a ſolid arbor, concentrically behind the ſolar wheel, according to Mr. Ferguſon's poſition, and the dials and other deſigns of the clock face may remain preciſely as deſcribed; ſo that inſtead of the pinion of 19 impelling two unequal wheels at once, we ſhall have a pair of ſmall wheels pinned together, one impelled by, and the other impelling its fellow, where the motion muſt be taken from an arbor of 12 hours, carrying a wheel of 37 to actuate the 74 in 24 hours, inſtead of from one of eight hours, as Mr. Ferguſon propoſed; which mode is equally practicable. As a proof of the accuracy of our calculation, we have by direct proportion as 2368 : 2451 :: 24^{h} : 24^{h} 50^{m}.4729729, &c.; hence the deviation from the data is here only .0000271 of a minute in each lunar day, which will not amount to an error of an entire day in leſs than 1,862,472 ſuch days, and therefore may be aſſumed as no bad ſubſtitute for the truth itſelf; ſeeing the clock will never be expected to go ſo long without cleaning or ſtoppage from ſome external cauſe.

Should it occur to the reader that 32 lunations conſtitute a period long enough for the clock of Mr. Ferguſon to go, before a new rectification, we beg leave to ſuggeſt to him, that in the ſpace of a lunar day there are two tides and two ebbs, conſequently an error of three-quarters of an hour in each lunation will place the tide-plate, H, three hours wrong in the ſpace of about four months, and in nearly eight months an high-water will be changed into low-water, and the reverſe in the next eight months, which is certainly an indiſpenſable error.

That the clock-maker may not be at a loſs how to apply the remedy we have propoſed for the inaccuracy of Mr. Ferguſon's ſolar and lunar wheels, we ſhall conclude our deſcription of the clock before us with an account of the exact dimenſions of the parts propoſed to be ſubſtituted. If we take the wheel of communication of 37 teeth at 12 per inch, meaſured at the pitch line, its geometrical diameter will be .98 or $\frac{98}{100}$ of an inch, and its practical diameter, with the addendum for the ends of the teeth, 1.04, as may be ſeen by inſpection in our Table of Diameters, under the article CLOCK-*making*; the wheel of 74 being double will have its geometrical diameter equal to 1.96, and its practical one 2.02; the fellow of this laſt or ſolar wheel has its geometrical diameter by the ſame proportion, 1.14, and its practical one 1.20; the diſtance of the ſtud from the centre of motion of the ſolar and lunar wheels, muſt neceſſarily be the ſum of the geometrical radii of theſe two laſt wheels, namely $\overline{1.96 + 1.14 \div 2}$ which is = 1.55; again the ſum of the geometrical radii of the remaining two wheels, 32 and 57, muſt be alſo equal to 1.55, in order that the centres of motion of the ſolar and lunar wheels may exactly coincide: but a wheel of a geometrical diameter, equal to $\overline{1.55 \times 2}$ or 3.10 inches and of $\overline{32 + 57}$ or 89 teeth, will have only about 9 teeth per inch, according to our table. and the practical diameters of wheels 32 and 57, by the ſame, will be reſpectively 1.21 and 2.1. The calliper ſuitable for theſe proportions and dimenſions is given, of half their full ſize, in *fig.* 2, of *Plate* X. which needs no further explanation, except that the wheels, 43 and 32, are ſo nearly of a ſize that one circle repreſents both, as pinned together, and revolving with a contemporary motion round a ſtud or ſcrew in their centre, going into the front plate of the clock-frame. The ſmall wheel of 32 acts deeper into the teeth of its fellow than the 43, by reaſon of having larger teeth than the other, though the wheel is of the ſame ſize.

Equation Clock by Enderlin, ſhewing alſo the relative Situations of the Sun and Moon, &c.

In our hiſtory of the ſucceſſive improvements in clocks, we have mentioned the names of various ingenious men who contrived mechaniſm for exhibiting on the dial of a clock both mean and apparent time, and conſequently the equation of time, which is the difference between theſe; to give drawings and deſcriptions of all the different methods of producing ſuch an effect, would be like throwing ammunition at a dead mark; but to gratify the wiſhes of the curious, in a certain degree, we propoſe to ſelect a clock of this kind, made on the continent by Enderlin, which appears to us to merit a deſcription better than moſt of the others.

Fig. 1, of *Plate* XXIV. of *Horology*, exhibits the plan of the mechaniſm which conſtitutes the equation-portion of Enderlin's clock (See Traité de Thiout, p. 252, *Pl.* XXV.) and *fig.* 2, is an exact repreſentation of the dial and hands; we will begin with *fig.* 1, or poſterior plane of the dial, where the motion is communicated from the wheels within the frame, and proceed, in the order of the communication of this motion, through the different parts of this figure. The ſmall wheel Q, of 24 teeth, borrows its motion from the movement of the ſtriking part, in order that the going part may not be impeded by cumberſome additions; this wheel is not repreſented as a contrate wheel in the original, which we have copied on a reduced ſcale, but would act better if it were; it impels the ſmall wheel R, of 32 teeth, with a vertical arbor, held to its poſition by a ſmall cock, T, on the front plate of the frame, which arbor has a bend and compound joint, below T, and a ſecond ſimilar cock above, that keeps the lower half of the arbor in its poſition, while the upper and lower ends, or pivots, bear in their reſpective cocks, which it is not neceſſary to inſert in the figure; this arbor has a ſingle endleſs ſcrew, S, on the middle of the inclined half, actuating a large wheel A, of 487 teeth, and alſo a pinion *a*, of 24 leaves, at the lower extremity, actuating a ſmall wheel V, of 32 teeth, and making this revolve, we are told, in 24 hours. From theſe data we can now calculate the periods of the other wheels that have been mentioned; if V revolves in 24 hours, *a* revolves in $\frac{24}{32}$ of that time, namely, in 18 hours, and with it the bent arbor R T S *a*; alſo the ſmall wheel, Q, revolves in $\frac{24}{32}$ of 18 hours, or in 13^{h} 30^{m}, by means of its connection with the ſtriking part, which may eaſily be effected by proper numbers in the teeth of the connecting wheel and pinion; likewiſe the large wheel A, of 487 teeth, revolves in $\frac{487}{1}$ of 18^{h}, which time reduced, is 8766 hours, or 365^{d} 6^{h}; this wheel,

wheel, therefore, is called the *annual* wheel. The wheel X, with 62 inclined teeth, and the wheel Z, with 90 teeth, revolve ſeparately round one common centre 5, and are impelled, the former by a ſingle tooth on the 24 hours arbor of the ſmall wheel V, and the latter by another ſingle endleſs ſcrew Y; this ſcrew Y has a pinion 6, of 21 leaves, on its upper end, impelled by the pinion *a* of 24 in $\frac{21}{24}$ of 18 hours, which period is $59^d\ 1^h\ 30^m$ or the ſum of two lunations, where each is $29^d\ 12^h\ 45^m$; wheel X, we have ſaid, has 62 teeth, one of which is impelled every 24 hours, therefore an entire revolution of this wheel, if the motion were continued, would be performed in 62 days; but it will be ſeen by and bye, that it never is permitted to make more than one half of a revolution, and frequently not ſo much, before it is made to retrograde at one jump to its original ſituation, from which it had been moved by the ſingle tooth or pallet at V. Into the plane of the annual wheel A, are inſerted 12 pins, at ſuch diſtances from each other, in a concentric circle, as are determined by the number of days in the correſponding months, which are ſuppoſed to lie reſpectively between the ſaid pins, ſo as to regulate the interpoſed ſpaces. Theſe pins might be denominated the pins of January, February, &c. in ſucceſſion, as they follow one another at the regulated diſtances of $\frac{31}{365}$, $\frac{28}{365}$, &c. On the centre of the ſaid annual wheel, is alſo fixed the centre of a piece of metal, B, ſhaped by an oblong curve, continually varying its radius of curvature half round, and in a ſimilar way back again, which curve is denominated the *equation* curve, from the office it has to perform, which we will recur to preſently. Round the centre 5 of the two wheels X and Z, is moveable the lever 5 6, with a claw at 6, and a tail 5 3, reſting on a pin in the click 2 7 8, which click is moveable round a point at 7; a ſecond lever 10, has alſo its tail reſting by a pin at 3, on the tail-piece of the click, while its inclined end 10 falls in the way of the pins of the months in the annual wheel, by means of the preſſure of a ſlender ſpring near the centre of its motion. The effect produced by theſe levers and click may be thus deſcribed; the pallet at V continues, by its daily motion, to gather up a tooth of X every 24 hours, and the click 2, ſliding over the inclined ſide of the contiguous tooth, lays hold of it when paſt, and keeps it faſt till the next day, when the ſame operation is repeated, the two levers in the mean time remaining quieſcent; this daily proceſs goes on till one of the month pins of the annual wheel, meeting with the end of the lever 10, depreſſes it; at the time this occurrence takes place, the tail of this lever puſhes, by means of its pin of contact, the tail 3 of the click back, and with it the fang of the click, which now quits the tooth it before held; the wheel X being now detached from the click and pallet V, and having a piece of watch main-ſpring coiled round its centre, one end attached to it and the other to a ſtud, is pulled ſuddenly back to the ſituation in which it was before it was gathered up by the pallet; and the hand D, *fig.* 2, being connected with this wheel, returns with it and recommences its motion from the beginning of the graduations of the double ſemicircle A B C, which is divided on the middle line, but figured alternately above and below, to prevent the figures from being crowded. The ſemicircle at D in *fig.* 2, is divided into $29\frac{1}{2}$ equal ſpaces; and a portion of the dial is cut away, as repreſented by the dark portion, and full phaſe of the moon, which conſtitute a portion of the front face of wheel Z, of 90 teeth, which wheel we have ſaid revolves half round in $29^d\ 12^h\ 45^m$; this dark lunar plate has a mark as an index over the moon, which diſappears the moment that a ſimilar one at the oppoſite point of the plate's circumference begins to appear; alſo another moon, at preſent hid from ſight, begins to appear at one day's ſpace of her age, as ſoon as the preſent one diſappears at the ſpace $29\frac{1}{2}$, and ſo on alternately throughout the year. The graduations of the moon's age are on the principal dial. The anterior plane of the annual wheel has the ſun's place in the ecliptic, the months, with their diviſions into days, and ſun's riſing and ſetting in time correſponding to each day, marked on it, which readings appear through the blackened apertures of the dial, above the double ſemicircle of the days indicated by the hand D, and under the hours and minutes of the large circle, as repreſented in *fig.* 2.

When the wheel X, in *fig.* 1, has returned to its original ſituation, the pallet at V goes on, and when it has made half of a revolution it meets with the end of the lever 6, and preſſing againſt it, diſengages the tail 3 from the click 2, which prevented this click from falling into a notch of the wheel X, while this wheel retrograded; but now the click reſumes its office, and the wheel of the months proceeds by a daily progreſs of one tooth: in the preſent ſituation of the different hands and of the annual wheel, the day is the 5th of November, the moon's age almoſt 15, being full moon, the ſun-riſe, $7^h\ 5^m$, A. M. ſun-ſet, $4^h\ 54^m$, P. M. and the ſun's place 12° in Scorpio. The annual wheel, we have ſeen, revolves in $365\frac{1}{4}$ days exactly, therefore the fractional portion of a day will amount to unity every fourth year, and will require that February ſhould have 29 days in each leap year; a proviſion is here made for effecting this purpoſe which ſhews conſiderable ingenuity; a piece of braſs of the ſhape of 15 16 17 18, repreſented by dots chiefly, becauſe nearly hid behind the annual wheel, as now viewed in *fig.* 1, is moveable on the point 15, and has marked on the concealed flat part the 4 years ſucceſſively, *viz.* leap year, and 1, 2, and 3, after, which are brought annually in ſucceſſion to the aperture of the dial above VI. in *fig.* 2, by the annual wheel: the proceſs is thus; the ſtar 20 with eight angular points, has two of its points carried forwards by pins in the annual wheel, one of which acts on the night of the laſt day of December, and the other in ordinary years at the end of the 28th of February; the ſtar has a metallic leg, called by the French *un ſautoir*, preſſed by a ſlender ſpring in ſuch a way, that the heel falls into a notch of the ſtar, the uſe of which is, to limit the quantity the ſtar ſhall move if it is moved at all; for when any following point of the ſtar forces the leg forwards till it paſſes the heel, the ſpring then puſhes the heel in again, and forces the ſaid point forwards a little farther, till it ſtops under the foot, and till the next following point of the ſtar reſts againſt the back part of the leg where the motion is arreſted: a ſnail with four ſteps is faſt to the ſtar, and regulates the poſition of the piece 15 16 17 18 by ſupporting the end 18 of this piece, which projects towards the ſnail; hence it is eaſy to apprehend, that numbers 1, 2, 3, or leap year, will appear in the aperture of the dial, accordingly as ſtep 1, ſtep 2, &c. of the ſnail is preſented to the reſting point 18 of the plate with the four years marked on its anterior face. This contrivance, however, does not yet account for the 29th of February every fourth year: the additional mechaniſm for this purpoſe is the rack without teeth, marked 11, moveable on the centre of the annual wheel, but under it in *fig.* 1, with a concealed ſpring (dotted) preſſing againſt its concealed and dotted bar, ſo as to make it reſt on a ſecond ſnail behind the ſtar; for as the lever 10 for the monthly pins is carried by this rack, the ſaid lever may be made to meet the pins or recede from them, or any one of them, the quantity correſponding to a day, or more if it were required; thus the concealed ſnail, which has a contrary ſpiral, removes the pin anſwering to the laſt day of February ſo far from the correſponding pin in the annual wheel, that the hand D, in *fig.* 2, has arrived at the 29th diviſion or day-ſpace, before the click is detached by the lever 10, and thus February has 29 days every fourth year. It may be proper to obſerve here, that the fourth ſtep of the ſnail ſeen on the ſtar has an inclined plane to allow the end 18 of the four years plate to aſcend it without being ſet faſt, after a revolution has been completed. Hitherto we have ſaid nothing about the equation portion uſually but improperly deſcribed firſt, which we have deferred becauſe it depends on the motion of the annual wheel. On the point D, in *fig.* 1, the rack, E, moves, while its tail, C, reſts on the circumference of the equation curve, as it makes its annual revolution; at O is a ſmall box with a ſpring, which keeps the cord 15 always ſtretched; this cord ſurrounds a pulley on the plane of a concealed wheel N, under K, but not attached to it, with which wheel, N, the rack acts and is kept always reſting on the equation curve in every ſituation of the annual wheel; the pinion, I, revolves by the going part of the clock in 60 minutes, and carries the equable hand of the minutes, now pointing to 46 minutes in *fig.* 2; by the pinion I, which has 30 leaves, the wheel K of 60 teeth is driven; which in its turn drives another pinion, L, of 30 leaves; ſo that L revolves in an hour as though it acted immediately with I; to L is attached a wheel, H, of 48 teeth, which actuates a ſimilar wheel, F, and this again a third ſimilar wheel, G, the tube of which ſurrounds the arbor of I, and carries the hand with a little ſun on its pointing to 30^m in the dial, *fig.* 2, which hand moves irregularly, and may be called the *equation-hand;* its irregularity is thus produced; the wheel N, below K, is pinned to a bar which is not ſeen, but which bears the wheel H, and pinion L; and as the teeth of the rack are acting with the wheel N, the concealed bar, here ſpoken of, is made to move alternately towards I and 15, as the radius of the equation varies during the year; this motion of the bearing bar makes the pinion L ſometimes advance, and ſometimes retrograde a few teeth, independently of the motion it receives from the revolution of K, and this additional motion, produced by the rack to the bar on which L reſts, is alſo communicated to the wheel H in conſequence of its connection with L, and hence to both the ſimilar wheels connected with it, F and G, the latter of which gives the ſaid addition and retrogradation alternately to the equation hand borne by it. The motion conſtituting the equation, here ſpoken of, would be produced if the wheel K did not revolve at all, and therefore is derived entirely from the equation curve, which curve has its ſhape aſcertained from a table of the equation of time. In the poſition of the two minute hands the diſtance between them is 16^m, which is the quantity of equation ſubtractive at the end of the firſt week of November. The pinion of ſix or eight leaves attached to F, drives the hour wheel of 72 or 96 teeth not given here, which bears on its tube the hour hand pointing between II. and III. which hand therefore participates of the equated motion, and correſponds to the equation minute hand; the minute hand for mean time is uſed to ſhew, by its diſtance from the other hand, the quantity of the equation at any given time. The ſeconds are for mean time, and therefore correſpond with the minute hand of mean time. Between the ſmall wheel Q, which we have ſeen revolves in 24 hours, and the dial, is a ſmall circular dial-plate ſeen through an aperture below 40^m in *fig.* 2, the uſe of which is, to regulate the annual wheel, by a key inſerted in the hole at 40^m on the ſquare of the arbor of the wheel Q, agreeably to the hour of the day indicated by the clock, otherwiſe the monthly pins might not happen to detach the click of the ratchet-wheel that carries the month hand, D, at the exact termination of the month. Laſtly, between the wheels I and G, is placed a ſmall ſpiral ſpring, to prevent a ſhake in the hand carried by G, which the play in the teeth might otherwiſe have occaſioned. This mechaniſm, as we have ſaid, is very ingenious, and moſt of the other equation clocks have a ſimilar equation curve, without an allowance for leap year.

We have recently underſtood that Quare, of London, was the firſt inventor of an equation clock, but we do not vouch for our authority.

An Aſtronomical Clock, by Mr. Thos. Reid of Edinburgh.

It has been uſual, among horological writers, to call all thoſe clocks indiſcriminately *aſtronomical,* which are uſed in obſervatories for aſcertaining the right aſcenſions of the ſtars, whether the time indicated is ſolar or ſidereal, and alſo thoſe clocks which repreſent the motions of ſome or all of the heavenly bodies, by appropriate wheel-work ſuperadded to the uſual train: theſe two kinds of clocks, however, are of a very oppoſite nature, one of them rejecting every appendage that does not contribute to accuracy in the meaſurement of time, under all the changes of atmoſpheric temperature, and the other being loaded with cumberſome additional mechaniſm, calculated to produce great irregularities of motion in the going train, beſides being deſtitute of compenſation mechaniſm for the effects of heat and cold. They are, indeed, equally the produce of much ingenuity; but one is contrived and executed with the greateſt care for uſe, while the other is deſigned, calculated, and conſtructed for mere curioſity: one is as ſuperior in its meaſurement of time to a common clock, as a chronometer is to an ordinary watch; but the other may be conſidered, in general, as holding a rank, in this reſpect, as much below a common clock: we feel ourſelves, therefore, juſtified in giving diſtinguiſhing names to two machines, which, however they may be claſſed in one genus, are of very different ſpecies; the clock which is uſed in aſtronomical obſervations we ſhall call an *aſtronomical* clock; but the clock which exhibits the relative poſitions of the heavenly bodies, or of any of them, we ſhall call a *planetary* clock; of which kind is that which we have partially deſcribed as being in the palace at Hampton Court, and of which kind are moſt of Mr. J. Ferguſon's more complex clocks. Sometimes clocks are made on the principle to which we propoſe to give the appellation of aſtronomical, which yet are not uſed in obſervatories, but kept at the clock-makers, with the view of being made a ſtandard by which to judge of the rate of other clocks and watches not yet brought to time; theſe are uſually denominated regulators, but when they have good compenſating pendulums and the beſt eſcapements, they differ not from aſtronomical clocks in any thing but the name, which is borrowed from the uſe to which they are put of regulating the time by which the common clocks are to have their rate of going adjuſted.

We might have preſented the public with a great variety of aſtronomical clocks, each differing from the others in ſome particular peculiar to itſelf; but if we give the deſcriptions of a couple, all the other conſtructions, or the greateſt part of them, will be eaſily apprehended from our articles Escapement and Pendulum, which are as much the characteriſtic parts of an aſtronomical clock, as the eſcapement and balance are of a chronometer, which machine has been already deſcribed.

Plate XXII. of *Horology*, exhibits, in different points of view, an aſtronomical clock, made by Mr. Thomas Reid, of Edinburgh, of which his brother, who reſides in Clerkenwell, London, obligingly permitted our draftſman to take the requiſite drawings for rendering all the eſſential parts intelligible. *Fig.* 1, is a view of the movement, with the eye placed perpendicularly over it, and the front plate of the frame taken off; and *fig.* 2, is the whole frame detached from the caſe and viewed laterally, which poſition may be conſidered as a ſection, the other being the plan of the works; theſe two figures are laid down on a ſcale of one third of the original ſize; *fig.* 3, is an enlarged repreſentation of the pallets and eſcapement wheel, on a ſcale of one half the real ſize, and in a detached ſtate; *fig.* 4, ſhows the back of the great wheel of 120 teeth, together with the ſmall ratchet and auxiliary ſpring and detent in a detached ſtate, of one third the real ſize; *fig.* 5, exhibits the gridiron, or compenſating pendulum, with its cock and other parts of ſuſpenſion, of one eighth part of the real ſize; and *fig.* 6, gives an enlarged view of the part that receives the crutch immediately above the ſuperior end of the gridiron portion of the pendulum; we ſhall deſcribe theſe ſix figures in the order by which we have here enumerated them.

A A, in *figs.* 1 and 2, ſtand at the ſuperior end of the frame plates, above the pillars, which are omitted in the ſecond figure, that the eſcapement wheel may not be concealed thereby; B, in both figures, is the cylindrical barrel for the cord C, of the weight, which conſtitutes the maintaining power; the wheels and pinions are denoted by the numbers of their teeth thus; 120 is the great wheel revolving in twelve hours; 10 is the pinion driven by it on the central arbor; the ſmalleſt, 96, is the centre wheel; 12, the pinion on the ſecond wheel-arbor, which arbor has alſo the ſecond wheel of the train, marked 90, impelling another pinion of 12 on the arbor of the third or eſcapement wheel of 30 teeth; the other two wheels of 96 each, revolving alike in 12 hours, are inſtead of dial-work. The ſmall ratchet wheel has 40 teeth, and the large one or perpetual ratchet 200, that the teeth of its circumference may be numerous enough to catch the detent G, *figs.* 1 and 4, without allowing the intenſity of the auxiliary ſpring, H, to be remitted; but the exact number of teeth is of no importance, provided they be both numerous and ſtrong enough to anſwer the deſired purpoſe; the number is here mentioned to ſhow that the wheel has been cut in an engine which divided it into 200 equal ſerrated teeth. The ſpring, which is here a ſubſtitute for the maintaining power, during the time of winding up the clock, has its extreme ends brought nearer together than was the caſe with the auxiliary ſpring of the chronometers which we have above deſcribed, but the office performed is preciſely the ſame, the only difference is in the mode of application; here one end of the auxiliary ſpring is attached to the great wheel, and the other preſſing againſt the ſide of one of the croſſes of the great ratchet, or perpetual ratchet, and when the two ends of the ſpring are brought nearly together, their effort to ſeparate becomes a temporary ſubſtitute for the maintaining power. The hour hand revolves in 12 hours along with the arbor of the great wheel of 120 teeth, on which it is placed by ſimple friction without a ſquare; the long hand E, *fig.* 2, ſhows minutes from the arbor of the centre wheel, on a circle of 60 ſurrounding all the hands; and the third hand F, ſhows ſeconds on the arbor of the pallet wheel; this hand has a very ſmall recoil on account of the faces of the pallets not being portions of concentric circles. The pallets have each a piece of agate to ſuperſede the uſe of oil, and are of the iſochronal kind, acting with teeth of a peculiar ſhape, both of which will be more particularly deſcribed under the article ESCAPEMENT: the two agates are retained in the hollow parts of the anchor of the pallets by three ſcrews applying to each, two of which are viſible in each pallet in the enlarged *fig.* 3; and the two vertical lines below the wheel of this figure repreſent, one of them, the poſition of the pendulum correſponding to the preſent ſituation of the pallets; and the other, which is drawn a little aſide, the ſituation of the ſame at the inſtant of eſcaping; which with other particulars of this eſcapement will be more minutely detailed hereafter, according to our recent reference. The frame is mounted by four pillars, ſituated near the four corners of the two plates, at the ſmall circles in *fig.* 1; and is firmly attached to the bracket or bearing piece L, *fig.* 2, at the ſuperior part of the caſe, by the connecting cocks, K and K, ſcrewed both to the frame and piece L. Though there is no dial-work in this clock, yet there are four little cocks, *a*, *b*, *c*, and *d*, on the front plate of the frame, the uſe of which is to make the wheels and pinions fall as nearly as can be at the middle of their reſpective arbors, ſo that there may not be more preſſure at one pivot than at the oppoſite one of any arbor; a refinement which few other makers have attended to in their conſtructions. The French clock-makers have given an appropriate name to each end of the arbor, depending on the diſtance of the pivot from the wheel it bears, one end being called the *tige*, and the other the *tigeron*. The author of this conſtruction attaches, and very properly, ſome importance to the poſition in which the great wheel and cord of ſuſpenſion are placed, with reſpect to the centre pinion; it may be ſeen from an inſpection of *fig.* 1, that the weight ſuſpended by the cord C, reſting on the acting tooth of the great wheel, does not preſs ſo much on the pivots as it would do if placed at the oppoſite ſide of the barrel: for in one caſe the preſſure on the pivots may be ſaid to be halved, but in the other doubled; ſuppoſing the barrel and wheel to be to each other as 1 : 2; beſides, an uniformity of appearance is thus preſerved in the three circles of the dial, which, we have not before ſaid, is attached to the frame by pillars, two of which are ſeen in *fig.* 2, at *e* and *f*.

The pivots of all the arbors are made cylindrical, and act in conical holes in the cocks before, and in the plate behind, which holes have the ſmaller ends continued through the metal, at the back faces of which is preſented the conical point of a piece of ſteel, to each fixed to the cock in ſuch a way, that a drop of fine oil lies between it and the pivot, detained by its coheſive attraction in the form of a ſpherule: this contrivance keeps the oil in its place better than counterſunk holes would do, and preſerves it from impurities longer; the ſteel pieces at the pivots entering the pillar plate, are ſeen at *g*, *h*, and *i*.

Fig. 4, requires no further explanation than we have given of the great wheel and perpetual ratchet in *fig.* 1, except that the under-ſide is here preſented to view, and that the ſame letters of reference apply to both figures. *Fig.* 5, is a repreſentation of the gridiron pendulum, which we have ſaid was invented by J. Harriſon; the dimenſions in the drawing are on a ſcale of one eighth of the real ſize of all the parts. The two obtuſe angled cocks, *a* and *a*, braced with croſs pieces near the top are firmly attached to the bearing part or bracket, L, in *fig.* 1, which has a portion taken out between L and L, in *fig.* 5, for the pendulum to vibrate in, but which cannot be ſeen in the poſition in *fig.* 1, where the cocks are on a larger ſcale, and where one of them is hid by the other, which appears as a ſtraight vertical piece of metal above M; which M denotes the edge of the pendulum in this figure: on the ſuperior ends of the two cocks is made an angular notch called a Y, the top of which it reſembles, in which the pivots of a tranverſe piece of ſteel, *b*, reſt; this tranſverſe piece has a central ſquare hole that receives a little rod by which the pendulum is ſuſpended by a ſlip of watch main-ſpring, tapered a little downwards; the three pins, one above the tranſverſe piece, *b*, and the other two at the oppoſite ends of the ſlip of ſpring, may all be ſeen in the figure without more particular reference; the rod attached to the upper end of the gridiron is of ſteel, and has an oblong hole with a pair of agates fixed in it, ſo as to form the ſides of the oblong hole, ſeen on a larger ſcale in a detached ſtate in *fig.* 6; the uſe of this long aperture is to receive the pin of the crutch, carried by the arbor of the pallets, as ſeen at N, in *fig.* 2. By this method of ſuſpending a pendulum, the ball has liberty to find its own perpendicular ſituation without twiſting the ſlender ſpring of ſuſpenſion, and the tranſverſe piece, *b*, having ſhoulders to keep it ſteady within the frame compoſed of the cocks, *a* and *a*, prevents any motion or ſhake that might otherwiſe be occaſioned by the vibrations of a heavy pendulum; alſo the pendulum may be put into exact beat, by forming the ſhoulders of the tranſverſe piece, *b*, ſo exactly at each ſide of the centre, that the crutch may not require to be bent; and if a ſlight deviation from true beat be obſerved when the cocks are mounted *pro tempore*, a ſlight lateral motion in them, before final fixing, will rectify the beat; or the poſition of the agates of the crutch pin might be reſorted to for adjuſting a very minute deviation from true beat; or, laſtly, an adjuſtment of the bearing part, L, might be recurred to; but we think it is of importance not to alter the central ſituation of the oblong aperture where the crutch-pin acts, leſt this pin ſhould not impreſs its force to a point perpendicularly over the centre of gravity of the pendulum, and ſhould thereby produce a vacillation in the vibrations, which would be injurious to the exactitude of their obedience to the laws of gravity. The compenſation for heat and cold, and adjuſtments for time and temperature of this gridiron pendulum, may be explained thus; as we have not room to put in the letters of reference between the bars of the gridiron portion we propoſe to call the rod attached to the ſpring of ſuſpenſion 1, which is the middle rod of the nine parallel ones; the two contiguous rods, one at each ſide of N°. 1, we ſhall deſignate by the figures 2 and 2, reſpectively; the two next in order to the right and left from N°. 1, we ſhall call 3 and 3; in like manner the two next at each ſide, correſponding to each other, we ſhall name 4 and 4; and the two extreme ones, 5 and 5, reſpectively; this mode of deſcription will ſhorten the circumlocution we muſt otherwiſe have been obliged to uſe: N°. 1, we have already ſaid, is a ſteel rod proceeding downwards from the point of ſuſpenſion; it has a ſhort croſs-piece, to which are faſtened the inferior ends of the rods, 2 and 2, which are of braſs, and conſequently more expanſible than ſteel; theſe rods, which may be conſidered as one ſo far as relates to their expanſion, proceed upwards to another croſs-piece ſomewhat longer than the firſt, to which their upper ends are faſtened: again another pair of rods, 3 and 3, of ſteel are faſtened to this ſecond croſs-piece near its extremities, ſo as to include the three former rods, and deſcend down paſt the ends of the firſt croſs-piece into a third croſs-piece, below the firſt, to which third piece they are united: this third piece alſo ſupports another pair of braſs rods, 4 and 4, which aſcend to the uppermoſt or fourth croſs-piece of the gridiron, to which they are alſo attached; and, laſtly, another pair of ſteel rods attached to the extreme ends of this fourth croſs-piece, ſo as to include all the former ones, deſcend to the loweſt or fifth croſs-piece, to which they are attached, and by which the gridiron frame is completed. The effect of the expanſion of the deſcending rod, 1, is to lower the firſt croſs-piece; but the effect of the expanſion of the two aſcending rods, 2 and 2, is to elevate the ſecond croſs-piece more; the effect produced by the pair, 3 and 3, as this effect relates to the third croſs-piece, is ſimilar to the effect of rod 1, on the firſt croſs-piece; alſo the effect of the pair of braſs rods, 4 and 4, on the fourth croſs-piece, is ſimilar to that of bar 2 and 2, on the ſecond croſs-piece; and, laſtly, the effect of the pair, 5 and 5, of ſteel bars on the height of the fifth or laſt croſs-piece, is analogous to the effect produced by the pair, 3 and 3, on the third croſs-piece, as above deſcribed: the total effects of the deſcending and aſcending bars are ſtated to be thus in the clock before us: *viz.*

Expanſion downwards by rod 1,	=	1
Do. - - by rods 3 and 3,	=	1
Do. - - by rods 5 and 5,	=	1
Total	=	3
Expanſion upwards by rods 2 and 2,	=	1.56
Do. - - by rods 4 and 4,	=	1.56
Total	=	3.12

Hence the difference between the total elevation and total depreſſion of the ball, which is ſuſpended by the loweſt croſs-piece, is $\frac{12}{100}$ which quantity of exceſs of the aſcending bars is taken as an equivalent for the downward expanſion of the ſpring of ſuſpenſion, and that part of the ſteel rod, 1, which is above the gridiron portion; and if this quantity on trial ſhould be found to be an exact balance, the compenſation of the pendulum will be perfect, and the centre of oſcillation of the whole pendulum will continue unchanged as it regards the point of ſuſpenſion under all the variations of temperature. Whenever it is found that the calculation for the reſpective lengths of the expanſion bars has been erroneous, or the materials imperfect, the adjuſtment for temperature muſt be made by altering the ſituation of the firſt croſs-piece, ſo as to lengthen or ſhorten the pair of braſs bars, 2 and 2, as they regard the ſteel bar 1; it is better to make the braſs ſomewhat too long than too ſhort for the ſteel bars, becauſe this croſs-piece can be raiſed when it cannot be lowered beyond a certain limit depending on the proximity of the third croſs-piece; and if that limit ſhould be found too circumſcribed, the croſs-piece above, which has four bars faſt to it, muſt neceſſarily be lowered, which will be attended with ſome trouble.

The adjuſtment for time is made by means of a nut with a milled head, under the ball of the pendulum, the ſocket of which nut, is tapped to ſuit the thread of the ſhort rod attached to the loweſt croſs-piece of the gridiron frame by which the ball is borne, ſo that the ball reſts not with its inferior edge on the nut itſelf as in ordinary clocks, but has a pin in its centre which reſts on the upper end of the nut's ſocket, and which ſlides in a ſlit made in the bearing rod above and below, as well as at the centre of the ball for the ſake of allowing an aſcending and deſcending motion of the inſerted pin borne by the central hole of the ball. The uſe of this contrivance is to prevent any effect on the pendulum produced in general by the upward expanſion of the ball itſelf, for the ball being circular, will in this caſe expand from the bearing pin in the centre, alike upwards and downwards, as well as in a lateral direction to the right and left. Strictly ſpeaking, however, the bearing pin to have its true ſituation for preventing all effect from the expanſion of a large ball, ought to be placed in ſuch a ſituation as ſhall have a regard to the centre of oſcillation of the pendulum conjointly with the weight and dimenſions of the ball, which, in ſo complex a pendulum, conſtitutes a difficult problem to ſolve in all the variety of caſes likely to ariſe in practice.

This pendulum has a weight of 9 pounds, and the clock goes eight days with a weight of 16½ pounds, falling 4 feet 10 inches in this ſpace of time.

We are informed by Mr. Reid's brother, that the arc of eſcapement in each excurſion is two degrees, and that the remaining portion of the ſaid excurſion is one degree; hence the whole arc of vibration is juſt 6° with the weight already mentioned. The peculiar property of this eſcapement, as will be ſeen in another place, is, that whatever be the maintaining power, or the total arc of vibration, the partial recoil which it has renders all the vibrations iſochronal.

It is ſcarcely neceſſary to add, that an aſtronomical clock, like a chronometer, ought to have all its adjuſtments made with great care, in order that ſome dependence may be placed on its rate of going under all circumſtances.

An aſtronomical Clock, with Troughton's Pendulum.

Each aſtronomical clock has uſually ſome part or parts peculiar to itſelf; the clock, which we are now about to deſcribe, differs from the preceding one in various particulars, but principally in the ſtructure of its eſcapement, pendulum, ſuſpenſion, and pivot holes. *Plate* XXIII. explains the works, and *Plate* XXVII. the pendulum and ſuſpenſion of the clock before us: we will firſt deſcribe *Plate* XXIII. *Fig.* 1, is a view of the movement, with the front plate removed, and the eye perpendicularly over the centre, which therefore may be called the plan of the movement; *fig.* 2, is a ſection, or ſide view of the frame, containing the movement, a part of the ſuſpenſion and pendulum, and the dial-work, face, and hands; *fig.* 3, is a front view of the front plate of the frame, as ſeen with the hands and dial off; and *fig.* 4, is the eſcapement-wheel and pallets of the dead beat kind. In *figs.* 1 and 2, A is the great wheel with 120 teeth, and a perpetual ratchet of the ſame number of teeth, ſimilar to the one deſcribed in the going fuſee of Brockbank's chronometer, which great wheel impels the centre pinion, *a*, of twelve leaves in an hour; the arbor of this pinion carries the minute hand, or large hand ſeen in *fig.* 3, moving from the centre of the dial; B is the centre-wheel, of 96 teeth, on the ſame arbor, driving the pinion, *b*, of 12 leaves; and C is the ſecond wheel of the train, with 90 teeth, urging the pinion *c*, of 12 leaves, on the arbor of the pallet or eſcapement-wheel D, which, as uſual, has 30 teeth; this wheel revolves in $\frac{12}{96} \times \frac{12}{90}$ of an hour, which is exactly one minute, and therefore carries the hand of the ſeconds, or ſmall hand, ſeen in *fig.* 3, above the minute hand. For a particular account of the dead-beat eſcapement, we beg leave to refer to the article ESCAPEMENT, a deſcription of which in this place would lead us out of our purpoſe; *e* and *f* are two cocks on the pillar-plate or back plate, into which the arbor, *g*, of the guard-gut, *h*, is pivoted; and *i* is the ſpring of the guard: below D, in *fig.* 2, is the arbor of the detent of the perpetual ratchet; and below *g* in the ſame figure is the arbor of the ſmall dial-plate, and its wheel *k*, ſeen on the frame in *fig.* 3, by a front view; this wheel has 192 teeth, and borrows its motion from a pinion of 8 leaves on the arbor of the centre wheel, theſe numbers of teeth being to each other as 24 to 1; they are the only dial-work this clock has got; the dial-wheel might have had a hand like the centre wheel, but it would have had its motion retrograde, on which account a light plate, equally poiſed, and neatly engraved, is put on behind the principal dial inſtead of it, and the hours are read through a circular aperture made in the large dial, and a fleur-de-lis on the front of this large dial ſerves as a ſtationary hand for indicating the hour on the revolving plate, which makes a revolution in a day. At *l*, on the arbor of the centre wheel, behind the dial, is a lever for counterpoiſing the minute hand, which, being long, of courſe has a ſenſible weight, that would act alternately with and againſt the maintaining power as reduced at this arbor, if there were no ſuch counterpoiſe. The four black circles, at the four corners of *fig.* 1, are the four pillars pointing to the eye, and near the centre wheel is the fifth; their correſponding outer ends are ſeen in ſimilar ſituations, with their faſtening ſcrews in *fig.* 3; the other four black circles, within the pillars in *fig.* 3, are the holes for receiving the pillars of the large dial, or face of the clock, two of which pilars, *m* and *n*, are ſeen in *fig.* 2, and alſo the edge of the dial *o p*. The frame is ſcrewed to E, the bearing part of the caſe, by two ſcrews paſſing through this piece and entering the lower pillars of the frame, one of which ſcrews is ſeen in *fig.* 2, at F, and the other is on the oppoſite ſide. The pivots of the pallet's verge, of the pallet-wheel arbor, and of the ſecond-wheel arbor, all run in jewelled holes in the ſmall cocks, 1, 2, and 3, reſpectively in *figs.* 2 and 3, and the piece 4, in *fig.* 3, covers the end of the detent-arbor pivot. This clock, which was made by the Brockbanks, and which is the property of Mr. Ed. Troughton, is finiſhed in a very ſuperior ſtile of workmanſhip; and though for many years it has been regulated by a pendulum compoſed of a glaſs tube and bulb containing quickſilver, which was Troughton's improvement on Graham's quickſilver pendulum, yet its performance has at leaſt equalled, if not ſurpaſſed, in accuracy and ſteadineſs of rate, the going of any other clock that has been conſtructed; if we may credit the report of an individual every way qualified to judge not only of its abſolute but comparative excellence: the pendulum, however, which is here made a part of this clock, is of recent invention, and we have great reaſon to believe will ſhortly ſuperſede all the other compenſation pendulums that have preceded it, on account of its poſſeſſing the following properties almoſt excluſively: firſt, it has all the advantages of oppoſite expanſions which the common gridiron pendulum poſſeſſes; ſecondly, the arrangement of the metallic parts gives it the ſimplicity in appearance of a ſingle rod, as well as a diminiſhed reſiſtance of the air in its vibrations; thirdly, it has great ſtrength without much weight above the ball; fourthly, its centre of oſcillation, compared with the centre of the ball, or with the centre of gravity, may conſequently be very nearly determined; fifthly, the motions of the compenſating parts upwards and downwards are not effected by jerks, but are progreſſive and ſteady, while yet the parts are ſufficiently braced to preſerve their relative ſituations and figures; ſixthly, the compenſation not only includes the ſpring of ſuſpenſion, and is adjuſtable for temperature, but has its adjuſtment for temperature made, independently of the rate of going, by a new pyrometer of great ſenſibility, and free from the uſual objections againſt pyrometers; ſeventhly, it is capable of being put into beat without altering the ſhape of the crutch, or of any other part; and, laſtly, it is capable of adjuſtment for rate even while going. It would have been more conſiſtent with our general plan to have given an account of the pendulum in queſtion under the word PENDULUM, but as that article is a remote one, the reader will doubtleſs have no objection to have the deſcription here. The common gridiron pendulum has already been deſcribed in our preceding ſection, and its mode of compenſation explained; therefore we need not uſe much circumlocution in our preſent detail. *Fig.* 1, of *Plate* XXVII. of *Horology*, ſhews a front view of the pendulum as ſuſpended by a board or plug attached to a ſolid wall; and *fig.* 2 is a ſide view of the ſame: *fig.* 3, which repreſents pretty nearly the common gridiron pendulum, is a repreſentation of the compound part of the pendulum with the rods placed to the right and left of the central one, for the ſake of being all ſeen, inſtead of being arranged round it, as they ought to be agreeably to the circular ſection below, which is the true arrangement, but which is not ſo eaſy to be apprehended by mere verbal deſcription, as we preſume it will be from the preſent, though unnatural, figure. The middle rod, reaching to the ſuſpenſion, is of ſteel, which, as before, we will call 1, deſcending to the croſs-piece *a*, which is a circular plate perforated with a central and four other holes, as ſeen in the ſubjoined ſection; under the central hole of this circular piece the rod 1 is pinned; then inſtead of a pair of braſs rods aſcending contiguous to, and at each ſide of, this central ſteel rod, as uſual, a braſs tube has its lower extremity faſt to the circumference of this ſmall plate *a*, and aſcends within a ſecond larger tube to another ſimilar circular plate *b*, with five holes likewiſe, to which it is attached in like manner; the two braſs tubes are ſo cloſe together, that they appear as one, except that the inner one is darker than the other in the figure; to the plate *b*, above the aſcending inner braſs tube, are faſtened two ſteel rods, which we will here denominate 2 and 2, appearing contiguous to the rod 1 in the figure, but actually at the ſame diſtance as the next pair denominated 3 and 3, which pairs ſtand at right angles to one another, as ſeen in the ſection under the figure; the pair of ſteel rods, 2 and 2, having deſcended from *b*, paſs through a pair of the holes of *a*, and are pinned under a tranſverſe circular piece, *c*, that has only four holes in it; to the circumference of this piece, *c*, is made faſt the outer braſs tube that hides all the rods and other tube, and that aſcends to a fourth circular piece, *d*, which forms an end-piece to the large tube, to which it is ſcrewed faſt; laſtly, the pair of ſteel rods, 3 and 3, are made faſt to the end-piece *d*, and deſcend through the other pair of holes of the three pieces, *b*, *a*, *c*, to a fifth croſs-piece, *e*, under which it is pinned, and by the central hole of which the ball of the pendulum is hung at its centre, or nearly ſo. This ſubſtitution of two braſs tubes for four braſs rods, together with their end-pieces, and the mode of arranging the fine ſteel rods within the tubes, afford all the properties united which we have previouſly mentioned; and it is eaſy to ſee that ſhortening either the rods of ſteel, or the braſs tubes, will alter the ratio of the reſpective aggregates of their length, ſo as to increaſe or diminiſh the effect of the oppoſite expanſions, till they exactly balance one another, when a delicate and very exact meaſure is taken from the point of ſuſpenſion to the centre of oſcillation: this meaſure is taken with great eaſe and accuracy by the new pyrometer which we have ſeen uſed, but which has not yet been publicly deſcribed, and the principle of which we do not feel ourſelves at preſent authoriſed to announce; when the author has gone through all his pyrometrical experiments, moſt probably he will lay before the public the conſtruction and the experiments at preſent in hand, both of which, no doubt, will prove intereſting. Indeed we can now venture to refer the reader to our article PYROMETER for the information we have ſpoken of, preſuming upon the experienced liberality of the author. Above the end-piece, *d*, of the outer braſs tube is a ſmall tube of the ſame metal ſurrounding the ſteel rod that aſcends to the ſuſpenſion ſpring, the uſe of which is to receive the fork of the crutch and to guard the ſteel from the oxiding influence of the air, as well as, it is probable, the other rods will be preſerved, by being encloſed in the braſs tubes. If we can diſcover any thing like the ſhadow of an objection to this ſtructure of the compenſation-pendulum, it is, that the included ſteel rods not being expoſed to the air, may not be ſo ſoon affected by atmoſpheric changes of temperature as the braſs tubes; but we can hardly perſuade ourſelves that the difference will ever be ſo ſenſible as to affect the rate of going of the clock, ſeeing all the parts are very contiguous to one another throughout the whole length, and muſt conſequently affect one another's temperature, by that general contiguity, at all times.

Figs. 4, 5, and 7, are views of detached parts of the ſuſpenſion, and *figs.* 8 and 9 of the crutch, all which we come now to explain, as eſſential appendages of the pendulum. We have already ſaid, that E, in *fig.* 2, *Plate* XXIII. is the bracket on which the frame is fixed; to this bracket the braſs triangular frame G is ſcrewed faſt, different views of which may be ſeen in *figs.* 1, 2, and 5, of *Plate* XXVII., as well as in *fig.* 2, *Plate* XXIII., in the laſt of which the ſcale is larger than the others; at the top of this frame is a milled nut, and under it a micrometer head, *a*, in *figs.* 1, 2, and 3, of *Plate* XXVII., with 22 diviſions on the circumference of the micrometer head to ſuit the fineneſs of the threads of the ſcrew, by which the adjuſtment for rate is made; below the divided head is a ſquare piece of metal, *c*, in *fig.* 4, which in *figs.* 1 and 2 is concealed within a tube having a ſquare hole, ſeen at *c*, in *fig.* 5, ſeparately; to the ſuperior end of this tube with a ſquare hole is an index made faſt, pointing to the divided head, ſeen alſo in *fig.* 5, which figure 5, is a detached view, on a larger ſcale, of the part *b* in *fig.* 2; at the lower end of the ſquare piece *c*, in *fig.* 4, is the piece of watch main-ſpring, called the ſpring of ſuſpenſion, to which the middle ſteel rod of the pendulum is pinned; that part of the piece *c*, which receives the nut and divided head, being tapped, draws the pendulum up and down when the divided head reſts on the frame G, and is turned in a proper direction; the cock *b*, with its tube *c*, is ſhewn as detached from the frame G, in *fig.* 5, but the manner in which this cock is attached to the frame, may be ſeen from the fittings; the dove-tailed piece, *d*, when detached from the cock *b*, enters the dove-tail of the cock G from *d* behind, above G, before the faſtening ſcrews attach it to the cock *b*, while the cock reſts on the ſhoulder of the frame G. *Fig.* 7, is a front view of the cock *b*, in *fig.* 5, and is on an enlarged ſcale, as compared with the ſame in *fig.* 1; *b* in this *fig.* 7, is a thumb-ſcrew, which draws the two pieces, *e* and *f*, together, between which the ſuſpenſion ſpring is clamped, after the adjuſtment for rate is finiſhed; ſo that in fact, the lower edge of theſe two clamping pieces, *e* and *f*, may be called the point of ſuſpenſion, as it relates to the diſtance from the centre of oſcillation of the pendulum; and is, therefore, the point from which the effective length of the pendulum ought to be meaſured; the ſcrew over *e*, which holds this piece to the tube, *c*, is in an oblong hole which allows the piece, *e*, to move without the ſaid tube. *Fig.* 6, is a front view of the frame top, when *fig.* 7, is taken off, the piece, *d*, in the cock, as ſhown in *fig.* 5, is here ſhown in its place inſerted into the oblong dove-tailed hole of the frame, G, together with the two ſcrew-holes at each ſide of the letter, *d*; when the cock in *fig.* 7, is placed ſo as to cover the ſliding-piece, *d*, in *fig.* 6, and is ſcrewed faſt to this piece by two ſcrews from behind the frame, it is evident that, when one of the two lateral preſſing-ſcrews, *s* and *s*, is turned forward and the other back, the ſliding-piece, *d*, and with it the whole cock in *fig.* 7, will move from right to left, or the contrary, as the caſe may be, and conſequently the pendulum, borne by this cock, as in *fig.* 1, will have a lateral adjuſtment, to bring the clock into exact beat without the rough treatment of bending the crutch, which is often done in other clocks; when the ſcrews are all faſt, however, the cock is as ſteady, as though it had neither the vertical nor horizontal adjuſtment; and as the pin at the lower end of the ſquare piece, *c*, *fig.* 4, is ſmaller than the hole in the upper end of the ſuſpenſion-ſpring, the pendulum finds its own vertical poſition before it is clamped, as well as if it were to be ſuſpended by Y^s and a horizontal axis, that admit not of adjuſtment for rate while the clock is going. *Fig.* 8, is the crutch, attached by the ſuperior end to the verge of the pallets, as ſeen behind the frame, in *fig.* 2, of *Plate* XXIII. where its fork embraces the braſs tube on the upper end of the pendulum, as ſeen in *fig.* 9, of our preſent plate; in Mr. Reid's clock, we have ſeen, a ſolid part of the fork entered an oblong hole in the pendulum, which hole was formed of two jewels to avoid friction; it may not appear to the reader at firſt why there ſhould be friction in this hole; but if he conſiders that the bent end of the crutch moves in a portion of a circle of ſmaller radius than the perforated part of the pendulum does, he will perceive that the crutch-pin muſt neceſſarily aſcend in this hole during the excurſion of the pendulum, and the more, the further the pendulum ſwings; to avoid the aſcent of the forked part of our preſent crutch, it is not firmly attached, as in general, to the lower end of the vertical part of the crutch, but the crutch is firſt bent into the form of an L reverſed, when viewed as in the plate, and then a pin is inſerted into the remote end, *a*, of the bent part to become a centre of motion for the lever of the fork, which has a ſmall tube moving round the pin ſo as to keep it in the ſame plane always, as ſeen in *fig.* 9; in *fig.* 8, the curve of the fork is in the ſame plane, facing the eye, as its lever; by means of this contrivance the fork, which holds the top of the pendulum-rod faſt, moves in the ſame radius of curvature with it, and though it riſes and deſcends alternately, as it regards the point, *a*, round which it has an unreſtrained motion, yet it continues to claſp the ſame part of the rod, and never ſlides from its hold, thereby avoiding all friction, except the inſenſible quantity at the point of motion, *a*. The ball of the pendulum is of the lenticular ſhape, but a little flattened at the circumference to allow it to hold more lead, and to be heavier than it otherwiſe would be. A ſmall portion of a circle is attached to the frame below the ball of the pendulum, at 48 inches from the point of ſuſpenſion, and a pointer demitted from the ball ſhows the number of tenths of an inch contained in the whole arc of vibration: this clock will go eight days, with a power of 3lb. 1½ oz. avoirdupois, falling ſix inches per day; its arc of eſcapement, on the ſcale, is 2.2 inches, and the total arc of vibration uſually, when the clock is clean, 3.4 inches; which numbers may be converted into degrees and minutes, thus: the circumference of a circle, of 48 inches radius, is very nearly 151 inches; therefore ſay, as 151 in. : 360° :: 3.4 in. : 8° 6′, the whole arc of vibration; alſo as 151 in. : 360° :: 2.2 in. : 5° 14′, the whole arc of eſcapement; hence each whole-excurſion is 4° 3′, and each arc of action on the pallets in that excurſion 2° 37′, in the clock before us; which quantities are to each other very nearly as 17 to 11. We do not profeſs to ſay that this is the beſt ratio to be adopted in practice between the arc of excurſion and the arc of action on the pallets, becauſe we believe that the experiments hitherto made on dead-beat eſcapements, to determine the beſt ſlopes of the faces of the pallets, have not been numerous enough to warrant a concluſion on this point, which, notwithſtanding, we think of great importance, and recommend to the notice of clock-makers. Mr. Nicholſon, the author of the "Journal of Philoſophy," &c. once informed us, in converſation, that his ſeconds pendulum clock with a dead-beat eſcapement, having its curves nicely formed in a lathe, does not vary its daily rate more than a ſecond per day, when the maintaining power is increaſed as much as four or five times, or more, which we believe, is not uſually the caſe with dead-beat eſcapements; we are not, however, at preſent informed of the exact quantity of the arc of action on the pallets, on which moſt probably the iſochronal property chiefly depends, though we were at the ſame time informed that the ſuſpenſion-ſpring is tapered from the top downwards, in a way that aids the longer vibration by quickening them. The ſubject is worthy of minute inveſtigation, particularly as Berthoud has aſſerted, that in his experiments he always found his clocks retard with the dead-beat eſcapement by the addition of weight to the maintaining power, and *vice-verſâ*, which was his reaſon for contriving his iſochronal pallets. The experimentaliſt, however, ought to bear in mind, that both the length of the arc of action and the modification of the impulſe vary with the ſlope of the pallet's faces in the eſcapement in queſtion.

CLOCK-*maker*. If we were to define the word clock-maker agreeably to the derivation of the term, we ſhould ſimply ſay that it means a man who makes clocks, and this definition, at one period of the art, would have been ſufficient for our purpoſe; but ſince clocks have become ſo common as to be conſidered as articles of houſehold furniture, the art of making them has not been confined, as at firſt, to one department of mechanics, but has gradually ramified into various branches, ſo diſtinct from one another, that the maker of one part is frequently unacquainted with the operations requiſite for the manipulations of another, equally eſſential. Since the time that clocks became an article of our manufactories, requiring various tools and engines for facilitating their conſtruction, the ſubdiviſion of the art into various departments was a natural conſequence, which has been found to contribute to expedition, and conſequently to cheapneſs; and, for the ſame reaſon that a tailor has no need to underſtand either ſpinning, weaving, or dying, a finiſher of a clock has now no occaſion to caſt or cut his wheels himſelf, much leſs to make his ſprings or enamel his dial-plate. From cuſtom, however, that man is called a clock-maker, who finiſhes or puts together the different conſtituent parts of a clock when made, and who has his profit from the ſale of the machine; though the makers, more properly ſpeaking, are the workmen employed in making the frame and contained wheel-work. The different operations may, indeed, be moſt of them performed by one workman, when the conſtruction is intended to be peculiar, or the works of ſuperior accuracy, but in general the different departments of the art may be ſeparately enumerated, agreeably to the ſubjoined order, *viz.*

1. The braſs-founder caſts the wheels, plates, pillars, and faces, according to approved models:
2. The ſpring-maker forges, ſhapes, and tempers the main-ſprings, to any required ſtrength or dimenſions:
3. The making of the weights, to be uſed as maintaining powers of the balls, or bobs, and hands, may be conſidered as one branch:
4. The man who keeps a cutting-engine and a fuſee-engine, cuts the wheels and pinions, and forms the grooves on the fuſee or barrel, accordingly as a ſpring or ſuſpended weight is uſed as a maintaining power:
5. The movement-maker mounts the frame, makes the wheels, pinions, detents, &c. and places them in the frame, agreeably to the propoſed calliper.
6. The clock ſmith forges the ſteel pieces for the arbors, pinions, pallets, rack, hammer, detents, &c.:
7. The bell-founder caſts the bell, or bells when the clock has chimes:
8. The enameller prepares the ground of the dial, or face, for receiving the colour of the figures, and gets the painter to lay on the figures, agreeably to the calliper, with or without a circle for the ſeconds:
9. When the face is not of real enamel, a japanner, or imitative enameller, prepares and finiſhes the dial:
10. When the face is braſs ſilvered, an engraver uſually prepares, and ſometimes alſo ſilvers it:

11. A jeweller is employed for the pallets and pivot-holes of the beſt aſtronomical clocks and regulators :

12. The gilder is frequently employed for preparing the ornamental parts of the caſe :

13. The glazier is applied to for the door of the ſuperior part of the caſe, when a ſeconds pendulum is uſed, and for the principal door ſometimes, when the clock has a ſhort pendulum :

14. The cabinet maker is reſorted to, uſually, for the caſe of the clock ; and ſometimes alſo the carver :

15. The chain or cat-gut maker is indiſpenſably neceſſary :

16. Recently the tubular compenſation-pendulum has been made and adjuſted, by the mathematical inſtrument-maker, as being a portion that requires great preciſion :

17. Laſtly, the finiſher, or, as he is otherwiſe called, the *maker*, poliſhes the teeth and ſteel parts, finiſhes the pivots, verifies the engagement, adjuſts the eſcapement, limits the arc of vibration by adjuſting the maintaining power to the weight of the ball, regulates the adjuſtments for beat and rate, finiſhes the ſtriking and repeating parts, and puts the whole machine into a ſtate ready for ſale.

CLOCK-*makers, Company of.* See COMPANY.

CLOCK-*making.* Clock-making, or the art of making clocks, ſeems not to hold that rank among the mechanical arts, which its connection with the ſciences, particularly that of aſtronomy, and alſo which the many ingenious improvements it has undergone by the help of ſcientific men, entitle us to expect. The cuſtom of working by piece-meal from eſtabliſhed models, which, it muſt be allowed, contributes greatly to expedition and cheapneſs, has, no doubt, conduced to exclude calculations and geometrical principles from the workſhops of the preſent day : whence it ariſes, that if we wiſh to be introduced to the workman who has had the greateſt ſhare in the conſtruction of our beſt clocks, we muſt often ſubmit to be conducted up ſome narrow paſſage of our metropolis, and to mount into a dirty attic, where we find illiterate ingenuity cloſely employed in earning a mere pittance, compared with the price which is put on the finiſhed machine by the vender of more eaſy circumſtances, though the latter has had little more trouble in the conſtruction than to order his name to be inſerted before it is placed for public notice in his bow-window. The practical departments of this art being thus frequently confined to the obſcurity of a garret, it is no wonder that a dexterity at performing certain manual operations, ſuch as hammering, filing, drilling, turning, ſoldering, tempering, poliſhing, &c. ſhould be conſidered as the perfection of the art, and that the reaſon is frequently not underſtood by the workman himſelf, and ſeldom by his employer, why the numbers of his wheels and pinions, and the ſhape, ſize, and diſpoſition of the different portions of his mechaniſm, are deemed preferable to others which he might have adopted as eaſily, if, in his apprenticeſhip, he had been ſo inſtructed. Indeed we have not in the Engliſh language any regular inſtructions for all the ſucceſſive portions of work to be performed in the conſtruction of a good clock, which want is much to be regretted ; for, until the clock-maker by profeſſion can proceed in his work on ſcientific principles, he muſt be content to be a mere ſlave of imitation in an art, which is capable of affording him genuine pleaſure, from the opportunities it affords, of calling in ſcience to his aid in every ſtep that he takes, through an infinite variety of practical conſtructions. It would tranſcend the limits preſcribed to our plan, ſhould we enter into a detail of all the minutiæ of the art, but as none of our predeceſſors have given the mechanician any information on this intereſting ſubject, we will give a ſuccinct account of the principal operations, as they preſent themſelves in ſucceſſion, which, if it may not afford the expert and informed workman much inſtruction, will, we preſume, gratify the curioſity of the inquiſitive mind, as far as the detail goes.

The firſt requiſite to be determined, is the kind of machine to be made choice of ; *viz.* whether the clock is to be portable or fixed ; how long it ſhall go at one winding up ; whether its maintaining power ſhall be a ſuſpended weight, or a ſpring ; what kind of a dial plate or face it ſhall have for the indication of time ; what ſhall be the nature of its eſcapement ; of what materials its pendulum ſhall be compoſed ; what ſhall be the time of a vibration ; and whether or not it ſhall have the ſtriking work : all theſe and ſimilar determinations, muſt be made before the work is put into hand. We will ſuppoſe that a portable eight-days clock, with a half-ſeconds pendulum, and a ſpring for a maintaining power, is fixed upon as the inſtrument to be made, which we will take as an example, on account of the variety of the parts which ſuch an inſtrument conſiſts of ; and, to render the account more complete, we will ſuppoſe that it be required to go whilſt it is wound up, and that, for the ſake of accuracy, it have the dead-beat eſcapement, and a compenſation pendulum ; the laſt of which is not very uſual in a portable clock.

The going Part of an Eight-days Clock.

1. *Calculation.* Having determined upon the kind of clock to be made, the firſt thing to be done, and that in which the clock-maker is generally deficient, is, to calculate the movement, or proper number of teeth in the wheels, and of leaves in the pinions, of the going part of the mechaniſm. Dr. Derham, in his "Artificial Clock-maker," has treated this ſubject at conſiderable length, and has laid down rules which have tended more to puzzle than aſſiſt the workman in the choice of his numbers ; he propoſes to take at random a certain number of vibrations per hour for a pendulum of an aſſumed length, to repreſent his train, and then to find the factors or numbers, which, uſed as multipliers, ſhall give the requiſite product, or nearly ſo ; after which each factor is repreſented by a ratio of two optional numbers, to conſtitute a wheel and its pinion. We will not follow the Doctor through his proceſſes here, but merely obſerve, that, by calculating his whole movement at one operation from an aſſumed number of vibrations, he has introduced a variety of ſuch trains into portable clocks and watches, as make a vibration of the ſhort pendulum, and an oſcillation of the balance, no exact fraction of a ſecond ; in ſhort he has begun at the wrong end of the buſineſs ; has firſt fixed on the length of his pendulum in inches, without conſidering exactly the number of vibrations it would make, and then calculated a train that would ſo nearly ſuit it, that the adjuſtment for time by the bob, would compenſate the defect of the numbers ; the conſequence has been, that the exact value of a vibration in a portable clock, and of an oſcillation in an ordinary watch, has hitherto been diſregarded in the conſtruction. On the contrary, we recommend to the clock-maker, firſt to fix upon his number of vibrations per ſecond, and then to calculate the true length of his pendulum, and exact value of his train agreeably to the number of vibrations per ſecond that he previouſly determined. The moſt ſimple way of calculating the numbers proper for the movement of any clock, intended to ſhow ſeconds, is, by dividing it into three portions, and then by calculating the wheels and pinions for each ſeparate portion, by a ſeparate calculation, beginning at the bottom of the train ; thus, we firſt fix upon the pinion of the hour arbor to be, ſuppoſe 8, which is a good practical number ; and as our piece is to go eight days, we will make

the fuſee to revolve in 12 hours, which conſtruction will require the great wheel on its arbor to be 8 × 12, or 96, becauſe the pinion of 8 revolves, with the minute hand on its projecting pivot, in one hour; hence if we divide 192, the number of hours in eight days, by 12, the time of one revolution of the great wheel, the quotient 16 will be the number of effective ſpiral grooves neceſſary to be cut on the circumference of the fuſee, in order that the piece may go juſt eight days. This portion of the movement is not, however, called a part of the train, but only determines, as has been ſaid, the time that the clock ſhall continue to go after each winding up of the maintaining power; and it is eaſy to conceive, that if a fuſee or a barrel, with 24 turns of the catgut or chain, were placed on the hour arbor, the clock would go a natural day without the large wheel; and alſo, that if an intermediate wheel and pinion were placed on the arbor between the hour arbor and the great wheel, the time of going might be prolonged to 10, 12, or even 20 times eight days, but then the maintaining power muſt be proportionably increaſed, which circumſtance renders ſuch a conſtruction by no means deſirable in a regulator, particularly as the auxiliary ſpring now in uſe will keep the piece in motion during the act of winding up.

The remaining portion of the movement is properly called the *train*, including thoſe wheels and pinions only, which are uſed for counting the vibrations made in an hour; the train is moſt eaſily aſcertained by two calculations, one for the two wheels and two pinions which multiply the minutes into ſeconds, and the other for that wheel and pinion, or thoſe wheels and pinions, which ſubdivide the ſeconds into vibrations; the former of theſe two portions of the train, like the firſt portion of the movement, or portion for the period of continuance, is the ſame for all clocks, let the time of vibration be what it may, a circumſtance not uſually conſidered; the ratio of velocity to be gained by the pinion on the arbor of the ſeconds hand, compared with the wheel on the arbor of the minutes hand, is required to be 60 : 1; which effect might be produced by one wheel of 300 teeth, and a pinion of 5 leaves, as is done in ſome of the ornamental French pieces; but the ſize of the wheel is cumberſome, therefore a pair of wheels, with a pair of pinions, one conſtituting a ratio or vulgar fraction equal in value to 8, and the other equal to $7\frac{1}{2}$, making $8 \times 7\frac{1}{2} = 60$, or any other two numbers making a ſimilar product, will produce the ſame effect with fewer teeth; for if the pinions be each 8, the wheels, in this caſe, will be reſpectively 64 and 60, the compound ratio $\frac{8}{64} \times \frac{8}{60}$ being equal to the ſimple $\frac{1}{60}$; and, by the ſame proceſs, if pinions of 10 had been choſen, the wheels would have been $8 \times 10 = 80$, and $10 \times 7\frac{1}{2} = 75$, which numbers would indeed have leſs friction than the preceding ones, by reaſon of their teeth acting at leſs depth, the diameters of the wheels remaining the ſame, and would moreover be capable of acting more behind than before the line joining the centres of the wheel and pinion; in like manner, pinions of 6 would require wheels of 48 and 45, and pinions of 12 wheels of 96 and 90, as may be ſeen in *Table* II. in our ſubſequent article, denominated Clock-*movement*.

The laſt portion of the movement, or ſecond portion of the train, for a half-ſeconds pendulum, will require only one wheel of 60 teeth on the ſeconds arbor, properly ſhaped for the eſcapement; for as one tooth in the dead-beat and common anchor eſcapements eſcapes completely at two vibrations of the pendulum, 60 teeth will eſcape, that is, a whole revolution of the ſeconds hand will be made, in 120 vibrations; if, however, the pendulum had been required to vibrate ſeconds, the wheel in queſtion, called uſually the ſwing wheel, in oppoſition to the crown-wheel, which requires another eſcapement, would have demanded only 30 teeth for that purpoſe; and if three vibrations had been fixed upon, the number to correſpond muſt have been 90, otherwiſe there muſt have been a wheel and pinion of the value of 3, like $\frac{8}{24}$, or $\frac{10}{30}$, in addition to the uſual ſwing-wheel of 30; or, which is the ſame thing, a wheel and pinion of the value of 6, like $\frac{8}{48}$, or $\frac{10}{60}$, muſt have been introduced between the ſeconds arbor and a pallet, or ſwing-wheel of 15. (See *Table* III. under Clock-*movement*.) Thus all the variety in the calculation of trains, where ſeconds are indicated, is confined, as we have intimated, to the laſt portion of the movement, and the calculation itſelf is ſo ſimple, that the mere altering of the numbers of the pallet-wheel will convert a clock with a ſeconds pendulum into one with half-ſeconds, and *vice verſâ*.

2. *Notation of the Numbers.* The calculation of numbers ſuitable for an eight-days clock with a half-ſeconds pendulum being thus readily obtained by three ſimple operations, which may be had by mere inſpection from the three tables contained in the article Clock-*movement*, the whole may be repreſented, and its value eſtimated again by a compound fraction thus: *viz.* $\frac{8}{96}$ of $\overline{\frac{8}{64} \times \frac{8}{60}}\Big|$ of $\frac{1}{60 \times 2}$ of 12 hours, or, which is the ſame thing in effect, thus, $\frac{8}{96} \times \frac{8}{64} \times \frac{8}{60} \times \frac{1}{60 \times 2} = \frac{512}{44236800} = \frac{1}{64800}$ of 12^h, or 86400 vibrations in 12 hours, which is the time of a revolution of the fuſee, and great wheel, 96, on its arbor, and therefore $\frac{86400}{12}$, or 7200 vibrations, each of half a ſecond in duration, in one hour, conſtitute the value of this train. This mode of notation gives the value better than any other perhaps that has been adopted; but the poſition of the wheels and pinions will be better underſtood from the ordinary mechanical method of writing them down; thus:

Great wheel 96
Pin. 8—64 hour wheel
Pin. 8 —60 ſecond wheel
Pin. 8—60 ſwing wheel
2 pallets.

Indeed it is difficult to write down the movement by any one notation that ſhall expreſs, at the ſame time, both the value and poſition of the wheel-work, on which account we recommend to the workman to write down his numbers by both forms, taking care in the method, by compound ratios, to put all the drivers under the line of diviſion, and all the driven ones above; ſo that when an aſcending movement is repreſented, the wheels may be the denominators, and when a deſcending one, the pinions. In our mode of calculation from the bottom of the train, the notation muſt be, as we have made it, aſcending.

3. *Proportioning.* The calculation of proper numbers being made and noted down, the next ſtage of the work is proportioning the diameters of the wheels and of their reſepective pinions, ſo as to tranſmit the maintaining power from the fuſee, or barrel in an ordinary 30 hours clock, to the pallets, and thence to the pendulum, to compenſate the loſs of motion which, when unaided, it would ſuſtain from friction and the reſiſtance of the air. If a wheel and pinion were to be made like two rollers, preſſing their edges againſt one an-

other, to produce a communication of rotatory motion, their diameters might and ought to be in geometrical proportion directly as their calculated numbers of teeth; but the force of the maintaining power would be too great to be ſuſtained by mere friction at the points of contact of ſuch rolling wheels and pinions; they have therefore been neceſſarily indented; and their teeth mutually inſerted ſo far into their correſponding ſpaces, as to prevent the revolution of one wheel or pinion without a correſponding motion produced in the next adjoining, which would not be the caſe with rollers, if a conſiderable force impelled them at one end of the train, and at the ſame time a retarding force oppoſed them at the other; for their ſurfaces, at the point of greateſt oppoſition to free motion, would mutually rub without effecting a communication of rotary motion beyond ſuch point. If now we call the points of contact of the two rollers, made in geometrical proportion to each other, or, in other words, the points where they pitch againſt one another, the pitch-line, and conceive a number of projecting little levers, or teeth, fixed at proper intervals from each other at theſe points of contact, in the circular pitch line of each roller, we ſhall have a true idea of two wheels properly proportioned to act together, which, when of unequal diameters, will not now be in geometrical proportion to each other, by reaſon of an equal lever, or length of tooth, being added to each ſeparately, after they were in exact geometrical proportion; moreover, it will be eaſily apprehended that the deviation from their original proportion, in the ſtate of rollers, will be the greater, the greater their diſparity of numbers. Hence it will be readily conceived, that the due proportioning of wheels and pinions is an important object in clock-making, for, ſuppoſing the teeth reſpectively of the true epicycloidal forms, inveſtigated under CLOCK-*movement*, unleſs the reſpective ſizes be properly adjuſted, the tranſmiſſion of the maintaining power, and communication of motion, will both be unequable, and the mechaniſm ſubject to rapid deſtruction. The uſual mode of proportioning, or ſizing wheels and pinions, as it is often called, is, firſt to make both a little too big for the propoſed calliper, and then, having rounded all the teeth of the pinion and a few of the correſponding wheels, to diminiſh the latter in the lathe, or turning frame, gradually, until, by ſucceſſive trials in the clock frame, they are found to act at a proper depth, when placed in the pivot-holes previouſly made; this vulgar mode we reprobate, as calculated to deſtroy the due practical proportions, and hope to ſee it baniſhed from the workſhops by the general adoption of a better method, which we have now to propoſe.

In proportioning wheels and pinions, after the numbers of their teeth are determined upon, two particulars are to be attended to, the coarſeneſs or ſolidity and the ſhape of the tooth; the former may be expreſſed by the number of teeth per inch in the circumference of the wheel; and the latter by the denomination epicycloidal: if a tooth were rounded in a circular ſhape, which we by no means recommend, the pitch-line would be conſidered as at one half the breadth of the tooth from the extreme edge; but when it is rounded, as we have recommended in our article CLOCK-*movement*, in an epicycloidal ſhape, or as the workmen call it, the *bay-leaf* form, Hatton has found, from numerous experiments, that the depth, or diſtance of the pitch-line from the circumference, will generally be $\frac{3}{4}$ of the breadth of the tooth in any wheel or pinion; and as the epicycloidal is the beſt ſhape for the regular tranſmiſſion of force and velocity, we will adopt it as the beſt for practice. We have juſt ſaid that when an epicycloidal tooth is uſed, the diſtance of the pitch line from the end of the tooth is equal to $\frac{3}{4}$ of its breadth, and if we ſuppoſe the tooth and ſpace cut to be reciprocally equal, we ſhall have the true acting diameter of any wheel or pinion greater than the geometrical diameter, which Camus calls alſo the primitive diameter, by $\frac{3}{4}$ of a tooth or ſpace, on each ſide of the centre, or $1\frac{1}{2}$ in the whole diameter; let now a ſpace or a tooth be called a *meaſure*, and there will be double the number of meaſures as teeth in any wheel; alſo let theſe meaſures of the circumference be reduced into meaſures of the diameter by the uſual ratio, of 3.1416 : 1, and then $1\frac{1}{2}$ added to ſuch geometrical meaſures of the diameter will give the proper acting diameter, which may be expreſſed in inches and parts when the meaſures per inch are known. For inſtance, let our great wheel and its pinion $\frac{8}{96}$ be taken at 12 teeth per inch at the pitch-line, which may in practice be more or leſs, according to the thickneſs of the metal compared with the maintaining power as modified at the wheel's circumference; the number of meaſures of the great wheel is 192, *viz.* 96 teeth and 96 ſpaces, each meaſuring 1-24th of an inch; then as 3.1416 : 1 : 192 : 61.1; therefore, if to the geometrical diameter expreſſed by 61.1 meaſures there be added 1.5, the ſum 62.6 or $62\frac{6}{10}$ will be the acting diameter in the ſame denomination, which are ſo many 24th parts of an inch; but $\frac{62.6}{24}$ gives 2.6 inches for the full acting diameter of the wheel in queſtion:—again, the pinion 8 has 16 ſimilar meaſures in its circumference, and by the ſame proportion the diameter will be 5.09 meaſures; to which if 1.5 be added, the acting diameter will be $5.09 + 1.5 = 6.59$, or with ſufficient accuracy $6\frac{6}{10}$, which divided by 24 as before, will give the ſame $\frac{27}{100}$ of an inch, or ſomewhat more than a quarter for the acting diameter of the pinion. Upon theſe principles Hatton ("Introduction to the Mechanical Part of Clock and Watch-work," page 334,) has conſtructed a table of the ſizes of pinions meaſured diametrically, and compared by a pair of callipers with a given number of teeth and ſpaces, in their correſponding wheels, which many workmen copy in practice; but as his calculations are founded on a ſuppoſition that the ends of the teeth are circular, requiring unity as the ſupplemental portion, we find them differ eſſentially from Berthoud's determination in his "Eſſai ſur l'Horlogerie," p. 172, tome i. and ſhall therefore inſert here a new table calculated on a ſuppoſition that the curve is epicycloidal, and that the circumference is to the diameter as 3 : 1, inſtead of 3.1416 : 1; the reſult of which mode agrees very nearly with Berthoud's experiments on the proper ſizes of wheels and pinions, and therefore we recommend it to the notice of the accurate workman.

Table of the true practical Sizes of Pinions.

Teeth in the Pinions.	Meaſures of the Wheel for a Diameter of the Pinion.
3	3.5
4	4.1
5	4.8
6	5.5
7	6.1
8	6.8
9	7.5

Teeth in the Pinions.	Meaſures of the Wheel for a Diameter of the Pinion.
10	8.1
11	8.8
12	9.5
13	10.1
14	10.8
15	11.5
16	12.1

The proceſs by which this table is calculated is ſimply this; multiply the pinion by 2 for the meaſures in the circumference; divide by 3 for the diameter, and add thereto $1\frac{1}{2}$ for the acting ſize; thus for the diameter of a pinion of 6, it is $\overline{6 \times 2 \div 3 + 1\frac{1}{2}} = 5\frac{1}{2}$ or 5.5; namely, $6 \times 2 = 12$, and $\frac{12}{3} = 4$ and $4 + 1.5 = 5.5$ for the meaſures; which laſt quantity taken by the callipers acroſs the extreme edge of the wheel will be 3 teeth and $2\frac{1}{2}$ ſpaces, or 3 ſpaces and $2\frac{1}{2}$ teeth, which are here ſuppoſed to be cut but not rounded.

The application of this table, it is preſumed, cannot be eaſily miſtaken by any workman who underſtands that the figures in the ſecond column, to the left of the decimal point, mean ſo many meaſures, either teeth or ſpaces, and the figure to the right of the ſaid point, ſo many tenth parts more of a meaſure to be added to the integral meaſures. It may be proper to add here that a proportioned pinion muſt be made ſomewhat ſmaller for a ſmall wheel than for a large one, and alſo ſmaller when driven than when it is the driver. We now know the numbers of our movement, and alſo that whatever the diameters of the wheels may be, our pinions of 8 muſt be turned in the lathe till their diameters are preciſely each 6.8 meaſures, or three teeth and very nearly four ſpaces, (taken by a pair of pinion callipers from their reſpective wheels, in a ſtraight line acroſs the ends of the teeth) either before or after they are ſlit, as the operation of dividing and cutting is called by the workmen. The diameters of the wheels are uſually made to diminiſh as the train aſcends, probably becauſe the force to overcome their inertia diminiſhes, and the friction alſo is leſs in fine teeth with ſlender pivots, than in coarſe ones with thick pivots: indeed there ſeems to want a ſtandard rule for the guide of workmen in this particular. Having taken the great wheel at 12 teeth per inch, meaſured at the pitch line, we will take the centre wheel of 64 at 14, and the ſecond wheel of 60 at 16, which will make ſomething like a regular diminution in the ſizes in the aſcent of the train, and allow us room enough in our plates for the repreſentation. From theſe data, by the help of the foregoing directions, we readily aſcertain the requiſites for drawing the calliper as expreſſed in the ſubjoined table.

Table of Wheels and Pinions.

Wheels.		Teeth per Inch.	Acting Diameters in Inches.	Geometrical Diameters meaſured from the Pitch Lines.
Great wheel	96	12	2.60	2.55
Its pinion	8	12	0.273	0.21
Centre wheel	64	14	1.514	1.46
Its pinion	8	14	0.234	0.18
Second wheel	60	16	1.24	1.19
Its pinion	8	16	0.207	0.16
Swing wheel	60	16	1.24	

Pennington, of Camberwell, the ingenious mechaniſt who conſtructed Mr. Mudge's time-piece, and gave the drawings in Mr. Mudge's pamphlet, has paid particular attention to the ſubject of ſizing wheels and pinions, and has publiſhed a ſmall pamphlet, recommending the uſe of his method of calculation by a ſector of a peculiar conſtruction; but we do not find that its uſe has become general. On conferring with him, we were informed that his practice is, to add $2\frac{1}{2}$ meaſures of the geometrical diameter to the wheel, and $1\frac{1}{2}$ to the pinion, in watch-work, when the wheel is the driver; and $1\frac{8}{10}$ to each, when the pinion is the driver. This rule, it will be ſeen, differs very little from our theory above laid down, where we obſerved that the driver ought to be ſomewhat larger than the proportion aſſigned by the addition of $1\frac{1}{2}$ parts or meaſures to each, and more particularly where the wheels have ſmall diameters, as is the caſe in watch-work. But, as the good action of wheels and pinions depends upon their being duly proportioned and callipered, as well as on a proper ſhape being given to the teeth, the latter of which requiſites is deſcribed under Clock-*movement*, we will not ſatisfy ourſelves with having given our own method of ſizing, which it is poſſible the unlettered portion of the workmen may not underſtand, by reaſon of its requiring ſome knowledge of arithmetical proportion, but we will add moreover the method of ſizing pinions practiſed and recommended by F. Berthoud, in his "Eſſai ſur l'Horlogerie," which is as follows; *viz.*

No. of Teeth. *The full or acting Diameter of the Pinion.*

4 = two full teeth of the wheel, unrounded, and the ſpace between.
5 = three teeth, rounded from point to point.
6 = three full teeth, unrounded.
7 = three full teeth and a quarter of a ſpace beyond.
8 = four teeth, rounded, from point to point.
9 = ſomewhat leſs than four full teeth.
10 = four full teeth.
11 no meaſure given.
12 = five full teeth.
13 no meaſure given.
14 = ſix teeth, rounded from point to point.
15 = ſix full teeth.

The pinions in watches, he remarks, muſt be ſmaller in compariſon with their wheels than in clocks, agreeably to what we have above ſaid.

Copiouſly, however, as we have treated the ſubject of proportioning the ſizes of wheels and pinions in a train of wheel-work, we think the ſubject of ſuch importance, that we are unwilling to ſatisfy ourſelves with merely having explained, and illuſtrated, by an example, the method of converting geometrical into practical dimenſions, but hope to render the buſineſs ſtill more familiar by an extenſive table containing the geometrical diameters of all numbers from 4 to 64, and alſo twenty different variations in the ſtrength of the tooth which we have newly calculated on purpoſe. The data, on which the table is calculated, have been already explained, and its application, it is preſumed, is ſo eaſy, that the geometrical diameter, in inches and decimal parts, of any wheel or pinion contained therein, may be ſeen by inſpection, and immediately converted into the proper practical diameter, by the ſimple addition of the quantity of engagement of the tooth, at the bottom of the ſame vertical column, out of which the geometrical diameter is taken, which addenda are calculated on a ſuppoſition that the teeth are intended to be rounded of an epicycloidal form.

Table of the Geometrical Diameters of Wheels and Pinions.

Wheels and Pinions.	Teeth per Inch.																				
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
4	.32	.25	.21	.18	.16	.14	.13	.12	.105	.098	09	.085	.08	.075	.07	.067	.064	.061	.058	.055	.053
5	.40	.32	.26	.23	.20	.18	.16	.15	.13	.12	.11	.106	.10	.094	.09	.084	.08	.076	.072	.07	.067
6	.48	.38	.32	.27	.24	.21	.19	.17	.16	.15	.14	.13	.12	.11	.105	.10	096	.091	.087	.083	.08
7	.56	.45	.37	.32	.28	.25	.22	.20	.18	.17	.16	.15	.14	.13	.12	.12	.11	.106	.101	.097	.093
8	.64	.51	.42	.36	.32	.28	.25	.23	.21	.20	.18	.17	.16	.15	.14	.13	.12	.12	.116	.11	.106
9	.72	.57	.48	.41	.36	.32	.29	.26	.24	.22	.20	.19	.18	.17	.16	.15	.14	.136	.13	.125	.12
10	.80	.64	.53	.45	.40	.35	.32	.29	.26	.24	.22	.21	.20	.19	.17	.17	.16	.15	.14	.14	.13
11	.88	.70	.58	.50	.44	.39	.35	.32	.29	.27	.25	.23	.22	.21	.19	.18	.17	.165	.16	.15	.14
12	.96	.76	.64	.54	.48	.42	.38	.35	.32	.29	.27	.25	.24	.22	.21	.20	.19	.18	.17	.17	.16
13	1.04	.82	.69	.59	.52	.46	.41	.38	.34	.32	.29	.28	.26	.24	.23	.22	.20	.196	.19	.18	.17
14	1.12	.89	.74	.64	.56	.49	.44	.40	.37	.34	.32	.30	.28	.26	.24	.23	.22	.21	20	.19	.18
15	1.20	.99	.80	.68	.60	.53	.48	.43	.40	.37	.34	.32	.30	.28	.26	.25	.24	.22	.21	.21	.20
16	1.28	1.02	.85	.73	.64	.56	.51	.46	.42	.39	.36	.34	.32	.30	.28	.27	.25	.24	.23	.22	.21
17	1.36	1.08	.90	.77	.67	.60	.54	.49	.45	.41	.38	.36	.34	.32	.30	.28	.27	.26	.24	.23	.22
18	1.44	1.15	.96	.82	.71	.64	.57	.52	.48	.44	.41	.38	.35	.34	.32	.30	.28	.27	.26	.25	.24
19	1.52	1.21	1.01	.86	.75	.67	.60	.55	.51	.46	.43	.40	.37	.35	.33	.32	.30	.29	.27	.26	.25
20	1.59	1.27	1.06	.91	.79	.71	.64	.58	.53	.49	.45	.42	.39	.37	.35	.33	.32	.30	.29	.28	.26
21	1.67	1.33	1.11	.96	.83	.74	.67	.61	.55	.51	.48	.44	.41	.39	.37	.35	.33	.32	.30	.29	.27
22	1.75	1.40	1.17	1.00	.87	.78	.70	.64	.58	.54	.50	.46	.43	.41	.39	.37	.35	.33	.32	.30	.29
23	1.83	1.46	1.22	1.04	.91	.81	.73	.67	.61	.56	.52	.48	.45	.43	.40	.38	.36	.34	.33	.32	.30
24	1.91	1.53	1.27	1.09	.96	.85	.76	.69	.64	.59	.54	.51	.47	.45	.42	.40	.38	.36	.34	.33	.32
25	1.99	1.59	1.33	1.14	.99	.88	.79	.72	.66	.61	.57	.53	.49	.47	.44	.42	.39	.38	.36	.35	.33
26	2.07	1.66	1.38	1.18	1.03	.92	.83	.75	.69	.64	.59	.55	.51	.49	.46	.43	.41	.39	.37	.36	.34
27	2.15	1.72	1.43	1.23	1.07	.96	.86	.78	.71	.66	.61	.57	.53	.51	.48	.45	.43	.41	.39	.37	.35
28	2.23	1.78	1.49	1.27	1.11	.99	.89	.81	.74	.68	.64	.59	.55	.52	.49	.47	.44	.42	.40	.39	.37
29	2.31	1.85	1.54	1.32	1.15	1.02	.93	.84	.77	.71	.66	.61	.57	.54	.51	.48	.46	.44	.42	.40	.38
30	2.39	1.91	1.59	1.37	1.19	1.06	.96	.87	.79	.73	.68	.64	.59	.56	.53	.50	.48	.46	.45	.41	.39
31	2.47	1.97	1.64	1.41	1.23	1.09	.99	.90	.82	.76	.70	.66	.61	.58	.55	.52	.49	.47	.45	.43	.41
32	2.55	2.04	1.70	1.45	1.27	1.13	1.02	.93	.85	.78	.72	.68	.64	.60	.57	.53	.51	.48	.46	.44	.42
33	2.63	2.10	1.75	1.50	1.31	1.17	1.05	.96	.87	.81	.75	.70	.66	.62	.59	55	.52	.50	.48	.45	.43
34	2.71	2.16	1.81	1.54	1.35	1.20	1.08	.98	.90	.83	.77	.72	.68	.64	.60	.57	.54	.51	.49	.47	.45
Epicycloidal Addenda	.188	.150	.125	.107	.094	.083	.075	.068	.063	.058	.054	.05	.047	.044	.042	.04	.038	.036	.034	.033	.031

Table of the Geometrical Diameters of Wheels and Pinions (continued.)

Wheels and Pinions.	Teeth per Inch.																				
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
35	2.79	2.22	1.85	1.59	1.39	1.23	1.11	1.01	.93	.86	.79	.74	.69	.65	.62	.59	.55	.53	.50	.48	.46
36	2.87	2.28	1.91	1.63	1.43	1.27	1.14	1.04	.96	.88	.81	.76	.71	.67	.64	.60	.57	.54	.52	.50	.48
37	2.95	2.35	1.96	1.68	1.47	1.31	1.18	1.07	.98	.91	.84	.79	.73	.69	.65	.62	.59	.56	.53	.51	.49
38	3.03	2.42	2.02	1.73	1.51	1.35	1.21	1.10	.01	.93	.86	.81	.75	.71	.67	.64	.60	.58	.55	.52	.50
39	3.10	.48	2.07	1.77	1.55	1.38	1.24	1.13	1.03	.96	.88	.83	.77	.73	.69	.65	.62	.59	.56	.54	.51
40	3.18	2.55	2.12	1.82	1.59	1.41	1.27	1.16	1.06	.98	.91	.85	.79	.75	.70	.67	.64	.61	.58	.55	.53
41	3.27	2.61	2.17	1.87	1.63	1.45	1.30	1.19	1.08	1.01	.93	.87	.81	.77	.72	.69	.65	.62	.59	.57	.54
42	3.35	2.67	2.23	1.91	1.67	1.48	1.34	1.21	1.11	1.03	.96	.89	.83	.79	.74	.70	.67	.64	.60	.58	.55
43	3.43	2.73	2.28	1.96	1.71	1.52	1.37	1.24	1.14	1.05	98	.91	.85	.80	.76	.72	.68	.65	.62	.59	.57
44	3.50	2.80	2.33	2.01	1.75	1.56	1.40	1.27	1.16	1.08	1.00	.93	.87	.82	.78	.74	.70	.67	.64	.61	.58
45	3.58	2.87	2.39	2.05	1.79	1.59	1.43	1.30	1.19	1.10	1.02	.95	.89	.84	.80	.75	.71	.68	.65	.62	.59
46	3.67	2.92	2.45	2.09	1.83	1.63	1.46	1.33	1.22	1.13	1.04	.97	.91	.86	.81	.77	.73	.70	.66	.64	.61
47	3.75	2.99	2.50	2.14	1.87	1.67	1.49	1.36	1.25	1.15	1.07	.99	.93	.88	.83	.79	.75	.71	.68	.65	.62
48	3.82	3.05	2.55	2.18	1.90	1.70	1.53	1.39	1.27	1.18	1.09	1.01	.95	.90	.85	.80	.76	.73	.69	.66	.64
49	3.90	3.12	2.60	2.23	1.94	1.73	1.57	1.42	1.30	1.20	1.11	1.04	.97	.92	.86	.82	.78	.74	.71	.67	.65
50	3.98	3.18	2.65	2.28	1.98	1.77	1.60	1.45	1.32	1.22	1.14	1.06	.99	.94	.88	.83	.80	.76	.72	.69	.66
51	4.06	3.24	2.70	2.32	2.02	1.81	1.63	1.48	1.35	1.25	1.16	1.08	1.01	.95	.90	.85	.81	.77	.74	.70	.67
52	4.14	3.31	2.76	2.36	2.06	1.84	1.66	1.51	1.38	1.27	.18	1.10	1.03	.97	.92	.87	.83	.79	.75	.71	.69
53	4.21	3.37	2.81	2.41	2.10	1.88	1.69	1.54	1.40	1.30	1.20	1.12	1.05	.99	.94	.88	.84	.80	.77	.73	.70
54	4.30	3.43	2.87	2.45	2.14	1.91	1.72	1.56	1.43	1.32	1.22	1.14	1.07	1.01	.95	.90	.86	.81	.78	.74	.71
55	4.38	3.49	2.91	2.50	2.18	1.94	1.75	1.59	1.46	1.35	1.25	1.16	1.09	1.03	.97	.92	.89	.83	.79	.75	.73
56	4.46	3.56	2.97	2.54	2.22	1.98	1.78	1.62	1.49	1.37	1.27	1.19	1.11	1.05	.99	.93	.89	.84	.81	.77	.74
57	4.54	3.63	3.02	2.59	2.26	2.02	1.82	1.65	1.51	1.40	1.29	1.21	1.13	1.07	1.01	.95	.91	.86	.82	.78	.75
58	4.62	3.69	3.08	2.64	2.30	2.06	1.85	1.68	1.54	1.42	1.31	1.23	1.15	1.09	1.03	.97	.92	.88	.84	.80	.77
59	4.69	3.75	3.13	2.68	2.34	2.09	1.88	1.71	1.56	1.45	1.34	1.25	1.17	1.10	1.05	.98	.94	.89	.85	.81	.78
60	4.77	3.82	3.18	2.73	2.38	2.12	1.91	1.74	1.59	1.47	1.36	1.27	1.19	1.12	1.06	1.00	.95	.91	.87	.82	.79
61	4.86	3.88	3.23	2.78	2.42	2.16	1.94	1.77	1.61	1.50	1.38	1.29	1.21	1.14	1.08	1.02	.97	.93	.88	.84	.80
62	4.94	3.94	3.29	2.82	2.46	2.19	1.98	1.79	1.64	1.52	1.41	1.31	1.23	1.16	1.09	1.03	99	.94	.89	.85	.82
63	5.02	4.00	3.34	2.87	2.50	2.23	2.01	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	1.00	.96	.91	.87	.83
64	5.10	4.07	3.40	2.92	2.54	2.27	2.04	1.85	1.70	1.57	1.46	1.36	1.27	1.20	1.13	1.07	1.02	.97	.92	.88	.85
Epicycloidal Addenda	.188	1.50	.125	107	.094	083	.075	.068	.063	.058	.054	.05	.047	.044	.042	.04	.038	0.36	.034	.033	.031

Uſe of the Table.

1. In the preceding table, the figures at the top of each column, from 4 to 24, denote the numbers of teeth per inch, and thoſe at the left hand, from 4 to 64, denote the numbers of ſuch teeth in the reſpective wheels and pinions, and the ſquares, formed by the vertical and horizontal columns interſecting each other, contain, in inches and decimal parts of an inch, the geometrical diameters of the wheels or pinions ſo circumſtanced, to which diameters, if the quantity of engagement entitled, "addenda" at the bottom of the vertical column be added, the ſum will be the practical ſize of the wheel or pinion ſtanding at the left hand of the ſaid horizontal column; for inſtance, let us take our centre wheel of 64 of 14 per inch, and we ſhall find at the interſection of 64 at the ſide and 14 at the top, 1.46 for the diameter, and under it .054, as the quantity to be added, which together make 1.514, agreeably to our former calculation; alſo, if we take its pinion 8, the interſection of 8 at the ſide and 14 at the top is 0.18, and the quantity to be added again .054, the ſum of which is 0.234, as before. The application of the table to all other numbers, both of teeth in the whole, and teeth per inch, is equally eaſy and accurate; and even if the numbers run too high for the vertical columns, like our great wheel 96, the reſult may be as well obtained by taking the halves, or other component parts, ſeparately, and uſing their ſum afterwards as a whole; for half of 96 is 48 and the interſection of 48 with 12 per inch is 1.27, which doubled gives 2.54 for 96, to which add .063 and the practical diameter is 2.603 as before determined; or otherwiſe take out for 50 + 46 and the ſum will be 1.32 + 1.22 = 2.54 for the geometrical diameter again as before. This mode of application renders the table unlimited in its extent.

2. But the determination of the practical diameter of a wheel, ſuitable for a given number of teeth, of a given ſtrength, is not the only uſe of this table; any two of the three things contained being given in clock and watch-work, the third may be found by inſpection, of which the preceding is but one variety; as another exemplification, if it were required to cut a wheel of ſome given dimenſions into a given number of teeth, the ſize of the cutter, which is of great importance, may be immediately aſcertained; for, ſuppoſing that a wheel of 1 inch diameter be required to be cut into 45 teeth, if we follow the column 45 horizontally towards the right hand till we come at .95, which has .05 for its epicycloidal addition, the ſum 1.00 or 1 is found in the column 15 per inch, which denotes twice the thickneſs of the cutter; and though the ſum may ſeldom be found, in other inſtances, to be ſo exact without a fraction, yet the neareſt number to the given diameter is always readily found, and if the difference between the teeth per inch, in the columns next above and next below, be taken, the proportional part, properly applied, will give a decimal quantity to be added to the thicker cutter, or lower number per inch, provided very great accuracy be requiſite in the thickneſs of the cutter.

3. When the cutter and dimenſions of the wheel are given without the number of teeth, which may be the caſe in ſome inſtruments with rack adjuſtment work, where calculations are out of the queſtion, come down the horizontal column from the teeth per inch ſuitable for the cutter, till the diameter given is met with; thus in the column of 5 per inch, for a wheel of 2 inches, the addition .15 added to 1.85 makes 2.0 exactly, and this coincidence happens in the horizontal column 29, which number will therefore be that of the wheel, for which the engine for cutting muſt be ſet to perform the requiſite work. Thus the table is not only extremely ſerviceable to the clock-maker, but to all inſtrument-makers where wheel-work is required.

4. Laſtly, when the number of teeth per inch is not aſcertained in a wheel, and the diameter of a correſponding pinion of a given number is wanted, the meaſured diameter of the wheel, excluding the rounded ends of the teeth, will be at any time ſufficient for finding, by the table, the correſponding pinion, and *vice verſâ*; for ſuppoſing the wheel to be 48, and its diameter, excluſively of the rounded ends of the teeth, 1.7 or $1\frac{7}{10}$ inches; from 48 on the left hand vertical column proceed horizontally till 1.7 is found, which will be in column 9 per inch; then in that vertical column aſcend till the given pinion, 8 for inſtance, ſtands oppoſite on the left hand, and its geometrical diameter is .28, to which, if its epicycloidal addendum be added, *viz.* .083, the ſum .363 will be the practical diameter of the pinion wanted: and in this way any wheel or pinion, previouſly made for a foreign purpoſe, may readily and accurately be made a portion of a clock-movement; and the calliper made accordingly.

4. *Callipering.*—We come next to laying down the plan or calliper of the clock-movement on paſteboard to be transferred to the plates of the frame when properly hammered, filed, and ſcraped, or planed; the diſpoſition of the calliper depends not on the acting, but on the geometrical proportions of the wheels and pinions, conjointly with the diſpoſition of the circles of indication on the face; when the wheels are ſmall, ſuch as we have choſen for our example of a half-ſecond's pendulum, the diſtance from the minute to the ſecond hands will not be too great for an ordinary face, if the arbors are pivoted in a ſtraight line, as in *fig.* 3, of *Plate* X. where the dotted circles, taken from the laſt column of our TABLE of *Wheels* and *Pinions*, repreſent the geometrical proportions, or the places of the pitch-lines, and the complete circles taken from the column of "acting diameters in inches," are ſuppoſed to coincide with the extreme ends of the teeth; hence the little ſpaces contained between the dotted and complete circles, at each ſide, repreſent the additional meaſure and half of each wheel and pinion, ſuch as were determined by calculation, to convert the geometrical into the actual ſize, or ſuch as are given by the large TABLE of *geometrical diameters* and *addenda*. It is evident, therefore, to the eye, that the diſtance between any two arbors or pivot holes is always equal to the ſum of the geometrical radii of the wheel and pinion, which act together; this conſideration renders the buſineſs of callipering very ſimple; for, the centre wheel of 64 being deſcribed from any convenient point in the given plane, a portion of a larger circle, A B, may be deſcribed with an extent equal to $\frac{1.46+0.18}{2} = .82$, or $\frac{82}{100}$ of an inch, which is half the ſum of the geometrical radii of the wheel 64, and of its pinion 8, and the pivot hole of the pinion may be in any point of this chord line; we have fixed upon a point in a line parallel to the ſide of the plate, from which as a centre we deſcribe the ſecond wheel of 60, and alſo the pinion of 8 on its arbor, to be actuated by the centre wheel of 64; we now take another ſweep from this determined point or pivot hole, with the extent $\frac{1.19+.16}{2} = .67$, or $\frac{67}{100}$ of an inch, which is again half the ſum of the geometrical radii of the ſecond wheel and its pinion, according to our table; and the pivot hole of the ſeconds arbor, or pallet wheel, may be in any point of the chord C D; but we have ſaid we propoſed to have all the pinions in a ſtraight line;

another point is conſequently fixed upon in a line parallel to the edge of the plate, which could not have been the caſe, if the wheels had been large, like thoſe uſually adopted to ſuſtain the great maintaining power of a ſeconds pendulum. Again with the extent $\frac{2.55+.21}{2} = 1.37$, or $1\frac{37}{100}$ inches, or ſum of the geometrical radii of the great wheel and centre pinion, which it actuates, we deſcribe the portion of a circle E F, in any point of which the pivot hole may be placed for the fuſee arbor; we have placed it, in our calliper, in a point at right angles to the line of the centres of the train, which is a matter of option, and the ſpring barrel may be either above, below, or on one ſide of the fuſee, as fancy, or the room left by the other work, may direct. From what has been here ſaid, it will be eaſy to conceive that there is almoſt an endleſs variety in calliper-drawing, the diſpoſition depending on the variable ſizes of the wheels and pinions of a movement, compared with the diſtance from the ſeconds to the minute-hand arbors; but the particulars we have here detailed, being thoroughly underſtood, will ſuffice as a guide in all poſſible caſes; for, ſuppoſing a face to be previouſly given, and the centres for the minute and ſecond hands already made, the pivot hole for the ſecond wheel may eaſily be determined by interſection from the two given centres with the reſpective extents as above determined; provided the diameters of the wheels be calculated large enough for the diſtance of the given centres; that is, provided the aggregate of the geometrical radii of the two interpoſed wheels and pinions exceed the ſaid diſtance.

As we intend to give a particular account, at ſome length, of the various kinds of pallets, under the article Escapement, we ſhall here ſatisfy ourſelves with a brief delineation of the dead-beat pallets, which we have propoſed to adopt in our half ſeconds little clock, and defer, for the preſent, our account of its peculiar properties. The number of teeth in the pallet-wheel has been determined to be 60, of which any portion leſs than half may be choſen to be included between the points of the pallets, as will be ſeen hereafter; we will aſſume ſixteen as a ſuitable number for a convenient conſtruction; then, as 16 teeth bear the ſame proportion to 60, the whole number, that 96° do to 360°; from the point *a*, at the extremity of the wheel, in the line of the centres, we ſet off *a b* and *a c*, each equal to 48°, and from the points *b and c*, draw tangents which will meet at the point *d*, which point will be the required centre of motion for the axis of the pallets: from this point *d*, with the extent *d b*, we draw the curve lines *b e* and *c f*, for the extremities of the pallets, and alſo parallel thereto, with a ſmaller extent; two other curves for the interior limits of the pallets, care being taken that the thickneſs of the pallets, or ſpace between the two concentric curves, be equal to almoſt one half of a ſpace contained between the extreme ends of two contiguous teeth; the body of the pallets may then be deſcribed at option by two curves from the centre of the pallet wheel, reſerving a little ſemicircular portion in addition, for the centre of motion. Had we fixed upon 12 teeth only to be contained between the points of the pallets, the centre of motion would have been, as appears in the figure, nearer the pallet-wheel, as at the interior edge of the body of the pallets; and if more teeth than 16 had been taken, the point *d* would have been more diſtant than is repreſented, and the pallets would have required a ſtem to have brought them down low enough; ſo that the ſhape, as well as ſize of the pallets, depends on the number of teeth included between their acting points, it being advantageous for the action that two lines, drawn from the centres of motion of the pallets and the pallet-wheel reſpectively, to the acting points, ſhould always form a right angle. With regard to the ſloping faces of the pallets, their direction is determined geometrically from the angles that the pendulum is required to paſs through in its vibration before the wheel eſcapes, which is therefore called the angle of eſcapement: we will not attempt here to aſcertain what angle of eſcapement is beſt for a given angle of the whole excurſion, but aſſume it, for our preſent purpoſe, at 2° on each ſide of the perpendicular, as a guide for the ſlope of our intended pallets. From the centre of motion of the pallets, *d*, with any extent, *dg*, therefore, we deſcribe the ſmall chords, *g h*, and *i k*, from the dotted tangent lines prolonged, and ſet off from *g* towards *h*, alſo from *i* towards *k*, 2° each, and draw two dotted lines from the point *d*, to the ſaid chords, ſo as to contain each an angle of 2°; then if a ſhort line be drawn from the upper interior to the lower exterior interſection of the dotted lines with the curved ends of the right hand pallet, it will give the proper ſlope as ſeen in the figure; alſo, if another ſhort line be drawn from the lower interior to the upper exterior interſection of the left hand pallet, it will give its proper ſlope, and the plan of the pallets will be finiſhed.

The ſpring box, as we have ſaid, may be placed either above the great wheel of 96, or below it, which is more uſual, as at G, in ſuch a ſituation that the band or chain may wind round both it and the fuſee attached to the arbor of the great wheel, without interfering with any part of the movement. We ſhall have occaſion to ſpeak more minutely reſpecting the requiſite ſize of the ſpring-box, when we come to treat of the articles Maintaining *Power* and Main-*ſpring*.

The calliper of the going part being thus finiſhed on paſteboard, we may proceed to draw the end and ſide lines to encloſe the wheel-work, taking care to leave ſpace enough for the wheel-work of the ſtriking part, and for the ends of the pillars not to interfere with the movement; the ſpace included within the four bounding lines, which may conſtitute either a parallelogram or a ſquare, limits the ſize and ſhape of each of the plates, which, together with the pillars, uſually placed near their corners or edges, conſtitute the frame of the clock-work.

We might here extend our account of the preparation of the plates for receiving the calliper, but as the proceſſes of hammering, filing, and ſcraping are manipulations familiar to the mechanician, as well as to the labouring workman, we may be allowed to paſs over them without any further notice, than that we ſtrongly recommend planing to be ſubſtituted for ſcraping, agreeably to the practice of mathematical inſtrument-makers, which operation makes an even ſurface.

The calliper for the ſtriking part of a clock, which is uſually and properly called the clock-part, might now be added to the paſteboard; but as we propoſed firſt to purſue the operations attending the conſtruction of the going-part, which has alſo been called the watch-part, on account of its watching or counting the time as it paſſes ſilently along, we will return to the ſtriking-part hereafter, and preſerve our account of the *going-part* diſtinct.

The calliper drawn on paſteboard may now be transferred to one of the plates, either by pricking through the centres upon the braſs plate, or by delineating again the ſame figure according to the directions we have given, unleſs a deepening tool be made uſe of for callipering the exact depth at which each wheel and pinion have had their action previouſly examined; this method is very little known in England, and ſtill leſs uſed, though it conduces greatly to perfect action ; whenever this tool is uſed, which is exhibited in our collection of Clock-*tools*, *Plate* XXI. *fig.* 6., of courſe the ultimate delineation of the calliper on the plate muſt neceſſarily be deferred till the wheels and pinions are divided and rounded, and their action duly adjuſted in the tool, before the transfer is made by means of the fine points of the parallel arbors, uſed as dividers, for the deſcription of the requiſite circles.

5. *The Pillars and Pivot-holes.* We have ſaid that the pillars, which connect the two plates of the frame, and keep them in their parallel poſition in a firm manner, are placed at the corners or ſides of the plates, as at B, B, B, B, B, *fig.* 1, of *Plates* XI. and XII ; the reaſons are obvious ; the work will thus be more firm than if the pillars were contiguous, and they will be out of the way of the wheel-work and cocks ; their number may be three, four, or five, as circumſtances may require. Before the holes are drilled for the ends of the pillars, the plates are uſually pinned together at each end, and filed to the ſame dimenſions, ſo that one piercing with the drill and opening with a broach, perforates both plates alike, and enſures the perpendicularity of the pillars when they come to be inſerted into their places. It is alſo uſual to pierce with a ſmall drill the pivot holes for the arbors of the different wheels while the plates are pinned together, that the arbors may paſs acroſs the frame at right angles to the ſurfaces of the plates, which is an eſſential condition in the planting of the wheel-work, and requires the workman to drill in as perpendicular a direction as poſſible, otherwiſe the plane of the wheel would not be parallel to the ſurfaces of the plates, and conſequently the communication of motion and tranſmiſſion of the maintaining power would have an obliquity in their direction, which would produce injurious friction among the teeth.

The ſtrength of the pillars depends chiefly upon the maintaining power and ſcale upon which the works are conſtructed ; in pieces with a heavy weight they muſt neceſſarily be pretty thick, but in ſpring pieces much metal only gives a heavy appearance, without adding to the utility ; the length of the pillars, however, is not ſo optional ; for it depends entirely upon the number of turns of the fuſee in ſpring pieces, and of the barrel in clocks with a ſuſpended weight ; in our little eight-days' piece, two inches will be a ſuitable diſtance between the interior ſurfaces of the plates to allow for ſixteen turns of the fuſee, with the addition of the guard-gut, or ſtop, at one end of the arbor, and the great wheel and double ratchet, with the auxiliary ſpring (hereafter deſcribed) to produce conſtant motion, together with ſpace for the rim of the centre wheel at the other. The pillars are generally riveted into the back plate, and paſs through the front one to ſhoulders againſt which the plate reſts, in which ſituation they are fixed by pins paſſing through their projecting ends ; which mode of fixing the plates admits, indeed, of their being readily diſmounted, but is by no means ſo neat as the method of mounting frames for wheel-work uſed by the mathematical inſtrument-makers, which ought to be adopted by clock-makers. The method alluded to is, to ſcrew the pillars into the back plate, even with its exterior ſurface, and to fix the front plate by ſcrews inſtead of pins, which ſcrews go into the ends of the pillars, and cover the perforations of the plate by means of intervening collars, as repreſented in the front of our frame, *Plate* XII. *fig.* 1. The preference of this mode conſiſts in its allowing the plates to preſerve their ſurfaces uninjured and perfectly parallel after being dreſſed, which the act of riveting would diſtort ; beſides, when the clock is at any time cleaned, the plates thus mounted are made handſome again, as they were at firſt, with little trouble, and the general appearance is thus more workmanlike than in the ordinary way. The ſhape of the pillars ſeems to be mere matter of fancy, when they are left ſtrong enough to effect their purpoſe ; but cuſtom has ſanctioned the bead, or ſpheroidical enlargement, at the middle.

Main-ſpring, Barrel, Arbor, and Ratchet.

The frame being put together and ready to receive the works, a ſuitable ſpring muſt be obtained for a ſmall clock from the ſpring-maker, whoſe art is diſtinct, and will form a ſeparate account in its place ; the breadth of the ſpring we will ſuppoſe to be an inch, which will require a box or barrel, C, *Plate* XI. ſufficiently deep to hold it, and to be of a diameter ſufficient to admit of as many effective coils or ſpirals as will turn the fuſee ſixteen times round, before its force is expended in unbending itſelf. Sometimes it may be neceſſary to try two or three ſprings before a good one is met with, that will act with a due degree of regularity ; and it has been aſſerted that a ſpring will act more regularly and be leſs liable to have undue friction among the coils, if the breadth be gradually diminiſhed from the exterior to the interior end ; but we pledge not ourſelves for the exiſtence of the fact, though we conceive that the friction of the ſides of the ſpring againſt the ends of the barrel, will thereby be greatly diminiſhed. The ſpring arbor muſt be ſtrong in proportion to the force of the ſpring, particularly at the pivots, the front one of which muſt be thick enough to admit of being ſquared to hold a ratchet, or ſmall ſerrated wheel, C, at the outſide of the frame, (ſee *Plate* XII.) the teeth of which ratchet muſt be ſtrong enough to hold the arbor in any ſituation to which it is turned, which it does by means of a click attached by a ſcrew to the exterior ſurface of the front plate of the frame ; the ſpring-arbor has a ſtrong pin inſerted into it at the middle, within the barrel, on which pin a hole made near the interior end of the ſpring hooks, while the exterior end is riveted to the circular ſide of the box ; hence it is not difficult to conceive that when the ſpring fills the box in its relaxed ſtate, and has its coils moſt cloſe at the rim of the barrel, it may be coiled up cloſe to the arbor in the centre, or, in other words, it may be wound up, by two different methods ; either the barrel may be held faſt, and the arbor be turned backward by its ratchet, or by a key fitting its ſquare ; or otherwiſe, which is the general and better practice, the ratchet may be ſuffered to detain the arbor in its place, and with it the interior end of the ſpring, and the barrel itſelf, to which the exterior end is riveted, may be turned forwards by a chain or cat-gut attached to it by a knot at one end and wound round it, as ſeen at C, in *Plate* XI. We have ſaid the latter method is the better, and the reaſon is, that, when the greateſt and ſmalleſt forces of the ſpring are adjuſted to the ſhape of the fuſee, or rather the fuſee to them, the ratchet cannot be altered without deranging this adjuſtment. The arbor is turned in a turning-frame with pivots and ſhoulders ſufficiently remote from each other to reach the interior faces of the plates, but to have juſt ſo much play endways as will prevent friction ; and the chain or gut muſt be long enough to fill the ſpiral grooves of the fuſee, and have at leaſt one half-turn on the barrel to ſpare ; alſo care muſt be taken that the depth or ſide of the barrel muſt be nearly equal to the effective length of the fuſee, otherwiſe the gut will be liable to ſlip off at the ends of it. The remote end-piece of the barrel is ſoldered faſt, and has a large pivot-hole, againſt which an inner ſhoulder of the arbor reſts, and the nearer end-piece is turned in the frame ſo large as to be capable of being forced or ſprung into a receptacle turned for it, round the inner part of the edge of the circular rim of the barrel, in which ſituation it reſts againſt a correſponding inner ſhoulder of the arbor, and completes the barrel; when this adjuſtable end is to be taken off for the purpoſe of examining or taking out the ſpring, a ſlight ſtroke at the remote pivot of the arbor will force it out of its place; ſome ſkill is neceſſary for putting the ſpring into the barrel, when a tool on purpoſe is not at hand, which will be deſcribed among the WATCH-*tools*, and which ſeems neceſſary to be more generally uſed in clock-work to prevent accidents conſequent upon a manual inſertion of the ſpring.

6. *Fuſee, Ratchet, and Guard-gut or Stop.*—The ſpring-barrel and its appendages being finiſhed, a rough eſtimate of the power of the ſpring may now be made by firſt coiling the gut, in a proper direction round it a few times till it is nearly all wound up, the arbor being held by its ratchet, or in a vice, and then by ſuſpending a weight to the ſpare end, ſuch as will juſt pull the barrel two or three times round from its relaxed ſtate; this weight will denote the ſmalleſt power, which ſuppoſe to be one pound; then add ſuch a heavier weight as will uncoil ſo much more of the gut as may be ſuppoſed to fill the fuſee, and note it, which we will again ſuppoſe to be two pounds and a half for the greateſt power of the ſpring; now this proportion of 1 : 2½ or 2 : 5, may be taken as a guide for the reſpective diameters of the conical piece of metal, E, *fig.* 1, *Plate* XI, called the fuſee, which is introduced to equalize the varying power of the ſpring, by acting, as it were, with a ſucceſſion of levers of different lengths, reciprocally proportionate to the power of the ſpring in any given ſituation, ſo that when the power is great it is pulling by a ſhort lever, and *vice verſâ.* The piece of ſolid metal intended for the fuſee muſt be drilled through the centre, and opened with a broach, and then have a ſteel arbor of conſiderable ſtrength driven tight into it, by which it is turned into a conical or rather paraboloidal ſhape, that has its thicker end ſomewhat ſmaller generally than the diameter of the barrel, and the other end ſmaller in the proportion, according to our ſuppoſition of 2 : 5, but ſometimes in a greater ratio, without the thickneſs of the gut; the length of the fuſee muſt be ſhorter than the pillars by as much as will admit the great wheel and two ratchets, with the centre-wheel behind them, to be introduced between it and the plate at one end, and a contrivance for ſtopping the revolutions when the ſpirals are filled with the gut, called therefore the guard-gut, at the other end of the arbor, as we have already ſaid. The fuſee may now be grooved into ſixteen complete ſpirals by a fuſee-engine, the method of doing which will be explained under this term hereafter; after this operation, a pair of ſtrong pivots may be turned on the fuſee arbor, the pivot-holes opened by a pivot-broach held perpendicularly with reſpect to the faces of the plates, and the fuſee introduced into the frame, parallel to the ſpring-barrel arbor; a hole is now drilled at the large end of the ſpiral, perpendicularly into the metal, the fuſee being taken from the frame, and another hole to meet it from the plane of the thick end, about a quarter of an inch from the circumference, which two holes are juſt large enough to receive the gut; the latter is then enlarged by a chamfering tool to form a bed for a knot to be made at the end of the gut, when inſerted into the hole made in the ſpiral groove. If now a ſquare be made, either on the front or back pivot, which muſt project through the plate, accordingly as it is intended to be wound up in the face or behind, and if a key be inſerted upon it, the ſpring may be wound up, and it will appear whether or not the gut is too long, and how much, nearly, which may accordingly be altered. Hitherto the work has proceeded, on a ſuppoſition that the fuſee has been turned of a paraboloidal ſhape, and that the ſpring is perfect at the two extremes, as well as at all the intermediate degrees of tenſion; but it yet remains to be proved, by mechanical adjuſtment, that theſe coincidences have been effected, or are even capable of being accurately effected, without material ſubſequent alterations in the length of the ſpring and ſhape of the fuſee; for this purpoſe a long graduated lever, with an adjuſtable weight, hereafter mentioned under CLOCK-*tools* by the title of an *adjuſting-tool,* (*fig.* 10. *Plate* XXI.) is inſerted on the ſquare end of the fuſee, at N, when the frame is mounted, as in *Plate* XII. and the weight is gradually removed along the bar, until by trial it is found to be an exact counterpoiſe to the ſpring previouſly wound up a few turns by means of the ratchet on the barrel-arbor; ſuch balance being effected, the ſpring may be wound up by the adjuſting tool, uſed as a key, till the ſixteenth ſpiral at the top, or ſmall end of the fuſee, be filled with gut, in which ſituation, if the weight of the tool ſtill conſtitute an exact counterpoiſe to the power of the ſpring, it is to be preſumed that the ſpring is properly fixed, with reſpect to its quantum of intenſity, by its ratchet; but if, in the latter ſituation of the tool, it turns out to be more than a counterpoiſe, either the ſpring is of too low an intenſity in the preſent ſituation of its ratchet, or the fuſee is too ſmall at the ſmall end, or both may be ſo circumſtanced; on the contrary, if the tool is not a counterpoiſe for the ſpring when wound up, either the ſpring is ſet too high by the ratchet, or the ſmall end of the fuſee is too thick; a few ſucceſſive trials of ſimilar adjuſtment for the oppoſite ends of the fuſee, by an increaſe or decreaſe of intenſity being gradually given to the ſpring by means of turning its ratchet, will generally determine whether the failure in the adjuſtment is occaſioned by the ſpring or fuſee, and the former may be ſhortened, or the latter altered, by a detached tool to run in the groove as it revolves in the turning frame, if a fuſee-engine is not at hand; though, it muſt be confeſſed that ſome experience in this buſineſs will greatly facilitate the determination of the proper means of final adjuſtment. We will now ſuppoſe the ſpring fixed, and the fuſee adjuſted by the tool, ſo as to render the maintaining power preciſely the ſame at the bottom and top of the ſpiral groove; the adjuſtments muſt next be made for all the intermediate turns of the helix ſucceſſively, by means of the ſame adjuſting tool with the weight unaltered, the ſpring arbor alſo reſuming at every trial its original poſition, which we will ſuppoſe to have been marked on the holding tooth of the ratchet. When the ſpring is good, and the fuſee approaching to a conical ſhape, it will be found on trial, that the maintaining power is too great for the tool of adjuſtment to balance before it is wound up half way; in conſequence of which increaſe in the maintaining power, the fuſee muſt neceſſarily be again put into the fuſee engine and have its groove deepened ſo as to make a parabolic curve inſtead of a ſtraight line from the top to the bottom of the fuſee; after this alteration the frame muſt be remounted, the ſpring coiled up again to its determined poſition, and the weight of the adjuſting tool kept unaltered in its ſituation; the intermediate grooves in the helix may not yet be found all ſufficiently deep to render the maintaining power equal in its effects throughout the whole length of the fuſee, but the adjuſting tool will detect the particular places where the power predominates; which places when marked may be again altered in the fuſee engine, and the parts replaced in the frame, when, after three, four, or perhaps more alterations of the fuſee, and adjuſtments of the ſpring, at length the effect produced by the power of the ſpring is the ſame

whatever part of the fuſee be actuated by the gut; the accuracy of this adjuſtment is of the utmoſt importance, and ſhould be minutely attended to, otherwiſe the piece may be made to vary its rate of going on each ſucceſſive day of the week, by reaſon of the irregularity of the maintaining power, unleſs indeed ſuch a conſequence be obviated by the nature of the eſcapement, or other contrivance, which ought not to be depended upon while there is a fundamental remedy. Hence it is evident that, whenever the original main-ſpring of a clock (or watch) happens to be broken, or by any means altered, another ſpring, though of the ſame dimenſions ought not to be ſubſtituted, as is often injudiciouſly done, without a correſponding alteration in the fuſee, if found neceſſary, by a trial of the adjuſting tool. Were an optician to put a thermometer tube containing mercury, already hermetically ſealed, into an old ſcale previouſly graduated, the indication of temperature with ſuch an inſtrument could not be depended upon to any thing like accuracy. Of the ſame nature is the probability of an imperfect meaſure and indication of time ariſing out of an exchange of the main-ſpring without a correſponding adjuſtment in the ſhape of the fuſee, more particularly if the crown wheel eſcapement happen to be adopted, which is almoſt conſtantly under the influence of the maintaining power.

During this labour of adjuſting the fuſee to the ſpring, it will occur that the gut might be wound up beyond the end of the fuſee, if it were turned more that ſixteen times round, on which account a ſnail piece of ſoft ſteel, equal in diameter to the ſmall end of the fuſee, independently of the claw or projecting piece, is uſually ſcrewed againſt this end of the fuſee at N, *Plate* XI., to prevent the gut from ſlipping off when it comes to the projection of the claw in queſtion, which contrivance it has been ſaid is called the guard-gut; but it may be remarked, that the gut might wind back again by a ſecond courſe, like the cord of a kitchen jack on its barrel, when it comes to the ſnail-piece of the guard-gut; to prevent ſuch effect, there are ſupperadded a ſpring, M, ſcrewed at one end to the inner face of the front plate, which plate is taken off in the drawing, and a lever, L, moveable on a pin as a centre, which pin paſſes through a ſtud in the front plate, according to the poſition given in *Plate* XI.; the remote end of the ſpring, M, ſtretches itſelf towards the back plate of the frame, and carries the lever before it; of which the conſequence is, that as the gut approaches the guard in winding, it at length meets with the lever, L, and preſſing againſt it drives it forwards till at length a ſhoulder near its remote end, ſeen near the pillar, is preſented to the claw, N, of the ſnail-piece, for which it becomes a ſtop at the inſtant that the ſixteenth ſpiral is filled by the gut, and the winding is then neceſſarily finiſhed.

The contrivance for allowing the fuſee to turn in the act of winding up, while the great wheel retains its poſition unaltered, but which prevents the return of the fuſee to take place by the pulling of the ſpring without the great wheel being actuated, is called the *fuſee* ratchet; it uſually conſiſts of a ſerrated wheel with ſloping teeth, and a click to catch the teeth, like the mechaniſm already mentioned as being at the projecting arbor of the ſpring barrel, but with the addition of a ſpring to preſs upon the click to keep it in the teeth; the ratchet wheel may be attached either to the end of the fuſee, and the ſpring and click to the plane of the great wheel, or otherwiſe the ſpring and click may be at the end of the fuſee, and the ratchet wheel on the plane of the great wheel, but the direction of the ſlope of the teeth will not be the ſame in both caſes, for in one caſe the wheel drives the click during the time of going, and in the other the click muſt drive the wheel; it is uſual to turn a circular groove between the edge of the ratchet wheel and the circumference of the fuſee large enough to form a bed for the click and its ſpring, which therefore are hid from ſight, when the ſpring is carried by the great wheel; but when it is carried by the end of the fuſee, the ſaid groove muſt be in the plane of the great wheel to anſwer the ſame purpoſe of concealment; the number of teeth in the ratchet wheel is optional, provided they be ſtrong enough to ſuſtain the maintaining power, and numerous enough to prevent a conſiderable return of the fuſee backward after winding, before the click catches a tooth; the conſtruction will be ſufficiently underſtood without further deſcription, from a reference to *fig.* 5, of *Plate* VIII., to *fig.* 7, of *Plate* XV., and to *fig.* 4, of *Plate* XXII. of *Horology*.

7. *Auxiliary-ſpring.* But we propoſed that our piece ſhould continue to go while it is wound up, which effect requires an additional apparatus to the ratchet we have juſt deſcribed, as being uſual in an ordinary ſpring-clock; the addition uſually conſiſts of another ratchet-wheel with teeth inclined in a contrary direction, and of a larger diameter, of a circular or ſometimes a horſe-ſhoe ſpring, and of a lever operating as a detent with one end faſtened to the inner face of the back plate, and the other reſting upon and ſliding over the ſloping face of the teeth of the large ratchet when the clock is in motion, but which prevents the ratchet's return when the clock is wound up. One end of the ſpring is pinned or ſcrewed to the rim of the great wheel, and the other end to the plane of the large ratchet, and in this caſe the ſmall ratchet before deſcribed actuates this large one, inſtead of the great wheel, exactly as above deſcribed; and then the large ratchet contracts the ſpring connecting it with the great wheel, till its reſiſtance in a contrary direction is equal to the maintaining power, in which ſituation the great wheel is then impelled in the ſame manner as if it were immediately connected with the ſmall ratchet; the effect of this beautiful contrivance is, that when the clock is under winding, the ſpring attached to the great wheel being no longer contracted by the maintaining power, immediately endeavours to extend itſelf, but the large ratchet-wheel, to which it is riveted, is ſtopped from going back by the end of the lever or detent, which is always in a poſition to catch the end of ſome one of the ſloping teeth of this ratchet, the conſequence of which is, that as the ratchet will not go back, the great wheel is impelled to go forward at the oppoſite end of the ſpring by a force, at the commencement of its action, equal to the maintaining power; and this force will continue for a much longer time than is neceſſary for the winding-up of any clock. This apparatus may be more clearly apprehended by a careful inſpection of *fig.* 4, of *Plate* XXII.. and of *figs.* 7 and 8, of Brockbank's chronometer in *Plate* XV., which differ in no other reſpect, but in their ſize, from the ſame parts as uſed in a clock.

8. *Arbors, Pinions, and Wheels.* Hitherto we have ſaid nothing of the manipulation of the arbors, pinions, and wheels of a clock, but have merely ſpoken of their diameters, numbers of teeth, and reſpective ſituations of their pivot-holes. It will not be neceſſary to enter into a detail of the manner of forging the arbors, or of caſting the braſs by models of given dimenſions, the ironmongers and tool-ſellers having on ſale ſets of wheels, and arbors with pinions of different numbers ready ſlit, and alſo pinion ſteel-wire drawn into a proper ſhape for the teeth of ſmall pinions, of all which clock-makers uſually avail themſelves inſtead of preparing them; otherwiſe the braſs-founders in Chancery-lane, and in other parts of London, as well as in Lanca-

ſhire, will caſt wheels to any model at a certain price per pound, which is a great convenience to the workman who has occaſion for unuſual ſizes in his wheel-work.

It will not, however, be deemed foreign to our purpoſe to mention, that it is often found requiſite to ſoften the pinions of ſteel, and their arbors, before the graver for turning can cut them with ſufficient eaſe in the turning frame; this ſoftening is uſually effected by putting the ſteel pieces into a wooden fire for ſome hours, and leaving them to cool gradually as the fire goes out. The wheels are generally croſſed in their original caſt ſtate to make them light, in order to avoid the effect of their inertia, and to prevent friction on the pivots of the arbors; but it is neceſſary to hammer the rims and other parts of a wheel well before they are filed flat, to be put on the arbor for turning, otherwiſe the metal would be too ſoft to wear well, and the teeth of a wheel would not ſtand the graver in the operation of being turned, after it is cut by the engine, in caſe the diameter ſhould require to be reduced, as is commonly done, to work well in its calliper with its pinion. When the wheels are hammered, and filed flat to nearly their exact thickneſs, according to the force they are deſtined to tranſmit, they are turned in the turning-frame to their practical diameters, after being previouſly perforated in the centre, and ſcrewed faſt on a ſuitable arbor, ſuch as is repreſented by *fig* 2, of *Plate* XIX.; they are then in a ſtate to be cut by an engine made on purpoſe, which is not always in the poſſeſſion of the clock-maker, particularly in large towns, but which is uſually kept by ſome individual, whoſe buſineſs is chiefly to cut wheels for the clock-makers at a certain price per ſet. An ingenious workman, of the name of Brown, who lived in King-ſtreet, Seven-dials, but who is now dead, was noted in London for his dexterity and accuracy in cutting clock-wheels, and occaſionally pinions, into any number of teeth; his engine, however, is now in the hands of Mr. Fidler, mathematical inſtrument-maker, Oxford-market, London, who has lately begun to uſe it; but the beſt engine for this purpoſe at preſent in conſtant uſe, belongs to Mr. Edward Troughton, of Fleet-ſtreet, and is uſed by James Fayer, at No. 35, White-lion-ſtreet, Pentonville, London.

This engine, which was contrived and made by the late ingenious mechaniſt Rehe, will round the teeth at the ſame time that it cuts them, if required, and is valued at 300*l.* in its preſent ſtate. As we ſhall have occaſion to treat further of the conſtruction and operations of the CUTTING *engine*, we ſhall here conſider that our wheels have now undergone their operation, and are returned into the hands of the clock-maker for finiſhing; we cannot, however, forbear remarking here, that the clock-makers of the preſent day have greatly the advantage of thoſe who laboured in the art in the infancy of clock-making, in that they have ſome of the moſt difficult operations in theory, ſuch as dividing and cutting the wheels, and forming the ſpiral groove of the fuſee, done by engines not only in leſs than one-hundredth part of the time, but with infinitely more accuracy, than they could be performed by hand with manual tools; and it is much to be deſired that they would, like watch-makers, have their wheels cut and rounded in the engine at the ſame time; that they would make uſe of the deepening tool, *fig.* 6, *Plate* XXI. for pitching their depth of action; and that they would in that ſtate transfer the diſtances of the pivots to the calliper, as we before recommended; for then the equable tranſmiſſion of motion and maintaining power would be enſured, provided the teeth be of a due ſize and form; the expence in cutting would, indeed, be ſomewhat more, but the labour of rounding by a file would be ſuperſeded, and conſequently the work would be more expeditiouſly, as well as more accurately, performed.

But it has been remarked, by a philoſopher well qualified to make the remark (Mr. W. Nicholſon), that the introduction of new inſtruments, and of new operations, requires the ſame ſpace of time that is neceſſary for inſtructing another generation; ſo much does that facility, which ariſes out of habit, militate againſt the adoption of new practices: we muſt, therefore, ſuppoſe our wheels returned from the engine with their teeth not rounded, and proceed with our detail. When a wheel has been cut, in the ordinary way, by the engine, there are uſually ſome filaments of metal, denominated burs, left at the edges of the teeth by the cutter, as well as general roughneſs on the ſides and at the bottom of the ſpaces; theſe are firſt cleared away by a fine file, juſt thin enough to go into the ſpace left by the cutter, which is called an equalling file, (ſuch as is repreſented in *Plate* XXI, *fig.* 14.) from its ſuppoſed property of leaving all the ſpaces equal, when the burs are removed. The croſſes of the wheel and interior edges of the rim are next dreſſed, firſt by a rough file, then by a ſmooth one, and laſtly by a burniſher of poliſhed ſteel, all ſhaped like *fig.* 17, of *Plate* XXI.; the arbor is next turned in a frame, by a well-tempered tool, or ſtrong graver, like that ſeen in *fig.* 9, of *Plate* XXI., to its propoſed thickneſs, and the pinion reduced to its practical diameter; after which its teeth are rounded, hardened, and poliſhed, each of which operations we will ſuppoſe to be underſtood, and the wheel is riveted on a ſhoulder left on the proper end of the pinion, exterior or interior, as the work may require, if it is on the hour arbor; otherwiſe it may be riveted, or ſtill better fixed by two oppoſite ſcrews, on a braſs collet, which is previouſly ſoldered upon ſuch part of the arbor, to which it belongs, as the place of the pinion which it actuates may require. The French call that portion of an arbor, which is between the wheel and the remote pivot, a *tige*; and that portion a *tigeron*, which lies between the wheel and the nearer pivot. Some of the moſt ſkilful workmen contend that the wheel ought always to be placed on its arbor, ſo as to be equally diſtant from both pivots, and we have ſeen clocks conſtructed with cocks, at the back of the plates, to hold the pivots of projecting arbors, in order to effect this purpoſe, but we will not undertake to affirm that this additional work is compenſated by any advantage thus gained; we rather conceive that the grievance complained of in the ordinary method of pivoting in the plates, *viz.* the alleged unequal preſſure and conſequent unequal friction in the oppoſite pivot-holes, when a pinion is at one end of the arbor, is to be attributed to another cauſe principally; *i. e.* the too great aperture of the pivot-holes: the workmen have a maxim, that "the pivots muſt have play to avoid friction," but they ſeem not always to underſtand what this play means; it certainly ought not to mean, that the holes ſhould be much larger than the pivots which are to turn in them, for in that caſe the pivots would be driven round the interior circumference of the holes, and cauſe the wheel to act at different depths in the pinion, which would be a great evil; the meaning of the maxim is, that the ſhoulders of the arbors ſhould not preſs againſt the plates when mounted, but that each arbor ſhould have a little play in the direction of its length, or, in other words, be left ſo as to be at liberty to move a little backwards and forwards; which condition ſeems requiſite.

We will now ſuppoſe all the wheels and pinions rounded neatly in the bay-leaf form, and their action tried in the deepening tool, with the correſponding pivot-holes drilled with drills reſpectively proportioned to the propoſed thickneſs of the pivots; the next ſtep will be to attach them to their arbors: the great wheel, however, notwithſtanding what we have ſaid about riveting, ſcrewing, and ſoldering, is not fixed by any of theſe operations, but is attached to its arbor by a method which admits of its being taken off at pleaſure, thus;—a hole is opened by a broach in the centre of this wheel, large enough to take the arbor of the fuſee without play, and, when it is preſſed cloſe againſt the end of the fuſee, or, in our preſent inſtance, againſt the plane of the ſecond large ratchet, two marks are made, with a fine file, at oppoſite ſides of the arbor, cloſe to the plane of the wheel; it is then taken off the arbor, and two ſquare-ſided notches are filed carefully in the ſaid marks of the arbor, but not deep enough to injure its ſtrength; a collet with a circular hole, like that at the centre of the wheel, made at one ſide of its centre, and with a ſtraight-edged ſlit acroſs the centre from the ſaid hole, is then put on the arbor, after the wheel has been firſt put on, and is puſhed forcibly along the notches of the arbor till, by means of the oblong aperture, it is concentric with the wheel, againſt the plane of which it preſſes, when in the notches, and keeps it cloſe in its place, and at the ſame time allows it to turn on its centre without the arbor. The auxiliary ſpring is ſcrewed or pinned, in the next place, at one end to the great ratchet, and at the other to the great wheel, as before noticed. When the wheel is thus firmly attached to the fuſee arbor, with a power to recede but not to proceed, on account of the click, without carrying the arbor with it, it muſt be put into the turning frame and examined, as to its being truly centered, and alſo as to its being in a plane perpendicular to the arbor; which trial may detect ſome ſlight alterations, neceſſary to be made, to fulfil theſe two conditions: after which, its pivots may be turned to their exact ſize, hardened, and poliſhed.

The practice of ſome workmen is, to ſolder their collets on the arbors with hard ſolder, but we diſapprove this practice, and recommend ſoft ſolder, particularly if the arbors have been before hardened; it is ſcarcely neceſſary to add, that if the ends of the collets are opened a little within, the ſolder will there have beds to contain a quantity ſufficient to keep the wheel firm on its arbor. What we have here ſaid will not be equally applicable to the hour or centre wheel, becauſe it is uſually riveted on the end of its pinion, which will require a riveting punch and clamp, on purpoſe (*fig.* 16, of *Plate* XIX.) to prevent any injury being done to the pinion. Before the wheels are all firmly attached to their arbors, they muſt be tried in the turning frame, or callipers with a ſtraight edge for that purpoſe, to ſee if they are concentric, and that their planes are perpendicular to their arbors, which conditions the workmen call being "in the round," and being "in the flat;" and when properly adjuſted, in theſe reſpects, they may be finally fixed as above deſcribed, and their arbor-pivots finiſhed. Should a wheel, that has had its teeth rounded in the engine, be at any time found a little eccentric in the trial, before it is fixed on its collet, which will not happen if the central hole be enlarged with a good broach and with due care, the remedy in this caſe would be, to mark the ſide of the wheel which has the longeſt radius, and enlarge the central hole carefully on that ſide moſt, and then to make a new collet for it, after the hole is again made perfectly round, and found to be concentric on an arbor that fits it; but when the teeth have been rounded by hand, the wheel may have the eccentricity rectified on its own arbor, and be again rounded where the teeth have been touched by the graver, which is the common practice, and which conſtitutes the greateſt recommendation of manual rounding of the teeth.

The files uſed in rounding the ends of the teeth of a wheel are ſmooth, and curved on one ſide (ſee *fig.* 16, of *Plate* XXI.), and have each a projecting pivot at the remote end, which a dexterous workman holds againſt one finger of the left hand as a reſt behind the wheel, while the right hand guides the file from one ſide of the tooth to the other, alternately, with a degree of rapidity which ſurpriſes the ſpectator.

We have hitherto ſuppoſed our piece not to be jewelled, nor buſhed with bell-metal, which addition enhances the price, but greatly diminiſhes the friction in the pivot holes: if the holes are carefully enlarged with a good broach, ſmall pieces of metal holding ruby, agate, or bell-metal, may be made to fit them exactly, the holes in which may be reſpectively equal to the original pivot holes, and then the good action of the wheel-work will not be altered thereby. The friction in the pivot holes is greatly diminiſhed too by the application of fine nut-oil; they are, therefore, generally chamfered, or counter-ſunk, at the exterior ſurfaces of the plates, in order that the oil may be retained; but what ſhould be the exact depth of the bearing part of the pivot-hole, is a matter not abſolutely decided. Mr. Reid, we have ſeen, prefers, to a counter-ſunk hole, a conical point, which holds the oil in a globule by coheſion, and which is held by a ſmall cock.

In ſome clocks which we have ſeen well-finiſhed, the ends of the pivots are conical, and bear againſt holes of nearly the ſame ſhape, not entirely perforated; but we conceive that, unleſs the pillars and arbors were all of the ſame metal, the difference of their expanſibilities muſt materially alter the quantity of play, lengthwiſe, at different ſeaſons of the year, and in cold weather create conſiderable friction, by affecting the braſs pillars more than the ſteel arbors; an effect which the workman probably does not take into his account, who thinks of avoiding friction by ſuch a conſtruction.

As the pallet-wheel makes many more revolutions than any other in the movement, it is neceſſary that the metal, of which it is made, ſhould not be very deſtructible, particularly when pallets are uſed which rub againſt its teeth; we therefore recommend a tempered ſteel wheel to be uſed, which ought to be alſo divided and cut with extraordinary care, becauſe any irregularity in the ſhape of the tooth, or diſtance between the teeth, would injure the eſcapement, and produce beſides ſuch irregularity in the motion of the ſeconds hand, placed on this wheel's arbor, as would offend the eye. We reſerve our obſervations on the ſhape of the teeth proper for different eſcapements to act with, until we treat this part of our ſubject more particularly in its proper place.

9. *Pallets.* There is no part of a clock which requires greater nicety in the execution than the eſcapement, or part which limits the intenſity and duration of the impulſe given to the pendulum by the maintaining power, and which keeps up the due quantity of motion, that would otherwiſe be gradually diminiſhed to a ſtate of quieſcence, by reaſon, as we have ſaid, of the unavoidable friction at the point of ſuſpenſion, and of the reſiſtance which the air affords to the ſolid parts of the moving pendulum: but for the ſame reaſon that we have poſtponed our particular directions concerning the conſtruction of the pallet or ſwing-wheel, till we come to the article ESCAPEMENT, muſt we alſo ſatisfy ourſelves here with a few general directions and obſervations, which apply excluſively to our dead-beat pallets. We have already detailed, under our ſubdiviſion, entitled *callipering*, the method of laying down the plan of the pallets in queſtion; the ſhape and dimenſions there aſcertained muſt be exactly copied, or otherwiſe projected again, either on one of the

plates or on a ſmooth ſheet of braſs, as a plate of trial for the eſcape, which will admit of pivot-holes being drilled, exactly as in the plates of the frame, for the centres of the pallet and pallet-wheel arbors ; a piece of good ſteel muſt then be forged nearly into the ſhape of the anchor, compared with the plan on the frame or braſs plate, but ſomewhat larger : after the arbor hole is drilled in the anchor, and enlarged to the propoſed aperture, the requiſite circles may be deſcribed, with extents borrowed from the braſs calliper, by means of a pair of ſmall bullet compaſſes, and the ſlopes may be copied or re-traced for the faces of the pallets ; the excluded metal may then be filed away very nearly, and all the ſurfaces be ſmoothed, firſt with fine files, and then with oil-ſtone duſt and oil. It has been ſaid that the breadth of each pallet muſt be ſomewhat leſs than half of a ſpace meaſured from tooth end to tooth end of the pallet wheel, but the quantity of diminution muſt not depend on conjecture ; therefore the breadth is left at firſt equal to one half as nearly as can be aſcertained, ſo that the diminution of breadth may be effected by tentative adjuſtment, firſt partially when the wheel has its teeth finiſhed, and when both it and the anchor of the pallets are inſerted on pins urged into the pivot-holes of the frame, or trial plate ; and again more minutely when they are fixed on arbors, and mounted in the frame. To enſure the perfect portion of a circle at the extremities of the anchor, we recommend that it be put on a motion arbor, that juſt fits the central hole, and that it be turned in a frame or lathe, like a wheel, before it is cut; for then it is certain there will be no recoil in the pallet-wheel, and ſeconds hand, when thoſe parts preſs againſt the ends of the teeth, during an excurſion of the pendulum ; and if the inner circles could be turned alſo after the eſcape is nearly adjuſted, it would be deſireable ; however, the point of a graver may trace in the turning frame this inner circle, and then a proper curvi-linear file, made and kept on purpoſe, may take off the interior ſuperfluity of metal. In adjuſting the ſlopes and breadth of the pallets, it will be ſerviceable to inſert an index on the pallet's arbor, after it is finiſhed and the pivots turned, and to mark on the frame plate the quantity of the eſcapement angle, in this inſtance 2° at each ſide of the perpendicular demitted from the pivot-hole, which will be a good guide for the true final adjuſtment of the eſcape. Particular care muſt now be taken that there be as little drop as poſſible, *i. e.* that as ſoon as one tooth has completely eſcaped the face of its pallet, the next acting tooth ſhall be cloſe to the back of the following pallet, ſo as not to ſtrike it with a jerk; the place where the firſt contact takes place between the end of the tooth and interior or exterior circle of the pallet, accordingly as it is the leading or following pallet, muſt be very near the commencement of the ſlope, but not upon it, nor yet on the angular point of interſection. Indeed it is extremely difficult to give complete verbal directions for this delicate adjuſtment, which requires long and attentive practice to do perfectly ; for frequently, after the pallets are hardened, which they muſt be as much as poſſible, the ſhape of the anchor is found to be altered, and the adjuſtment of the pallets conſequently deranged : to remedy this conſequence, it is uſual to harden only the pallet parts of the anchor, ſo that by certain ſtrokes given near its arbor, the pallets may be brought in or ſet out a little to rectify them ; but after ſuch rectification it will always be neceſſary to try, in the turning frame, or at leaſt by a pair of bullet compaſſes, if the circular parts are again perfectly concentric, without which condition the pallets will not be truly what are called dead-beat.

Hitherto we have conſidered the back pivot hole of the pallets arbor, as being in the plate of the frame, but it becomes neceſſary to cut away that portion of the back plate where the pivot hole falls, by reaſon of the crutch, or little rod of ſteel which muſt be ſcrewed to a collet attached behind the frame to the arbor, to form an L ; which contrivance impreſſes the force that the pallets receive from the maintaining power upon the pendulum ; the bent end of the crutch is uſually inſerted into a ſlit made in the verge or rod of the pendulum, but when the bent part is divided and encloſes the pendulum rod, it is denominated the fork : the crutch is moſt uſually about one ſixth part of the whole length of the pendulum rod, but there ſeems to be no fixed rule laid down by which its beſt length might and ought to be determined in different caſes, which therefore we think deſerves further conſideration.

But to return to the pivot-hole of the pallet's arbor ; this, for the reaſon we have juſt given, is finally placed in a cock at the back of the poſterior plate, which is generally ſo ſhaped as to furniſh alſo a point of ſuſpenſion for the pendulum. (See *a*, in *fig.* 3, of *Plate* XI.) The exact placing of the cock, ſo that the arbor pivoted into it ſhall be perfectly at right angles to the ſurface of the plates, is of the greateſt importance, and therefore it ought to be placed and its ſteady pins fixed, before the original pivot-hole, through which it muſt protrude, is cut away in the plate ; for in that caſe the protruding end of the arbor, while in its proper poſition after the adjuſtment of the eſcapement, will be like a fixed arbor on which to ſlide the cock, and fix its poſition before the ſteady pins are applied and the ſcrews fitted to their places.

It is, however, the practice of ſome workmen to adjuſt the eſcapement, by moving the cock before the ſteady pins are inſerted.

We might have noticed, that after the anchor of the pallets is ſcrewed to the collet of its arbor, it ſhould be ſuſpended by the pivots of the verge, which is the name given to this arbor, to try if the weight of each pallet exactly balance that of the other, which may be effected by dimiſhing the thickneſs of the heavier pallet a little by a fine file before it is finally poliſhed ; alſo before the crutch is ſcrewed it ſhould be hung on the verge of the pallets arbor, after the pallets are balanced and ſuffered to find their place of quieſcence, in order to find its own perpendicular direction, and then it ſhould be fixed in that ſituation ; for without this care it will require to be bent ſo as to offend the eye, for the purpoſe of putting the clock into beat, or otherwiſe will require a ſlit in it acroſs the centre, to admit of an eccentric adjuſtment, or ſome ſuch contrivance. When all the adjuſtments of the eſcapement are thus made, the pallet faces, if not jewelled, and alſo the pivots, muſt be hardened and finally dreſſed by the uſual ſucceſſive operations of poliſhing.

10. *Pendulum and Suſpenſion.* The precautions we have hitherto dictated, in our directions for the ſucceſſive operations in clock-making, have for their principal object the regular tranſmiſſion of a certain quantity of the maintaining power to the pendulum, in order to preſerve the arc of vibration unaltered, which is one of the two eſſential qualities of the going pendulum, on which the exact meaſurement of time depends ; the other, which is an indiſpenſable quality of the pendulum, where great exactneſs is required, is that by which its length is preſerved unaltered in all the variations of temperature, as the centre of oſcillation regards the centre of ſuſpenſion. Theſe two properties of the pendulum, its conſtant arc, and conſtant length, conſtitute the excellence to which all the other parts of the mechaniſm are ſubſervient, and without which no clock will continue in-

variably to indicate true time at all ſeaſons of the year, however exquiſite the workmanſhip of the movement and other parts. In an ordinary clock, the iron or ſteel rod of the pendulum is liable to conſiderable alternate expanſions and contractions, which render a compenſating contrivance neceſſary for pieces deſtined for aſtronomical purpoſes; or, otherwiſe, a deal or ebony rod is ſubſtituted for the metallic one, which natural ſubſtances, when of a ſtraight grain and gradually dried by age, are found to be much leſs liable to alteration in their length by changes of temperature, than iron or any other metal; their dimenſions, however, are a little altered by moiſture, which alteration renders them in our opinion objectionable.

In our half-ſeconds pendulum we propoſed to make uſe of a compenſation, in which the unequal and oppoſing expanſibilities of two different metals produce the deſired effect. It would, however, extend our preſent article to an improper length, if we entered here into the geometrical theory of the pendulum, or even if we detailed again the arrangement of the bars which conſtitute the mechaniſm of the compenſation propoſed; but under our article PENDULUM, the reader will, we preſume, find the former omiſſion amply ſupplied; and the latter has been anticipated in our deſcriptions of Reid's and Brockbank's aſtronomical clocks. Reſpecting the ſhape and ſize of a requiſite bob or ball for the pendulum, we have already made our remarks under the word BOB, and therefore ſhall not repeat them here, particularly as we ſhall have occaſion to reſume the ſubject under the article MAINTAINING *Power;* it ſeems proper, notwithſtanding, to add a few words on the ſubject of the ſuſpenſion of the pendulum. Berthoud, the juſtly admired author of many French works on clock and watch-making, has affirmed (in conſequence of ſome of his experiments on the length of time that pendulums, differently ſuſpended, take in coming to the ſtate of quieſcence, after being moved the ſpace of a given angle from the line of direction), that what is called a knife-edge ſuſpenſion is preferable to that in which a piece of watch main-ſpring is uſed at the point of ſuſpenſion; we will not undertake to decide to which mode the preference is due, but adopt that which our Engliſh clock-makers, perhaps without a ſufficient compariſon of the two, have brought into general uſe. In ordinary clocks a ſlit is made in the moſt prominent part of the cock, into which the piece of watch-ſpring is inſerted, which carries a ſmall piece of braſs riveted to its extremity, by which the weight of the pendulum is ſuſpended on the cock, and a hole drilled through both the clock and braſs piece receives a pin to keep the pendulum in its ſituation; but this mode of ſuſpenſion is liable to two conſiderable objections: firſt, if the pendulum ſpring happen not to coincide with a perpendicular line paſſing through the pivot-hole of the pallet's arbor, one ſemi-arc of vibration will be greater than the other, even after the bending or eccentric adjuſtment of the crutch has brought the clock into beat, for which imperfection this mode of ſuſpenſion affords no remedy; and ſecondly, the adjuſtment for time, as determined by the going of the clock, cannot be made without ſtopping the pendulum to ſcrew up the adjuſting ball at the bottom of the rod; to obviate theſe two evils, we might have ſuſpended our pendulum in a way which admits of both a lateral and longitudinal adjuſtment, without ſtopping the motion of the pendulum, according to the drawings contained in *Plate* XXVII., and deſcribed under the ſection of *Aſtronomical Clock,* by Meſſrs. Brockbanks; but for the ſake of variety, we propoſe to introduce a different mode of limiting the effective length of a pendulum, which mode is frequently uſed, but we believe has never before been publiſhed. The method we mean, is that which we have deſcribed under the head of *an eight-days portable clock,* contained in *Plates* XI. and XII.; from which deſcription, it is preſumed, the reader will already have apprehended all that is neceſſary to be underſtood relating to the mechaniſm, and its application to the regulation of the going pendulum.

11. *Dial work.*—In the deſcription of the ſame eight-days clock which we have juſt referred to, has alſo been particularly explained the common dial-work of a clock, the different parts of which are ſo diſtinctly repreſented in *Plate* XII., that no further directions ſeem neceſſary in this place, eſpecially as we propoſe to give an ample account of the different methods of indicating time on the faces of clocks and watches, under the article DIAL-*work.*

12. *Striking part.* As we have dwelt ſome time on the different ſucceſſive parts of the mechaniſm of the going-part of a clock, which are the moſt eſſential to be attended to, we hope to be excuſed, if we treat more generally, and claſs under one head what remains to be ſaid on the ſtriking part, which requires leſs of ſcience, and more of mere mechanical contrivance, than the parts we have hitherto treated of.

Neither do we mean to deſcribe over again here, the offices of the different parts of the ſtriking mechaniſm, but to point out the order in which the various conſtituent pieces ought to be ſucceſſively made, and to give our reaſons for their requiſite diſpoſition; leaving the mechanician and workman in poſſeſſion of their own mechanical reſources, to be applied in their own way.

The directions which we have given for the callipering and manipulation of the train in the going part of the clock, will equally apply to the wheels and pinions of the ſtriking part, and the ſpring box, D, *fig.* 1. *Plate* XI. together with the great wheel, F, and its fuſee, may be made preciſely in the ſame way as thoſe of the going part, C, and E, have been directed to be made; alſo the guard-gut muſt be ſimilar. To ſhew the manner in which the main-ſpring is coiled within the box, the lid or end piece is left out in our drawing. The numbers of teeth proper for the wheels and pinions of the ſtriking train, and alſo the number of pins in the pin-wheel, have been before explained; as alſo the ſtructure and poſition of the fly, hammer, and bell; which explanations therefore, need not be repeated.

When the dial-work is finiſhed, and the clock is meant to ſtrike the hours only, which is our ſuppoſition here, the warning pin may be attached to the wheel which revolves in an hour, which we have elſewhere called the minute wheel, (ſee *fig.* 2, *Plate* XII.) becauſe it carries the minute hand as it revolves; or otherwiſe it may be put, as we have placed it, in the ſecond wheel of a ſimilar number of teeth, marked *g,* in *fig.* 1, of *Plate* XII. where it is better ſeen. The warning-piece, *t u v,* muſt revolve round the angular point, by means of a tube fitting nicely on a fixed ſtud, in ſuch a ſituation on the front plate of the frame, that the piece will not require much force, to be deducted from the maintaining power, to be moved from its ſtationary ſituation at the end of each hour; and that this may be the caſe, the tail-piece, *v,* ſhould lie at right angles with the tangent line, in which the warning pin is moving at the time of their contact; the bent end, *t,* muſt neceſſarily be at ſuch a diſtance from the centre of motion of the warning-piece, as the pin in wheel R, *fig.* 1, *Plate* XI. which it muſt fall in the way of demands. Alſo the hawk's-bill *p q r,* *fig.* 1, *Plate* XII. which is lifted by the bent end of the warning-piece, ſhould lie in a line, *p r*, perpendicular to the tangent-line, in which the end of the warning piece moves at the inſtant of lifting, in order that the leaſt impreſſed force may detach the bill from the teeth of the ſubjacent rack; and that the hawk's-bill may have the mechanical advantage of a long lever, its centre of motion muſt be at the remote end *r*; likewiſe, in order that it may always move in the ſame plane, it muſt have alſo, like the warning-piece, a tube moving round a ſtud in the plate of the frame conſidered as its centre of motion. The weight and ſtrength of the materials of theſe two pieces, which are uſually of ſteel, ſhould be proportioned to the power of the main-ſpring which lifts them; for which reaſon, the lighter they are the better, provided they do not bend with the forces they have to ſuſtain as detents, when at reſt. The length of the gathering pallet, *s*, in the laſt named plate, muſt be guided by the ſtrength of the main-ſpring, as exerted at the arbor on which this pallet is placed, compared with that of the counter-ſpring, *o*, of the rack-tail: for if the latter is comparatively ſtrong, the pallet muſt neceſſarily be ſhort, to have power enough to gather up the rack; but the length of the tail of this pallet, depending on the diſtance that the catching pin, *m*, on the rack, is from the laſt tooth of the rack, may be optional; only it may be obſerved, that the longer the tail is, the more power it has to arreſt the motion of the ſtriking train, when the hour is ſtruck. It is of little importance, whether the gathering pallet be before or behind the bill of the hawk's-bill, provided they act clear of one another, and provided the rack have 12 notches, to be caught ſucceſſively by the pallet.

The ſize and ſhape of the rack, *m n*, depend on the diſtance of the centre wheel arbor from the gathering pallet, conjointly with the ſize of the ſnail *l*; when the quarters are not ſtruck, the ſnail is uſually attached to the 12-hours wheel, and revolves with it, as in our drawing; but it might with equal propriety be placed on a ſecond wheel, revolving in the ſame ſpace of time, as is the caſe in the clock with chimes, repreſented in *Plate* XVII. of *Horology*. The ſteps which form the notched ſpiral outline of the ſnail have their depth depending partly on the length of the tail-piece, *n*, of the rack, and partly on the ſize of the teeth of the rack; the diſtance from the outer to the inner end of the irregular ſpiral of the ſnail muſt be ſuch, and the length of the rack-tail ſo proportioned to the body of the rack, that the 12 teeth of the rack will only juſt paſs the gathering pallet, while the pin, in the extremity of the ſaid tail, moves down the ſtraight line that connects the two ends of the ſpiral, formed by the boundary of the ſnail; hence, ſuppoſing the rack previouſly made, the point for its centre of motion muſt be found ſuch, that the two conditions will be exactly fulfilled; but the beſt way is, to fix upon a point for the centre of motion firſt, and then to proportion the rack and ſnail to each other, for the aſſumed length of tail, from the ſaid centre of motion; the ſteps will aſcend by equal additions of height, if the teeth of the rack are equidiſtant. When the ſnail is deſigned, care muſt be taken, that each ſtep ſhall ſubtend exactly the twelfth part of a circle, or 30 degrees; the apparent increaſe in the ſize of the ſteps is not owing to any increaſe in the angles ſucceſſively ſubtended, but to the increaſe of the ſucceſſive radii of curvature: for as the wheel that carries the ſnail round revolves in 12 hours, every ſtep muſt correſpond to an hour's motion, otherwiſe the ſame hour might be ſtruck a ſecond time ſometimes, when a greater ſpace than the hour has elapſed, as indicated by the minute hand. The rack, like the warning-piece and hawk's-bill, is uſually made of ſteel; but the ſnail may be made of braſs, which is more eaſily cut by the file than ſteel. The bar for repetition, and the ſtrike or ſilent, may be added with little trouble, if deemed deſireable, but the account we have given of theſe parts before, when deſcribing a portable eight-days clock, will be deemed ſufficient by the generality of readers, and thoſe, who have been inſtructed in the art, will need no further direction from us reſpecting thoſe parts of the workmanſhip which are merely mechanical; for were we to enter into a detail of all the nick-nacks which have been introduced into the ſtriking part of a clock, we might write a whole quarto volume on the ſubject. Neither do we think it incumbent on us to enter minutely here into the particulars of the enamelling, ſilvering, &c. of the dial, or of the manufactory of the hands, and caſe, which are ſeparate departments: it may, however, be proper to obſerve, that ſome care is requiſite in making the pillars of the dial to be all of an equal length, that the plane of the dial may be exactly at right angles to the axes of the hands; otherwiſe they will approach the dial in ſome points of their reſpective revolutions more than in others, which will offend the eye of a ſpectator. It is a matter of very little importance whether the bell of the ſtriking part be fixed vertically or horizontally; this point is generally determined by the ſize and ſhape of the caſe that is fixed upon.

13. *Adjuſtment for Rate.* Suppoſe now our propoſed clock to be finiſhed, and fixed in its caſe, and this firmly attached to a ſolid wall, to avoid all caſual motion, that might be derived from the floor of the room in which it is placed, when trodden upon; ſuppoſe moreover, its poſition ſuch, that when the pendulum is put into motion, the two alternate excurſions are exactly ſimilar in extent and time, or, in other words, that the clock is in perfect beat; it then only remains to be brought to true mean time, ſolar or ſidereal, as its deſtination may be; if the latter is fixed upon, the adjuſtment for the length of the pendulum muſt be made from night to night ſucceſſively, till a ſtar, ſeen through a tranſit-inſtrument, ſhall be found to croſs the central thread of the eye-piece, exactly at the ſame hour, minute, and ſecond, for two or three ſucceſſive nights, which nicety of adjuſtment may be effected at any ſeaſon of the year, provided the compenſating mechaniſm be perfect; indeed an examination of the paſſage of the ſame ſtar, whatever it be, will detect the inaccuracy of the compenſation if there be any, provided the tranſit-inſtrument have its adjuſtments perfect. It is hardly neceſſary, perhaps, to add, that when any known ſtar is paſſing the middle thread of the field of view of a tranſit-inſtrument, properly ſet in the true meridian line, the ſidereal clock ought to be indicating the exact hour, minute, and ſecond, denoted by the ſaid ſtar's right aſcenſion for the year and day in queſtion. When ſolar or common time is intended to be indicated by the clock, which is the caſe for all civil purpoſes, the clock may be tried by a compariſon with a regulator previouſly adjuſted, or more accurately by ſucceſſive obſervations, taken of any of the heavenly bodies, as explained in ſome of the problems contained in our article CHRONOMETER.

If a tranſit-inſtrument is uſed as the inſtrument of obſervation, an allowance of $3^{m}\ 55^{s}.9$ muſt be made for each twenty four ſidereal hours, which is the quantity by which a ſolar day is longer than a ſidereal one, as has been explained under the article juſt referred to. It may ſave ſome time in making calculations for this purpoſe, if we ſubjoin a table computed for the ſervice of thoſe who wiſh their clocks to be properly regulated.

Table for regulating Clocks or Watches.

Revolutions of the Stars.	Mean Solar Time corresponding.				Acceleration of the Stars in Solar Time.		
	d.	h.	m.	s.	h.	m.	s.
1	0	23	56	4.1	0	3	55.9
2	1	23	52	8.2	0	7	51.8
3	2	23	48	12.3	0	11	47.7
4	3	23	44	16.4	0	15	43.6
5	4	23	40	20.5	0	19	39.5
6	5	23	36	24.6	0	23	35.4
7	6	23	32	28.7	0	27	31.3
8	7	23	28	32.8	0	31	27.2
9	8	23	24	36.9	0	35	23.1
10	9	23	20	41.0	0	39	19.0
11	10	23	16	45.1	0	43	14.9
12	11	23	12	49.2	0	47	10.8
13	12	23	8	53.3	0	51	6.7
14	13	23	4	57.4	0	55	2.6
15	14	23	1	1.5	0	58	58.5
16	15	22	57	5.6	1	2	54.4
17	16	22	53	9.7	1	6	50.3
18	17	22	49	13.8	1	10	46.2
19	18	22	45	17.9	1	14	42.1
20	19	22	41	22.0	1	18	38.0
21	20	22	37	26.1	1	22	33.9
22	21	22	33	30.2	1	26	29.8
23	22	22	29	34.3	1	30	25.7
24	23	22	25	38.4	1	34	21.6
25	24	22	21	42.5	1	38	17.5
26	25	22	17	46.6	1	42	13.4
27	26	22	13	50.7	1	46	9.3
28	27	22	9	54.8	1	50	5.2
29	28	22	5	58.9	1	54	1.1
30	29	22	2	3.0	1	57	57.0
40	39	21	22	44.0	2	37	16.0
50	49	20	43	25.0	3	16	35.0
60	59	20	4	6.0	3	55	54.0
70	69	19	24	47.0	4	35	13.0
80	79	18	45	28.0	5	14	32.0
90	89	18	6	9.0	5	53	51.0
100	99	17	26	50.0	6	33	10.0
200	199	10	53	40.0	13	6	20.0
300	299	4	20	30.0	19	39	30.0
360	359	0	24	36.0	23	35	24.0
365	364	0	4	56.5	23	55	3.5
366	365	0	1	0.6	23	58	59.4

The application of the preceding table can hardly be miſtaken, but, for the ſake of illuſtration, we will ſuppoſe an example that ſhall include all the difficulties that are likely to occur in practice; let it, for inſtance, be required firſt to put the clock to mean ſolar time, when Spica Virginis is paſſing the meridian hair of a tranſit-inſtrument, on the evening of the 1ſt of May, 1807, and that, on the evening of the ſeventh ſucceeding day, the ſaid clock being obſerved to be indicating $10^h\ 15^m\ 29^s$ at the moment, it be required to aſcertain the daily loſs or gain on an average of the ſaid ſidereal days? The work may be thus performed; *viz.* –

R. A. of Spica Virginis for 1806 (Tab. III. CHRONOMETER)	13^h	14^m	$59^s.29$
Annual variation for one year, add			3.15
Ditto for four months, - do.			1.05
	13	15	3.49

Star's corrected R. A. for May 1, 1807	13^h	15^m	$3^s.49$
Sun's R. A. for noon of ditto, ſubtract	2	30	56.3
Approx. ſolar time of ſtar's paſſage	10	44	7.19
Propor. part of $3^m\ 48^s.7$ (daily dif.) ſubtract		1	42.03
True time of the ſtar's paſſage to which the clock muſt be ſet	10	42	25.16
Seven days acceleration of the ſtar from the Tab. ſubtract		27	31.3
True mean ſolar time -	10	14	53.86
Time by clock per ſuppoſition -	10	15	29
Amount of error in ſeven days	+0	0	35.14

Hence the daily error, in exceſs in each ſidereal day, is $= \frac{35^s.14}{7} = 5^s.02$, which was to be determined.

For the other methods of aſcertaining the rate of a clock or watch, and for the manner of applying the equation of time, the reader is deſired to conſult the problems under the article CHRONOMETER.

CLOCK-*movement* is a term in *Horology*, which ſometimes implies a combination of wheels and pinions employed in the ſtriking part of a clock, but moſt uſually that ſucceſſion of wheels and pinions which move one another, from the maintaining power to the pallets in the going part, and which are employed to tranſmit the force of that power in an equable but modified manner to the regulator, at the ſame time that they count and indicate the number of its vibrations in a given period of time. That theſe offices of the going part, to which we will confine ourſelves principally, may be performed in a proper manner, it is requiſite that the wheels and pinions of the movement ſhould have their number of teeth properly calculated; that their diameters ſhould be exactly proportioned to act in ſuitable pairs; that they ſhould be properly callipered to make the pitch-line of each wheel coincide with that of its pinion; and that the teeth ſhould be of a proper ſize and ſhape, to tranſmit the motion and force they have received, to the teeth acting with them in an uniform manner in every poſſible ſituation of the acting parts.

The three firſt of theſe requiſites have already occupied a conſiderable portion of our attention under the article CLOCK-*making*, to which the reader is referred; and the fourth, which relates to the ſize and ſhape of the teeth, might have been properly deferred till we come to the word TOOTH, had it not fallen ſo far into the alphabet; we ſhall therefore introduce the ſubſtance, appropriated to that word, in this place, that the ſubject may appear in as complete a ſtate as our arrangement will admit, at an early period of our work.

Before we proceed to examine ſcientifically the requiſites which ought to guide the practical conſtruction of the teeth of wheels and pinions, it ſeems neceſſary that we ſhould premiſe ſome obſervations on the principle by which a communication of motion and a tranſmiſſion of force in general are effected in wheel-work.

In *Plate* III. *fig.* 1, of *Horology*, let A B be a lever, or rod without weight, moveable on C as a centre, and let W and *w*, ſuppoſed to be two bodies with weight, have their maſſes ſo proportioned to each other, that the maſs *w* may be to the diſtance C A, as the maſs W is to C B; or, in other words, if the maſs *w*, multiplied by its diſtance from the centre of motion, B C, give a product, or momentum, equal to the product of the maſs W multiplied by its diſtance C A; then the two bodies, *w* and W, will remain in equilibrio in any ſituation, A B, or *a b* of the free lever; but if we ſuppoſe the two bodies to have equal maſſes, or, which is the ſame thing, equal weights, it is equally evident, that the body, *w*, would preponderate in conſequence of its greater diſtance from the centre of motion, which we will ſuppoſe to be three times as great as that of W, and its velocity would, in this caſe, be three times that of W; conſequently it would require an oppoſing force, three times as much as W would require, to arreſt its motion; but if W has its maſs or weight increaſed three times, the diſtances remaining unaltered, the oppoſing forces, becoming ſimilar, would then arreſt one another, and produce an equilibrium.

The ſame effects would follow if the threads of ſuſpenſion were not left free at the ends of the lever, but were folded round the circumferences of two circles, deſcribed round the common centre, C, with their reſpective radii, C A and C B, *fig.* 2; in this caſe, alſo, the ſmaller the circumference of the dark circle is, the greater muſt be the ſuſpended weight to preſerve the equilibrium of the two circles, and *vice verſâ*, the ratio being conſtantly reciprocal.

Let us ſuppoſe, now, *fig.* 1 placed contiguous to *fig.* 2, with the large circle of one converted into the portion of a wheel, and the ſmall one of the other into a pinion, as in *fig.* 3, and let us ſee what will be the conſequence, when the teeth are connected and the weights, W and *w*, applied as before; if we ſuppoſe the materials of which the portion of the wheel and the pinion are made, to be without weight, an equilibrium will ſtill take place; but remove the ſmall weight *w*, and what will then be the conſequence? Why, the pinion D will be impelled at a mean rate, in a direction contrary to that of wheel B, with a force equal to the weight of the ſmall maſs, *w*, or, as we have aſſumed, equal to one third of the large maſs, W, which may now be called the maintaining power. But when a tooth of the pinion moves with only one third of the force of W, applied at the point, A, of the wheel, which is at a diſtance from the centre, C, equal to the radius of the pinion, it moves with the velocity of point B of the wheel, tooth for tooth, and therefore the pinion makes three revolutions for the wheel's one, ſuppoſing their numbers to be reſpectively 16 and 48, as their radii; hence 3, the acquired angular velocity of the pinion's circumference, multiplied by $\frac{1}{3}$, its diminiſhed force, makes the momentum unity, which will alſo repreſent the momentum of the maintaining power in motion, *viz.* force 3 multiplied by $\frac{1}{3}$ comparative velocity. Again, let us ſuppoſe the pinion, D, actuated by a body, *w*, equal to $\frac{1}{3}$ of the weight of W, and diſregard its velocity for the preſent, the portion of another wheel, E, attached to it by the lever E D, will have its motion contemporary with it; but, by the ſame mode of reaſoning, the velocity of the point E will be increaſed to three times that of the pitch-line of the pinion, as before was the caſe with the wheel B, compared with the point A; but its force will be diminiſhed in the ſame ratio: that is, the velocity will be $3 \times 3 = 9$, and the force, diſregarding friction, &c. will be $\frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$; but $\frac{1}{9}$, the force, multiplied by 9, the velocity, will ſtill be unity as before; accordingly, a ſmall body, F, having one-ninth part of the weight of W, the maintaining power, carried over a ſmall fixed pulley, G, will be ſufficient to preſerve the equilibrium with reſpect to the maintaining power, when the ſecond body, *w*, is removed If an additional wheel and pinion were added to the above, and were ſuppoſed to have the ſame dimenſions, the velocity produced at the pitch-line of this third wheel would be $9 \times 3 = 27$, and the diminiſhed force, on our former ſuppoſition of no friction or oppoſing force, would be $\frac{1}{27}$ only of the maintaining power. In this illuſtration of the principle by which an increaſe of velocity, and a correſponding decreaſe of power, accompany a communication of motion in alternate directions in wheel-work, the teeth may be conſidered as the remote ends of ſo many levers, which have their fulcra at the centres of the wheels and pinions reſpectively, as in *fig.* 4; and it is eaſy to ſee, that an accumulation of velocity, accompanied by a correſponding diminution of force, may be produced in any machine where the wheels drive the pinions, as is the caſe in clock-movements, to ſuch an extent, even where the ratio of the wheel to the pinion is 3 : 1 only, that the friction of the acting parts, together with the reſiſtance of the air oppoſed to the moving parts, may become a complete counterpoiſe to the maintaining power. In higher ratios of 12 : 1, 8 : 1, &c. which are uſed in clocks, the number of wheels and pinions, to produce ſuch an equilibrium, would not require many pairs beyond what an ordinary clock has for its movement. If, however, the pinions had been the drivers inſtead of the wheels, the reverſe of what we have ſtated would have taken place; the velocity would have decreaſed, and the force applied have been augmented in the ſame ratio we have explained, which is the caſe in cranes, and other engines for raiſing heavy bodies. Hence, if the movement of a clock were compoſed of ſtrong wheels and pinions with thick arbors, and had the power applied at the balance-wheel, which may be called the top of the movement, the barrel of an eight days clock having a thick cord coiled round it, would raiſe a very ponderous body, and become no mean engine for lifting weights, ſurpaſſing the ordinary efforts of man's natural ſtrength.

A ſlight conſideration of what we have here advanced, will ſuffice to convey an idea to any one, who has not previouſly conſidered the ſubject, how admirably well adapted for the purpoſes of a clock-movement this property in dynamics is, by which an increaſe of velocity is always accompanied by a proportionate abatement of force; for by means of it, the maintaining power, however large, may be ſo economically portioned out in minute quantities, ſufficient only to compenſate the loſs of motion which the pendulum or balance ſuſtains, at each vibration, that it may be made to laſt for many days, or even weeks, before it is exhauſted by the great number of ſucceſſive minute deductions, which are made at periodical intervals; at the ſame time, certain wheels and pinions, by their numbers and due arrangement, divide and ſubdivide, by means of hands and divided circles, the ſexageſimal portions of each hour, denominated minutes, and alſo of each minute by the name of ſeconds. The various offices of communicating motion, of increaſing its velocity as at firſt produced, of diminiſhing the original force of the maintaining power, of dividing, ſubdividing, counting, and indicating the hours, minutes, and ſeconds, all performed by the ſimple contrivance of a clock-movement, or watch-movement, in conjunction with the regulator, we heſitate not to affirm, when duly conſidered, exhibit one of the moſt ſtriking inſtances of human ingenuity. The experiments of the philoſopher, the calculations of the mathematician, and the perſevering ſkill of the mechaniſt, have combined to produce ultimately this admirable piece of mechaniſm, of which we hardly know which moſt to admire, the ſimplicity of the conſtruction, or the complexity of the various offices, conſtantly and moſt correctly performed.

As a further illuſtration of this fundamental part of our ſubject, we will here introduce the reader again to the calliper of our propoſed half-ſeconds clock, (ſee Clock-*making*) where we will ſuppoſe the centres of the wheels and pinions arranged in a ſtraight line, as ſeen in *fig.* 4, of *Plate* III. We will ſuppoſe the main-ſpring, or power, pulling with a force, at the point P of the great wheel A, equal to the weight of a body, W, of three pounds; then becauſe this wheel has 96 teeth, and actuates a pinion, *a*, of 8 leaves, their numbers of teeth being directly to each other as their radii, which are repreſented as levers acting together, with their fulcra at the reſpective centres, the velocity at the circumference of the wheel will be communicated to the circumference of its pinion *a*, which therefore will make $\frac{96}{8}$, or 12 revolutions, during the time that the wheel makes one; hence if the great wheel be aſſumed to revolve once in 12 hours, as we propoſed, the centre pinion *a*, together with its wheel B, will revolve in one hour, and its arbor will be proper for the hand to indicate minutes on a circle of 60 on the clock face; but it muſt be obſerved, that the velocity is not increaſed 12 times, as it reſpects the point P, where the maintaining power is applied, nor is the force diminiſhed in the ſame ratio as it regards that point; but, to make the calculation more ſimple, we will conſider the diſtance of P, from the centre of A, equal to $\frac{1}{12}$ of the radius of wheel A, which is the radius of pinion *a*, and correct the concluſion drawn from ſuch a ſuppoſition afterwards: the pinion *a* then, we ſay, has its velocity at the pitch-line, or its number of revolutions equal to 12, and its force equal to $\frac{1}{12}$; in the next place, the radius of a pinion *a*, is to the radius of the concentric and contemporary wheel B, as 8 : 64, and $\frac{64}{8} = 8$; the circumference of this centre wheel, therefore, will move with a velocity equal to 12 × 8, or 96, and with a force only of $\frac{1}{96}$; both which will be imparted to the pitch-line of the pinion *b*, of 8 leaves; again, the radius of the latter pinion *b*, is to the radius of its concentric and contemporary wheel C, as 8 : 60; but $\frac{60}{8}$ is a fraction, the value of which is $7\frac{1}{2}$; and $96 \times 7\frac{1}{2}$ therefore make 720 to expreſs the velocity, or number of revolutions of pinion *c*, actuated by the wheel C; and $\frac{1}{720}$ will expreſs the force, or fractional part of three pounds, the quantity aſſumed for the maintaining power, which is equal to 24 grains of troy weight. We have now found, that while the wheel A is making one revolution, the laſt pinion *c* will make 720, and that 24 grains troy, ſuſpended by a ſmall pulley over the pitch-line of pinion *c*, and attached to it, will balance three pounds of the ſame ſpecies of weight, ſuſpended at $\frac{1}{12}$ of the radius from the centre of the great wheel, if we diſregard the effects of friction. Let us examine the conſequence of theſe calculations as they regard our arrangement of the calliper: the pinion *c*, we have ſeen, revolves in $\frac{1}{720}$ of 12 hours, according to our original aſſumption of A revolving in 12 hours; but in twelve hours there are juſt 720 minutes; one revolution conſequently of the laſt pinion *c*, is performed in exactly one minute; its arbor will therefore be proper for the axis of the ſeconds hand, which goes round its circle of 60 in this time: but the maintaining power, W, is not actually ſuſpended at $\frac{1}{12}$ of the radius of wheel A, according to our ſuppoſition when we calculated, conſequently the reſult, as it relates to the modified force at the pitch-line of pinion *c*, requires yet to be corrected, or ſomehow compenſated; this is done by making the radius of the ſwing or balance wheel D, equal to the diſtance of P from the centre of A, in which caſe, the calculated velocity and force at any point in the circumference of D will be in the ſame proportion to what thoſe of the maintaining power ſuſpended at P are, as the velocity and force at the pitch-line of pinion *c* would have been, if the ſame maintaining power had been actually ſuſpended $\frac{1}{12}$ of the radius of A, from its centre; the body W of 24 grains therefore attached to the circumference of wheel D, and carried over the ſmall pulley above it, will balance three pounds, ſuſpended at the point P, of the great wheel, if, as before, we diſregard friction; and the puſh made, in any direction, againſt the pallet face, will be equal to a force of 24 grains, acting in the ſame direction: the ſame reſult would alſo have accrued, if the body W had been ſuſpended at the circumference of wheel A, provided the ſwing-wheel had been of the ſame radius; but, ſuppoſing the body W to remain at P, and the ſwing-wheel D made equal to the great wheel, then the velocity of the former would have been increaſed, and its force diminiſhed, in the proportion of the diameter of the ſwing-wheel to the diameter of the barrel, by which we ſuppoſe the body W to be ſuſpended at P: in this caſe, the ſmall dotted body, *x*, ſuſpended at *y*, at a diſtance equal to the radius of wheel A, would have been ſufficient to keep the body W in equilibrio.

The pendulum propoſed to be adopted, being a half ſeconds pendulum, the ſwing-wheel muſt have 60 teeth, in order that one tooth may eſcape the pallets at every ſecond vibration, which therefore becomes a proper regulator for our preſent movement.

When the whole movement is previouſly given in any clock, and we want to aſcertain the relative revolutions of the firſt and laſt wheels, a little conſideration of what we have ſaid will ſhow, that the product of all the wheels, divided by the product of all the pinions at one operation, will give the reſult at once thus, $\frac{96}{8} \times \frac{64}{8} \times \frac{60}{8} = \frac{368640}{512} = 720$, as before.

Alſo, when the relative forces of the maintaining power, at the barrel, and at the end of a tooth of the pallet-wheel are thus aſcertained, this calculated force muſt be altered, inaſmuch as the pallet-wheel has its diameter greater or leſs than that of the barrel, accordingly as we have ſhown above. When a ſpring and fuſee are uſed, the power of the ſpring may be aſcertained either by the inſtrument of adjuſtment uſed as a lever with a ſliding weight, or, what will be leſs equivocal, a barrel may be attached to the ſquare of the fuſee arbor, when the ſpring is adjuſted, and then a heavy body ſuſpended by it in a ſcale to admit of weights of adjuſtment, which barrel and weights may be ſubſtituted for the ſpring and fuſee in the calculation, firſt of the whole force applied as a maintaining power, and then of its modification at the face of the pallets.

If we were to take the oppoſing force of friction into our calculation, we ſhould find the problem extremely complicated; for there are not only various cauſes of friction in a movement, ſuch as that cauſed by the action of the teeth, and in the pivot-holes, &c.; but the continual variation of the quantum of friction, ariſing from the deſtruction of the rubbing parts, the thickening of the oil uſually applied, and the admiſſion of duſt, is ſuch, that no regular and conſtant data can be obtained whereon to ground ſuch a calculation as would prove ſerviceable. The readieſt, and perhaps beſt, practical way of aſcertaining how much of the maintaining power is expended in friction, is really to ſuſpend ſuch ſmall weight by a tooth of the ſwing-wheel, as will balance the maintaining power, and compare this with the requiſite force obtained by calculation; the difference will give the collective quantum of friction, at the time of the experiment, in the whole movement.

Friction, however, is not the only obſtacle to the maintaining power in the works of a clock in motion; the tranſmiſſion of force is not conſtant, but effected at ſuch equi-diſtant intervals of time, as depend on the vibrations; for inſtance, in our half-ſeconds piece, the wheels and pinions are put into motion, and ſtopped again alternately 60, and where there is recoil 120 times in each minute; hence the inertia of the matter compoſing the wheel-work is as often to be overcome as the arreſted motion is re-produced, and if the wheels are not made very light at the upper end of the train, where the force is greatly reduced, a very conſiderable portion of the calculated force will be employed in moving the works from a ſtate of reſt, at every vibration. We preſume it is on this account, more than on account of friction, that the workmen have found it neceſſary to diminiſh the wheels, and to reduce their weight, as much as is conſiſtent with ſtrength, accordingly as the train aſcends. To overcome the obſtacles to the due effect of the maintaining power, ariſing from friction, and the inertia of the wheels and pinions, more force is uſually given to it than would otherwiſe be neceſſary, and the requiſite addition, over what calculation gives, muſt in every inſtance depend upon tentative adjuſtments of the maintaining power to the momentum of the regulator, ſo as to produce the due excurſion of the pendulum or balance beyond the eſcapement angle. In ſome delicate machines for keeping true time, the pivots of the arbors are made to reſt on friction rollers, or otherwiſe, are buſhed with ſome of the precious ſtones that take a high poliſh, which expenſive additions admit of the maintaining power being ſmall in compariſon with the momentum of the regulator; which circumſtance, when the regulator is rendered unchangeable by ſome compenſating mechaniſm, is beſt calculated to preſerve the angle of vibration alſo unchanged, provided the maintaining power remain uniformly the ſame; and even if ſome ſlight alterations of force ſhould ariſe out of an imperfect adjuſtment of the fuſee, where a ſpring is uſed, the great controul of the regulator would, under ſuch circumſtances, reſtrain the effects of the ſlight irregularities of the impulſes on the pallets.

Hitherto we have conſidered the action of the wheel with its pinion, or what the French call *engrenage*, to be ſo perfect, that the velocity and force, at the circumference of every wheel, is truly and conſtantly imparted to its reſpective pinion; which is ſuppoſing not only the wheel-work to be proportioned and callipered with the utmoſt exactneſs, but alſo their teeth ſhaped in the beſt manner. There are, however, three very common cauſes of bad action; firſtly, whenever the wheel is too ſmall for the pinion, though ever ſo well callipered, its teeth will pitch againſt the ends of the pinion's leaves, and require more than ordinary force to be conſumed in their diſengagement; ſecondly, when the wheel is too large, it will impart to the pinion too much velocity during the action, and part of the force will be expended in the drop that will take place before the action commences againſt each following leaf of the pinion, after it has ceaſed to act with the leading leaf; and thirdly, if the curve of the tooth be ill formed, the tranſmitted force will, in ſome ſituations, exceed, and in others fall ſhort of a mean force; in all theſe caſes the varied intenſities of the tranſmitted force will conſiderably affect the iſochroniſm of the regulator with any of the ordinary eſcapements. Of the two firſt of theſe cauſes of bad action, we have pointed out the remedy, when we treated of the proper method of proportioning and callipering a movement, under the word Clock-*making*; the third, which is of the utmoſt importance, not only in clock-work, but in wheel-work of every deſcription, preſents itſelf now for diſcuſſion.

In *fig.* 5. of *Plate* III., let us ſuppoſe $b\,C\,A$ and $b\,c\,a$ two bent levers, reſpectively moveable on the points C and c, as their centres, and let us conceive that the parts, $C\,A$ and $c\,a$, which are in the direction $c\,C$ of the line of the centres of motion, be unchangeable in length, and be loaded with their reſpective weights W and w; but that the parts, $b\,C$ and $b\,c$, be variable in length, ſo that in any ſituation their extremities may meet and act reciprocally on each other; we affirm that the ſame weights W and w, which will keep the two variable levers in equilibrio at the point P, in the line of the centres, will alſo keep them in equilibrio when their ends reſt againſt each other at any other point, b, in the circumference of a circle, of which $c\,P$, or $C\,P$, is the diameter.

Demonſtration. Let $b\,d$, the ſhort line perpendicular to $b\,C$, which may repreſent the ſhort arc made in an inſtant by the lever $b\,C$, turning on the centre C, expreſs the abſolute force of the weight W, acting at the extremity of the lever; and let this abſolute force be decompoſed into two others, $b\,e$ and $b\,f$, the former of which, $b\,e$, may be perpendicular to $c\,b$, in the direction of $P\,b$, the angle at b being a right angle, by reaſon of its being formed at the circumference by two chords from oppoſite ends of the diameter, and the latter, $b\,f$, may be parallel to the line $b\,C$; it is evident that $b\,e$ expreſſes that portion of the force $b\,d$, which is employed in moving the point, b, of the lever $c\,b$, from b towards g, and, conſequently, in making the lever, $c\,b$, revolve, whilſt the other portion, $b\,f$, expreſſes that part of the force, $b\,d$, which has a tendency to puſh the point b towards C; but C is a fixed reſiſting point, which therefore deſtroys this part of the decompoſed force: we ſay, likewiſe, that $b\,d$ expreſſes the abſolute force exerted at the end, b, of the bent lever, $a\,c\,b$, by the weight w, to oppoſe the revolution of the point, b, round its centre, c; for, becauſe the right line, $A\,W$, is perpendicular to $C\,A$, and alſo $b\,d$ to $b\,C$, the weight, W, is to the force, $b\,d$, as the line, $b\,C$, is to $C\,A$; but in taking $C\,B$ perpendicularly to the line, $b\,P$, prolonged, the like triangles, $d\,b\,e$, and $C\,b\,B$, give $b\,d : b\,e : C\,B : C\,b$, therefore, by multiplying, $W : b\,e :: C\,B : C\,A$: now let the abſolute force with which the weight, w, urges the point, b, in a direction oppoſite to $b\,g$, be called x, and we ſhall have $w : x :: c\,b : c\,a$, or, on account of the ſimilarity of the triangles, $c\,b\,P$, $C\,B\,P$, as $C\,B$ to $C\,P$; but on the ſuppoſition that the two weights, w and W, will balance each other, when their forces are exerted reciprocally at the point P, on account of the equality of the levers, $c\,a$, $c\,P$, the weight, w, may be ſuppoſed to be ſuſpended at the point P; it will be then as $W : w :: C\,P : C\,A$; likewiſe, by multiplying, $W : x :: C\,B : C\,A$; but we have juſt proved that $W : e\,b :: C\,B : C\,A$, therefore $e\,b = x$; hence there will be an equilibrium, when the force, $e\,b$, is equal to the force with which the point, b, is urged to revolve by the weight W. It is equally demonſtrable, that an equilibrium will take place between the two levers when their point of contact falls in any other part of the circumference of the circle, $c\,b\,P$; and alſo, that an equilibrium will not take place if ſuch point of contact fall either within or without the circumference of the ſaid circle. Vide Berthoud's "Eſſai ſur l'Horlogerie," tom. i. p. 41.

Corollary. From the preceding demonſtration an inference is deducible, of the utmoſt importance in wheel-work; namely, if we ſuppoſe the point b to be always in the circumference of $c\,b\,P$, while the lever $b\,C\,A$ impels the lever $b\,c\,a$, the circles $H\,K$ and $h\,k$ deſcribed from the centres of motion C and c, and touching one another at P, when attached each to its own lever, will move with the ſame force and the ſame velocity.

For 1ſt. Let F and f be the reſpective forces with which the circumferences of the circles HK and hk are urged, and we ſhall have $bd : F :: CP : Cb$, and $f : be :: cb : ch$ or cP; but we have ſeen above that $be : bd :: Cb : CB$, therefore $f : F :: CP \times cb : cP \times CB$; but the ſimilar triangles cbP and CBP give $cP : CP :: cb : CB$; hence $cP \times CB = CP \times cb$, therefore $f = F$; conſequently, if the circle HK be moved by any force uniformly, the circle hk will alſo be moved uniformly.

2dly. Whatever may be the velocity of the point b, of the lever ACb, that which it will communicate to the lever bca, in the direction be, perpendicular to the point of contact, will be the ſame as that of point b; that is, if we demit the perpendicular dg, the velocity in the direction bd, being repreſented by bd, the velocity in the direction be will be repreſented by bg. If then V be the velocity of the circumference of the circle, or wheel, HK, and v that of the ſmaller circle, or pinion hk, it is evident that $V : bd :: CP : Cb$, likewiſe, that $bg : v :: cb : ch$; alſo, the like triangles, bdg, and CbB, give $bd : bg :: Cb : CB$; therefore, $V : v :: CP \times cb : cP \times CB$; but theſe two laſt products we have ſeen are equal, therefore $v = V$.

By a ſimilar reaſoning it is equally demonſtrable, that neither the force nor velocity of the wheel would be equally communicated to the pinion, nor thoſe of the pinion to the wheel, if the point of action were ſituated either within or without the ſemi-circle cbP.

To apply the preceding corollary to our preſent purpoſe, of effecting an equable communication of force and velocity in wheel-work, let us conceive the variable levers ACb, and acb, in *fig.* 1, *Plate* IV. ſo circumſtanced, that their remote points, b, meet at P, and that the points H and h, of the wheel HK, and pinion hk, be alſo in contact at P; let the wheel now move through five ſucceſſive portions, $H\alpha$, $\alpha\beta$, $\beta\gamma$, $\gamma\delta$, and δP, ſucceſſively, and conceive it to drive the pinion hk, by ſimple contact; in this caſe, the pinion will move in like manner, through ſimilar arcs $h\alpha'$, $\alpha'\beta'$, $\beta'\gamma'$, $\gamma'\delta'$ and $\delta'P$, and at each of the ſucceſſive points of contact, $\alpha\alpha'$, $\beta\beta'$, $\gamma\gamma'$, &c. the reſpective lengths of the levers, in order to meet in the ſemi-circle cbP, will be $AC1$ and $ac1$, $AC2$ and $ac2$, $AC3$ and $ac3$, $AC4$ and $ac4$; and, laſtly, ACb and acb, continually varying: hence we may conceive a curve, Hb, ſuch, that ſome point of the variable lever ach, between b and h, ſhall always reſt on it in every ſucceſſive ſituation of the wheel and pinion, beginning at h, and ending at b; if now we ſuppoſe the curve H, on which the variable end of the lever cbh reſts, to be attached to the wheel HK, and to be brought back into its original ſituation P, and alſo ch to be coincident with cP, it is evident that, though the wheel and pinion were not ſo in contact as to impel one another, yet if the wheel were to be moved uniformly as before, the curve-piece attached to it would drive the lever cbh before it in ſuch a manner, as to effect a conſtant variation in its length, but whether ſuch motion of the pinion occaſioned by the attached ſtraight lever, when urged by the curve-piece Hb, will or will not be uniform, depends entirely on the nature of the curve which we have not yet eſtabliſhed. Let us examine the figure a little more cloſely. The arcs PH, of the wheel, and Ph of the pinion, we have aſſumed to be equal in length, though one contains double the number of degrees as the other, by reaſon of having only half its radius; but the ſemicircle, cbP, is deſcribed from only half the radius of the pinion; conſequently the dotted lines, $c1$, $c2$, $c3$, &c. which meaſure degrees, by being prolonged, on the circumference of the pinion, meaſure double degrees on the ſemi-circle, cbP, by reaſon of their meeting at the end of the diameter, inſtead of at the centre; therefore the arc Pb, is alſo equal in length to either of the others, PH, and Ph. Theſe conſiderations will enable us to determine the requiſite curve, thus; transfer the diviſions, $H\alpha$, $H\beta$, &c. from P, back towards K; and through the interſections 1, 2, 3, 4, b, of the ſmall ſemi-circle, cbP, draw parallel arcs, 11′, 22′, &c. in dotted curves from C, as a centre; which extents will be the ſucceſſive acting lengths of the radius of wheel HK, in the ſucceſſive ſituations, as it revolves from P to H; alſo the ſmall extents $P1$, $P2$, $P3$, &c. will be ſo many radii of curvature applied ſucceſſively from the different points of diviſion; for inſtance, $P1$, applied to the firſt point below P, will interſect the innermoſt dotted arc at 1′; $P2$, from the ſecond point in PK, will interſect the ſecond dotted curve line at 2′; $P3$, from the third point, will interſect the third dotted line at 3′; $P4$ at 4′; and, laſtly, $P6$, at 6′; and if the interſtices of the curve ſo formed be completed, it will have the peculiar property of driving the ſtraight line, bh, and its pinion, with an equable force, and an equable velocity, provided the wheel HK, to which it is attached, move equably; for the acting point will always be found in the ſemi-circle cbP, which is fulfilling the condition of the problem; alſo, reverſing the motion, the ſtraight line, bh, will drive the curve, bH, and its wheel, back again with an equable force and velocity, as though the pinion drove the wheel by contact. We have here ſuppoſed the curve piece attached to the wheel, and driving the pinion, but the ſame projection, or rather the ſame mode of projecting the curve, will apply when the pinion has the curve, and is the driver according to the repreſentation given in *fig.* 2, of *Plate* IV. which is the reverſe of *fig.* 1. We have alſo hitherto ſuppoſed, that a wheel or pinion moves always in the ſame direction; but as it is frequently required in wheel-work, that the works ſhould turn both backward and forward, it is neceſſary to have a counter-curve on the following part of the tooth, which in its turn may occaſionally be the leading part; the ſame geometrical proceſs will give this reverſe curve, which muſt neceſſarily begin at the diſtance from the other of the whole breadth of the tooth; in our drawing, we have given the tooth equal to four diviſions, in order to ſhow more clearly the proceſs of deſcribing it, but in ordinary works, particularly in clock movements, the ſtrength of the tooth is too ſmall to admit of being deſcribed and demonſtrated in this way; we have notwithſtanding thought it our indiſpenſable duty to inveſtigate, and lay before the reader, the fundamental principle on which the proper ſhape of a tooth depends. According to the preceding inveſtigation, the curved portion of one tooth, it will be ſeen, muſt always drive a ſtraight edge of the other, and *vice verſâ*; alſo a line drawn from the point of action to the primitive circles, or pitch line, where it is interſected by a line joining the centres, will be always perpendicular to both the ſtraight line and the curve.

Here the reader will naturally be led to aſk, what is the preciſe nature of the curve we have determined? and what name ſhall we give it? A little reflection on its property and delineation will ſoon convince the geometrician that it is an epicycloid, or rather a portion of an epicycloid, for the generation of which the wheel conſtitutes the baſe, and a circle, equal in diameter to the radius of the pinion, the generating circle. Camus in his "Cours de Mathématiques," Liv. x. and xi. has inveſtigated the epicycloid, as it affords a rule for the formation of teeth in wheel-work, which portion of the work has lately been tranſlated into Engliſh, but the tranſlator has added ſome practical directions reſpecting the ſhape of a tooth, taken from "Imiſon's Elements of Science and Art," the principle of which we think it neceſſary here to correct, at the ſame time that we avail ourſelves of the elucidation of our ſubject which Camus's maſterly treatment of it affords.

In *fig.* 3, of *Plate* IV. let H K repreſent a portion of the ſame wheel which is repreſented by the ſame letters in *fig.* 1, and let the epicycloidal curve, H 2′ 4′ 6′, be deſcribed in the uſual way by a fixed point in the circumference of a ſmall circle, with a radius equal to that of the ſemicircle, *c b* P, in *fig.* 1, coming in contact with the circle H K, and thereby effecting a revolution; then it is evident that the epicycloidal curve in our preſent diagram is preciſely the ſame as the curve P 1′ 2′ 3′ 4′, &c. in *fig.* 1, which ſimilarity proves the latter to be alſo epicycloidal; for the chords 2 2′, 4 4′, &c. in *fig.* 3, are preciſely the ſame as P 2, P 4, &c. with which the points 2′, 4′, &c. are deſcribed in the curve P 1′ 2′ 3′, &c., in *fig.* 1; and in *fig.* 3, the arcs, 2 2′, and 4 4′, &c. are reſpectively equal to 2 H, 4 H, &c. of the ſame *fig.* in the ſame way that P δ′, P γ′, &c. are reſpectively equal to P δ, P γ, &c. in *fig.* 1. This epicycloidal curve, P 1′ 2′ 3′ 4′ *b*′, in *fig.* 1, or H 2′ 4′ 6′, in *fig.* 3, is of the kind called exterior, by reaſon of the generating circle revolving round the outſide of the baſe H K; but if it were made to revolve by a ſimilar contact with the interior ſide of a circle, the generated curve would be of a different ſhape, and would be denominated an interior epicycloid. In the particular caſe where the generating circle has its diameter, exactly equal to the radius of the circle which conſtitutes the baſe, the line generated by a fixed point in the circumference of this generating circle will not be a curve, but an exact ſtraight line paſſing through the centre of the circle which is made the baſe: thus in the lower part of *fig.* 3, if we conceive the fixed point, in the generating circle, for deſcribing the line required, to be at *a*, a point in the circumference of the baſe, *a d e*, and the generating circle to move forwards to the points *d* and *e* ſucceſſively, it is demonſtrable that the ſaid fixed point, *a*, will be found ſucceſſively at *b* and *c*, and will conſequently deſcribe the ſtraight line or radius, *a b c*, in the ſame time that the generating circle revolves down one quadrant, *a d e*, of the circle conſtituting the baſe; this conſequence muſt follow from the conſideration that the arc, *d b*, is equal to the arc, *d a*, and that the ſemi-circle, *e c*, is equal to the quadrant, *e d a*, according to our aſſumption of the diameter of the ſmaller circle being exactly equal to the radius of the larger.

With theſe demonſtrable truths in our recollection let us now turn to *fig.* 4, and ſee how both the exterior and interior epicycloids are concerned in the formation of an epicycloidal tooth, or tooth that has the property of tranſmitting both the force and velocity it has received without alteration to its fellow-tooth, when it is alſo ſhaped according to the ſame principle: if we ſuppoſe the portion of a circle, H K, to drive the ſmall generating circle, *c b* P, equably by ſimple contact at the point, P, the fixed point *b* will deſcribe the portion, H *b*, of an exterior epicycloid on the plane of H K, extended, which portion we will ſuppoſe to be one ſide of a tooth attached to H K, to which curve the line P *b* is always perpendicular; again, if we ſuppoſe not only the ſaid generating circle *c b* P, but alſo at the ſame time the circle *k h*, to revolve, by means of a ſimilar contact with H K at the point P, then the inner or generating circle, *c b* P, will make two revolutions, while the outer one, *k h*, makes only one; the conſequence reſulting from ſuch a combination will be the ſame, as though the generating circle, *c b* P, moved only once round within the circle, *k h*, conſidered as ſtationary, that is, the circle *k h* becomes the baſe to the generating circle, and the deſcribing point *b* ſo circumſtanced will trace on the plane of circle *k h*, the ſtraight line or interior epicycloid, *h b c*, which is the radius to the circle conſtituting the baſe in this caſe. Hence if we conceive the points *b*, *h*, and H, to coincide at H, for the original poſition of the three circles, and alſo of the tracer *b*, it is eaſy to comprehend, that, if a ſlit were cut in the plane of the circle *k h*, in the direction of the radius *c h*, ſuch as would juſt admit the tracer to paſs through it, provided the great circle, H K, communicates its motion equably to the other two by contact at the point P, the tracer will paſs along the ſlit, conſidered as an interior epicycloid, and at the ſame time will deſcribe an exterior epicycloid on the plane beneath both the circles, *c b* P, and *k h*. A ſmall inſtrument might readily be made to prove practically that the reſult we have here pointed out would follow from this arrangement of three circular metallic plates kept in their places by a ſuitable frame. But this is not all; if the curve H *b* be made to form a part of the circle H K, conſidered as a wheel, and the point, P, of contact be removed a very ſmall diſtance from the two circles, ſo as not to touch them, the points, *b*, *h*, and H, may be again brought into their original coincident ſtate, either by puſhing the tracer, attached to the extremity of the generating ſmall circle, againſt the edge of the epicycloidal curve, or otherwiſe by ſubſtituting a ſtraight lever in the place of the ſlit, as a radius of the circle *k h*, and by preſſing it, inſtead of the tracer, againſt the ſaid curve; in either caſe an equable motion will be communicated to the great circle or wheel, K H, as well as though it had been actuated at the point of contact, P: nay, moving the tracer back from *h*, while in the ſlit at P, would give an equable motion to all the three circles: alſo reciprocally, the curve H *b*, by preſſing againſt the tracer, while the wheel H K is in motion, will give an uniform motion to the generating circle, *c b* P; or otherwiſe it will uniformly drive the larger circle *k h*, by preſſing againſt its radial lever; in either caſe the motion will be as equable as though communication were to take place by mere contact, or by teeth infinitely ſmall, at the point P.

This view of the ſubject, it is preſumed, will afford the reader a full and clear elucidation of the application of the exterior and interior epicycloidal curves to the formation of teeth in wheel-work, and, at the ſame time, eſtabliſh an eſſential difference, which has been overlooked hitherto in practice, between the curve generated by a circle equal to one of the acting wheels or pinions, and the curve generated by a circle equal in diameter to only *half* of one of the acting wheels or pinions, the correſponding wheel or pinion being in both caſes taken of its full geometrical diameter as the baſe of generation. The tranſlator of a part of Camus, and the editor of "Imiſon's Elements of Science and Art," have poſitively though erroneouſly aſſerted that the generating circle ſhould in all caſes of wheels and pinions be equal to the fellow of the wheel on which the curve is to be deſcribed, in which opinion ſome very reſpectable mechanicians agree; but others, on the contrary, aſſert, with equal confidence, and more truth, that the ſaid generating circle ſhould have its diameter equal to only one half of the diameter of the ſaid fellow. (See Camus, Dr. Young's Syllabus, and Brewſter's Edit. of Ferguſon's Select Exer. &c.) A careful examination of Camus's demonſtrations would of itſelf have reconciled the diſagreeing parties, which we truſt a due attention to our elucidation, by means of the tracer and radial lever, will not fail to effect. The fact is, that, where pins like our tracer, or ſpindles are uſed for teeth in any wheel or lantern, as is frequently the caſe in large works, the generating circle muſt be equal in diameter to the diameter of the acting wheel or lantern which it repreſents, in order to trace the epicycloidal teeth of its fellow; but in clock-movements, and in all other inſtances in wheel-work where both the wheels and pinions have the epicycloidal formation, the generating circle muſt be only one half in diameter to what it is required when lanterns are uſed, for in this caſe, which is what is moſt frequent, the interior and exterior epicycloids impel each other alternately, the former being a portion of the radial lever, and the latter a portion of the epicycloidal curve: thus, if a pin were attached to the extremity of the generating circle cbP, and a radial lever to the plane of the circle, kh, of twice its diameter, they would be alike driven by the epicycloidal tooth, H b, of the driving great wheel, H K. Hence the ſhape of the tooth of the driven wheel or pinion will always determine whether the curve of a tooth in the driver muſt be deſcribed by a circle of the full or half ſize uſed as a generating circle, neither of which, it appears, will apply excluſively in all caſes. It may be remarked, however, here, that the beginning of the curve, or that part which is formed on the end of a tooth, will in practice be, as nearly as may be, the ſame whichever of the two generating circles be made uſe of, particularly if the teeth to be formed are ſmall; for in *fig.* 1, it will make little difference whether P 1 and P 2, or P δ and P γ, be taken as ſucceſſive extents for deſcribing the curve P $1'$, $2'$, &c.; but if Ph were taken inſtead of P b, the difference at b', the remote end of the curve generated, would be conſiderable. Hence the argument in favour of the erroneous principle, adduced from the trial of ſeven years wear without repair, by the tranſlator of Camus, is without weight, and proves only that a convenient approximation to the truth may ſometimes be ſubſtituted for the truth itſelf in practice; as the ſmall circular arcs of a pendulum are ſubſtituted for cycloidal arcs, to which they are very ſimilar at the loweſt point; but where the truth itſelf is attainable by equally ſimple means, approximations ought to be inadmiſſible.

Our theory, it will be obſerved, hitherto ſuppoſes that the whole tooth of the driving wheel or pinion be formed by interſecting portions of an exterior epicycloid, and that the whole tooth of the driven wheel or pinion be formed like a ſtraight radial lever, which is eaſily ſhaped; theſe formations will act pretty well together, and when they are adopted, the outer ends of the teeth of the driven one muſt be in its primitive circumference; but in the driver the whole tooth muſt project beyond its primitive circle; ſo that the two primitive circles, geometrically obtained, muſt not meet at what is called the pitch-line, but be ſeparated by a ſpace equal to the length of the driving tooth; but in practical works, particularly in horology, the teeth of both the driver and driven wheel or pinion are uſually formed nearly alike; partly by means of the exterior epicycloid, and partly by means of the interior one, or ſtraight line; the exterior ends are formed uſually by being curved, and the interior parts are bounded by radial ſtraight lines, either of which parts will drive the other, which office they do alternately; this ſhape is not only found to be the moſt practicable, but admits of a contact of the two primitive circles at a point of each tooth, called the *pitch-line*; the conſequence of which formation is, that nearly an equal addition may be made to each curve for the rounded parts of the teeth of both the wheel and pinion; it is this formation that we mean when we ſpeak of ordinary teeth, and to which our table is applicable, which is given under the article CLOCK-*making*.

Olaus Roemer, the celebrated aſtronomer and mechaniſt of Denmark, according to Wolfius and Leibnitz, was the firſt who pointed out the utility of the epicycloidal curve, when applied to delineate the ſhape of a tooth; but De la Hire took up the ſubject after him, and demonſtrated, that if a tooth of either a wheel or pinion be formed by portions of an exterior epicycloid deſcribed by a generating circle of any diameter whatever, the tooth of its fellow will be properly formed by portions of an interior epicycloid, deſcribed by the ſame generating circle, which curious circumſtance allows of an infinite variety in the two correſponding curves that form the teeth of the wheel and pinion, if they were practicable. Nay De la Hire has ſhewn, that if the teeth of any wheel be triangular, circular, or of any other regular figure, an uniformity of force and velocity may be mutually imparted, provided the teeth of the correſponding wheel or pinion have its teeth formed by a figure, compounded of the epicycloid and ſaid figure, which he has further ſhewn the method of effecting in a variety of caſes, not however adapted for practice. But whether the mechaniſt may chooſe to uſe his exterior and interior epicycloids jointly in the ſame tooth, or ſeparately, in different wheels acting together, this practical rule ought never to be loſt ſight of, *viz.* the outer end of his interior, and alſo the inner end of his exterior epicycloid ſhould univerſally commence in the primitive or geometrical circle of his wheel or pinion.

The reader is now prepared to be told, what otherwiſe might have appeared paradoxical, not only that the ſame pinion, of eight leaves for inſtance, will require the teeth of a wheel of thirty to be ſomewhat differently rounded at the ends, from thoſe of a wheel of ſixty, or any other number, in order to have like action in both caſes, but that, however accurately the teeth of wheels are rounded, all numbers are not equally good to be uſed indifferently for wheels and correſponding pinions. This latter part of our ſubject has not been much attended to in practice, but is curious, and may contribute to great utility, particularly in horology, where an equable tranſmiſſion of velocity and force is deſirable.

The whole of what we have hitherto ſaid reſpecting the action of epicycloidal teeth, has been upon a ſuppoſition that the impelling force begins at the line which joins the centres of any pair of wheels, or of a wheel and pinion, and is exerted outwards always on one ſide of this line until the teeth eſcape one another, which mode is allowed to be the beſt, when it can be effected; but there are many ratios, and thoſe in common uſe between a wheel and its pinion, which will not admit of this kind of action, however good the ſhape of the teeth. Indeed, Camus has ſhewn, that no pinion leſs than one of eleven leaves, will entirely anſwer the purpoſe of acting always on one ſide of the line joining the centres, and that conſequently the common pinions of ſix are very ill calculated to effect an equable tranſmiſſion of velocity and force, by reaſon of their leaves acting alternately before and behind the line of the centres.

In *fig.* 5, ſuppoſe H K to be a portion of a wheel of 50 teeth, and kh a pinion of ſeven thin leaves or levers, each like cbh; Camus has proved, that this wheel will not impel its pinion in an uniform manner, by acting always behind the centres. His reaſoning is to this effect; in order that the leaves of a pinion of ſeven, may be impelled only behind the line joining the centres, the tooth, P b H, of the wheel muſt not quit the leaf $c\,h$, until the next following leaf, cI, has reached the point, P, in the line of the centres, in order that it may be impelled in its turn by the next tooth, K I, behind that line. The angle I $c\,h$, or quantity that one leaf of the pinion muſt be moved before the following one comes to the line of the centres, is one ſeventh of 360°, or 51° 25′ 43″ almoſt; conſequently the angle C $c\,h$, or C cb, is 51° 25′ 43″. Then taking the radius of the pinion at ſeven parts, the ſide cb of the ſmall right angled triangle, when ſolved, will be

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4·364 of ſuch parts; alſo in the triangle bCc we have the two ſides cb as before, and cC equal 57, with the included angle bcC, from which data, by a ſolution of the problem, we have the angle bCc equal 3° 35′ 50″ nearly. The angular quantity of the wheel H C I, which one tooth and one ſpace occupy, or $\frac{1}{50}$ of 360°, is 7° 12′, from which, if we deduct the angle bCc, or 3° 35′ 50″, the remainder, 3° 36′ 10″, will be the angle H C b. Now, as the two epicycloidal portions of the tooth P b and H b are equal and ſimilar, and alſo ſimilarly placed with reſpect to the full radius C b, and as the angle H C b has been found to be 3° 36′ 10″, the angle H C P, which ought to contain one tooth and ſpace, will be 7° 12′ 20″; but we have ſeen that the angle H C I is only 7° 12′, conſequently the angle H C P will be greater than H C I by 20″, which is impoſſible, becauſe a part cannot be greater than the whole. It is, therefore, impoſſible that a wheel of 50 ſhould move in an uniform manner, a proportionate pinion of ſeven leaves impelling them only behind the line joining the centres. A wheel of fewer teeth than fifty will be ſtill leſs proper, and one of a greater number will not leave ſpace enough for a ſufficient thickneſs of leaf in a pinion. Hence it appears, that when a pinion of ſeven leaves is uſed, it will be impelled by its wheel, partly before and partly behind the line joining the centres, as may be ſeen more fully in *fig.* 6, where the pinion is ſuppoſed to be impelled by the wheel from right to left.

In the ſame manner it may be proved, that if a wheel of 57 were made to drive a pinion of eight, the whole arc for both the tooth and ſpace would be 6° 18′ 57″, of which 5° 7′ 40″ would be occupied by the tooth of the wheel, and only 1° 11′ 17″ by the ſpace, or by the tooth of the pinion, which quantity is not enough for the thickneſs of an acting tooth; therefore if the teeth of the wheel are made nearly equal to the ſpaces, they will drive the pinion of eight both before and behind the line of the centres.

Alſo if a wheel of 64 were to drive a pinion of nine leaves in ſuch a way, that the impulſe might be only behind the line of the centres, the arc at the pitch-line of the wheel, for both tooth and ſpace, will be 5° 37′ 30″, of which the tooth will occupy 3° 45′ 42″, and the ſpace only 1° 51′ 48″, which will not leave room for a leaf ſufficiently thick for the pinion.

Likewiſe where a wheel of 72 drives a pinion of ten leaves behind the line of the centres, the arc of the wheel's tooth is 2° 47′ 16″, and of the ſpace between two teeth 2° 12′ 44″ only, therefore here the tooth and ſpace cannot be equal.

In pinions of 11, 12, &c. the impulſe may take place entirely behind the line of the centres, and the extreme ends of the teeth might be taken away, as in the pinion of *fig.* 6, and in the two teeth of the wheel, which are ſuppoſed to have paſſed the centre. Nay, in thoſe caſes where the pinion is always driven by an impulſe made only behind the line of the centres, the addition to its tooth beyond the geometrical diameter, may, as we have ſaid, be nearly diſpenſed with; that is, the acting and the geometrical diameters may be almoſt the ſame, provided the angular points be a little rounded to prevent their catching and ſcraping the teeth of the wheel, though it is ſafer to give a little addition for the curves.

Under our article Clock-*making*, we ſaid that the driving wheel or pinion ought to be ſomewhat larger than according to its calculated proportion; but we did not give the reaſon there, which is, that in thoſe caſes where the teeth are actuated both before and behind the line of the centres, the impulſe of the tooth before the line of the centres takes place later than it otherwiſe would do, as well as occaſions a ſmaller ſhock at the commencement of the impulſe. The defect attending ſuch a conſtruction is a little more velocity in the driver than in the driven wheel or pinion, but this is conſidered as of leſs importance than the ſhock otherwiſe occaſioned in movements, with pinions of low numbers.

It is of the utmoſt importance, that the mechaniſt ſhould bear in mind another practical rule, which we have now to offer, as it ariſes out of the preceding diſcuſſion of this ſubject, which is, that, in all ordinary caſes of wheel-work, the portion of an interior epicycloid of any tooth, whether that portion be a curve or ſtraight line, ſhould always drive the portion of an exterior epicycloid of the tooth of its fellow, before the line joining their centres; but that, on the contrary, a portion of an exterior epicycloid muſt always drive a portion of an interior epicycloid, whether the latter be a curve or ſtraight line, after the line of the centres.

We are not, however, to infer from this rule, that it is a matter of indifference, whether a wheel drive its pinion, and a pinion its wheel, before or after the line joining their centres; for in the action that takes place before this line, there is much friction occaſioned, by the ſliding of the tooth of the driver, along that of the driven wheel or pinion, as well as an accumulation of dirt occaſioned at the bottom of the tooth of the latter; whereas, when the action is after the line in queſtion, the teeth roll on one another, and the dirt is carried out of the ſpace between the teeth; this conſideration is the greateſt recommendation of that kind of action, where an exterior epicycloid impels an interior one only after the line of the centres, which mode we have ſeen, cannot take place with low pinions; from which view of the ſubject the direct inference is, that pinions of high numbers ought to be adopted in every caſe that admits of ſuch an adoption. We may alſo refer to the ſame cauſe the origin of the common bay-leaf ſhape of a tooth, which impels both before and after the line of the centres, and acts at the pitch-line, at the moment of paſſing this line.

The epicycloidal teeth, ſuch as we have deſcribed, are not however the only ones which have the requiſite property of tranſmitting the force and velocity uniformly, though we have hitherto confined our obſervations to theſe ſhapes, by reaſon of their being moſt generally uſed. Two teeth which are formed by the evolution of threads from their reſpective geometrical circles, as ſeen in *fig.* 7., and which are ſhaped by the interſection of portions of their reſpective involutes, though leſs known and conſequently leſs uſed, have, according to the late profeſſor Robinſon and others, the ſame requiſite property as the foregoing ones, and may be uſed inſtead of them in practice. The curve formed at any point, i, by a thread reſting at the point H, of the wheel or point, h, of the pinion, is perpendicular to the thread, and the thread is a tangent to the circumference of the circle from which it is evolved; whenever therefore one tooth drives the other, the point, i, of action lies in the line H h, which is a common tangent to both circles, and the force is conſtantly exerted in the direction of the common tangent, in every poſition of the acting teeth; the nature of the action conſequently will be preciſely the ſame as though the points H and h were in contact, and impelled each other at the point of contact, hence the angular velocity of K H, will be to the angular velocity of $k\,h$, as the radius, $c\,h$, is to the radius C H; that is, the motion and force communicated will be uniform.

It is evident from an inſpection of the figure, that when teeth compoſed of interſecting involutes are uſed in a pair of wheels, or in a wheel and pinion, the geometrical radii muſt have the whole length of their reſpective teeth added to them to conſtitute their acting radii ; and alſo, that the two proportionate circles which come in contact and deſignate the place of the pitch-line in ordinary epicycloidal wheel-work, muſt be removed from each other to a diſtance equal at leaſt to the length of the longer tooth. This length will depend upon the geometrical radius of the wheel or pinion, and coarſeneſs of the tooth conjointly. In large wheels the tooth will be long, and in ſmall ones the contrary, where the coarſeneſs is the ſame, the breadth of the tooth being in every inſtance the abſciſs, and its length the ordinate of the involute or curve that forms one ſide of the tooth. The full length of any tooth of a given coarſeneſs, in a wheel of a given diameter, may conſequently be aſcertained by a fluxional proceſs, which we intentionally avoid as being too intricate for ordinary purpoſes.

This formation of a tooth, where the involute is derived from the wheel or pinion's own circumference, is recommended by profeſſor Robiſon, on account of its admitting the ſimultaneous action of many teeth, thereby participating the force among them ; but as he does not profeſs to ſay that they act without friction, we conceive that horology would not be benefited by their adoption, even if the formation were practical. Mr. Brewſter, in his new edition of Ferguſon's Lectures, vol. ii. page 223, has properly obſerved, that the principle of the profeſſor's teeth is not new. De la Hire having long ago conſidered the involute of a circle as the laſt of the exterior epicycloids, which it may be proved to be, if we conſider the generating ſtraight line as a curve with an infinite radius ; and the involute may be deſcribed moſt conveniently by a ruler or other ſtraight edge, bearing a tracing point moved round the circular baſe, while they are kept in contact. Accordingly, our rule for the ſituation of the geometrical or primitive circles holds good. The teeth which project beyond theſe circles are formed by portions of exterior epicycloids; but our rule for the action before and after the line of the centres, cannot, in this caſe, apply, becauſe here the interior epicycloid is not concerned, and the formation of the exterior one has no reference to the diameter of its fellow. (Vide the articles EVOLUTE and INVOLUTE.)

After having ſaid ſo much on the requiſite ſhape of a tooth in a wheel or pinion, to tranſmit the motion and force equably through a movement ; we might here add the neceſſary directions for calculating the ſuitable numbers for conſtituting movements of various kinds ; but theſe have been anticipated under the article CLOCK-*making*, to which the reader is deſired to refer, and in which he will ſee that we have divided the whole movement of the going part into three portions ; any one of which may be altered at pleaſure, without affecting the other two. Upon the plan there laid down, we have calculated three ſeparate tables of the different portions, which we ſubjoin, with a view of giving a great variety of trains, to be had by mere inſpection, and of thus ſaving the clock-makers the trouble of going through tedious calculations, according to the prevailing cuſtom of taking into one calculation the whole movement at once, and of breaking it into portions by a ſubſtitution of ratios equal in value to the different factors of an aſſumed product, which proceſs makes the determination intricate.

TABLE I.

The firſt Portion of a Clock-movement.

Hours.	6	7	8	9	10	11	12	13	14	15	16
3	18	21	24	27	30	33	36	39	42	45	48
4	24	28	32	36	40	44	48	52	56	60	64
5	30	35	40	45	50	55	60	65	70	75	80
6	36	42	48	54	60	66	72	78	84	90	96
	42	49	56	63	70	77	84	91	98	105	112
8	48	56	64	72	80	88	96	104	112	120	128
9	54	63	72	81	90	99	108	117	126	135	144
10	60	70	80	90	100	110	120	130	140	150	160
11	66	77	88	99	110	121	132	143	154	165	176
12	72	84	96	108	120	132	144	156	168	180	192
13	78	91	104	117	130	143	156	169	182	195	208
14	84	98	112	126	140	154	168	182	196	210	224
15	90	105	120	135	150	165	180	195	210	225	240
16	96	112	128	144	160	176	192	208	224	240	256

TABLE II.

The ſecond Portion of a Clock-movement.

Factors.	6	7	8	9	10	11	12	13	14	15	16
4 15	24 90	28 105	32 120	36 135	40 150	44 165	48 180	52 195	56 210	60 225	64 240
$4\frac{2}{7}$ 14	84	30 98	112	126	140	154	168	182	60 196	210	224
$4\frac{1}{2}$ $13\frac{1}{3}$	27 80		36	120	45		54 160		63	200	72
$4\frac{8}{13}$ 13	78	91	104	117	130	143	156	60 169	182	195	208
5 12	30 72	35 84	40 96	45 108	50 120	55 132	60 144	65 156	70 168	75 180	80 192
$5\frac{5}{11}$ 11	66	77	88	99	110	60 121	132	143	154	165	176
6 10	36 60	42 70	48 80	54 90	60 100	66 110	72 120	78 130	84 140	90 150	96 160
$6\frac{2}{3}$ 9	40 54	63	72	60 81	90	99	80 108	117	126	100 135	144
7 $8\frac{4}{7}$	42	49 60	56	63	70	77	84	91	98 120	105	112
$7\frac{1}{2}$ 8	45 48	56	60 64	72	75 80	88	80 96	104	105 112	120	120 128

TABLE III.

The third Portion of a Clock-movement.

	6	7	8	9	10	11	12	13	14	15	Vibrations per ſecond.	Length of the pendulum.
12	30	35	40	45	50	55	60	65	70	75	2	9.80
15	24	28	32	36	40	44	48	52	56	60		
20	18	21	24	27	30	33	36	39	42	45		
30	12	14	16	18	20	22	24	26	28	30		
12			50				75				$2\frac{1}{2}$	6.27
15	30	35	40	45	50	55	60	65	70	75		
25	18	21	24	27	30	33	36	39	42	45		
30	15		20		25		30		35			
15	36	42	48	54	60	66	72	78	84	90	3	4.35
18	30	35	40	45	50	55	60	65	70	75		
30	18	21	24	27	30	33	36	39	42	45		
45	12	14	16	18	20	22	24	26	28	30		
15	42	49	56	63	70	77	84	91	98	105	$3\frac{1}{2}$	3.20
21	30	35	40	45	50	55	60	65	70	75		
35	18	21	24	27	30	33	36	39	42	45		
15	48	56	64	72	80	88	96	104	112	120	4	2.45
20	36	42	48	54	60	66	72	78	84	90		
24	30	35	40	45	50	55	60	65	70	75		
30	24	28	32	36	40	44	48	52	56	60		
40	18	21	24	27	30	33	36	39	42	45		
15	54	63	72	81	90	99	108	117	126	135	$4\frac{1}{2}$	1.935
27	30	35	40	45	50	55	60	65	70	75		
45	18	21	24	27	30	33	36	39	42	45		
15	60	70	80	90	100	110	120	130	140	150	5	1.57
25	36	42	48	54	60	66	72	78	84	90		
30	30	35	40	45	50	55	60	65	70	75		
50	18	21	24	27	30	33	36	39	42	45		

Explanation of Table I.—Table I. contains numbers ſuitable for the great wheel, and the pinion on the arbor of the centre wheel, together denominated "the firſt portion of a clock-movement," which is that on which the duration of motion at one winding up depends: the numbers on the uppermoſt horizontal column, from 6 to 16 incluſively, repreſent ſo many pinions; the numbers in the firſt vertical column, from 3 to 16 incluſively, are the reſpective hours in which the barrel or fuſee turns once, as the caſe may be; and the larger numbers beginning with 18, and ending with 256, in the interſections of the horizontal and vertical columns are the great wheels. By way of exemplification, ſuppoſe we want a fuſee to revolve in twelve hours, with a pinion of 8 on the arbor of the centre wheel, the interſection of 12 hours at the left-hand ſide, and eight at the top, gives 96 for the number of teeth in the great wheel, to produce the deſired effect; or if the pinion had been required for a wheel of 96, to revolve in 12 hours, over 96, in the column of 12 hours, ſtands the pinion 8. In the ſame manner for 4 hours, and a wheel of 48, the pinion will be 12, and *vice verſâ*.

Explanation of Table II. Table II. contains wheels and pinions ſuitable for the ſecond portion of a clock-movement, or firſt portion of the train, being that which effects a multiplication of 60, and regulates the velocity of the ſeconds' hand, by making its arbor revolve in one minute. This might be done by one large wheel of 300, and a ſmall pinion of 5, but ſuch a conſtruction would require a large frame; a compoſition of two wheels and two pinions is therefore ſubſtituted to produce the ſame effect more conveniently, the firſt wheel being placed on the centre or hour arbor that carries the minutes' hand, and the laſt pinion on the arbor of the ſeconds' hand that revolves in a minute. The uppermoſt horizontal column contains the pinions from 6 to 16 incluſive, like Table I., and the left-hand vertical column contains couplets of factors, which, multiplied together, produce 60 always as a product. Any pair of factors, which are coupled together by a $\}$, may be taken at pleaſure, and the wheels in the ſpaces made by the interſections of the vertical and horizontal columns, under the pinions made choice of, and oppoſite the factors ſelected, will be proper for the ſecond portion of the movement. For inſtance, when pinions of 8 are uſed with the factors $\left.\begin{matrix}7\frac{1}{2}\\8\end{matrix}\right\}$, the wheels, found in the ſpace formed by the interſection of the vertical column under 8 and horizontal column in which $\left.\begin{matrix}7\frac{1}{2}\\8\end{matrix}\right\}$ ſtand, are 64 and 60; but if the pinions were to be aſſumed, one 10 and the other 8, then the wheels would be either 80 and 60, or otherwiſe 75 and 64, accordingly as the pinion 10 is made a part of the ratio to repreſent the factor 8, or the factor $7\frac{1}{2}$, which it may be taken to do indifferently; hence the notation may be $\frac{10}{80} \times \frac{8}{60}$, or $\frac{8}{80} \times \frac{10}{60}$, or $\frac{10}{75} \times \frac{8}{64}$, or $\frac{8}{75} \times \frac{10}{64}$, the reſult in point of accuracy is the ſame, but in the conſtruction, the wheels of largeſt diameter and weight are required to be taken firſt in the movement, becauſe the diameters diminiſh as the train aſcends, by reaſon of the diminution of the tranſmitted force, which otherwiſe would not overcome the inertia of the wheels, which it is required to do at each vibration of the pendulum: any two pair of wheels and pinions properly taken out of the correſponding columns when reduced to a ſimple atio by the uſual method of multiplying the numerators together for one numerator, and the denominators for one denomination, will be found equal to $\frac{1}{60}$; thus $\frac{10}{80} \times \frac{8}{60} = \frac{80}{4800} = \frac{1}{60}$, and $\frac{10}{75} \times \frac{8}{64} = \frac{80}{4800} = \frac{1}{60}$, as before; therefore, if the firſt wheel revolve in an hour, the laſt pinion will, in this and in every other inſtance, revolve in a minute. The diminution of the diameter of the third wheel of the movement, which is the ſecond wheel of the train, may be effected in two ways, either by taking the ſeconds' pinion ſmaller than the firſt from a column at the bottom of the table, where the factors are nearly of equal value, or by taking the pinions alike, and the wheels from one of the higher horizontal columns where the factors differ conſiderably in value; thus $\frac{7}{60} \times \frac{6}{42}$ from column $\left.\begin{matrix}7\\8\frac{4}{7}\end{matrix}\right\}$ and $\frac{7}{70} \times \frac{7}{42}$ from column $\left.\begin{matrix}6\\10\end{matrix}\right\}$ are each equal to $\frac{1}{60}$, but in the firſt portion of the movement the ratio of the ſize of the two wheels is 60 : 42, and in the other 70 : 42, from which mode of compariſon of the columns it will be ſeen that a decreaſe in the diameters of almoſt any given ratio may be adopted from this table, ſo comprehenſive is its extent, as it relates both to the variety of 11 pinions, and to the choice of 10 pair of factors, which begin with the ratio 4 : 15, or 1 : 4, and end with $7\frac{1}{2}$: 8.

The principal care to be taken is, that every wheel be taken under its own pinion and oppoſite its own factor; for another inſtance, in the horizontal column of factor $\left.\begin{matrix}6\frac{2}{3}\\9\end{matrix}\right\}$, the pinions of 9 will do for wheels 81 and 60; or otherwiſe, wheel 90 may be taken with pinion 10, and wheel 60 with pinion 9; that is, any wheel may be taken oppoſite its own factor, provided the pinion in the ſame column over it be uſed as its fellow; ſo that examples may be given to a very great extent, which will afford abundant means of aſcertaining by experiment the beſt poſſible numbers for this part of the movement, without the trouble of calculation.

Explanation of Table III. Table III. contains the third portion of a clock-movement, or ſecond portion of the train, which is that on which the number of vibrations per ſecond depends. When a vibration is performed in an exact ſecond, one wheel only is neceſſary for this purpoſe, with 30 teeth, becauſe one tooth completely eſcapes the pallets at every ſecond vibration, which wheel muſt be placed in this caſe on the arbor of the ſeconds' hand, and is uſually denominated the ſwing wheel; alſo a wheel of 60, ſimilarly placed, will be proper for half ſeconds, 75 for 2½ vibrations per ſecond, and 90 for 3 per ſecond; but theſe laſt numbers are found too high for portable clocks, time-pieces, &c. therefore a wheel and pinion are introduced in addition to the eſcapement-wheel, in order to diminiſh its diameter into a convenient ſize for a portable conſtruction, as well as to render it light, ſo as to have but little inertia to be overcome by the diminiſhed force, which acts at this part of the movement. In ordinary pieces the two wheels are, one a contrate-wheel, and the other called the crown-wheel, with the pinion on its arbor, but the wheels may all have the ordinary form of the wheels of a clock that ſwings ſeconds, it being not the ſhape, but the numbers of the teeth of the wheels and pinions that determine the frequency of the vibrations. The uppermoſt horizontal column in this table, like that in the two preceding tables, contains all the variety of pinions from 6 to 15 incluſively; the pinion of 16 being omitted, however, to make room for two additional vertical columns at the right hand of the table, the firſt for the number of vibrations per ſecond made by the pendulum, and the other for the length of the correſponding pendulum in inches and decimal parts, meaſured from the centre of ſuſpenſion to the centre of oſcillation, which two data once fixed upon determine the horizontal column out of which the wheels muſt be taken with a given pinion; the left-hand vertical column is that in which one of the two wheels is found, and the number ſtanding on the ſame horizontal line, under the given pinion, is the other; for as the product of the two wheels, divided by the pinion under which one of them ſtands, is always equal to 60 in the higheſt large column, or column of 2 vibrations per ſecond, it is of no importance to the accuracy which of the two wheels is made the pallet-wheel; the determination of this point being a matter of practical convenience; in the ſame manner in the ſecond large horizontal column, the quotient ariſing from the product of any two wheels ſtanding in the ſame line taken horizontally, one in the firſt vertical column, and the other under the choſen pinion, divided by the pinion, is always 75; in the third parallel column the quotient ſo obtained is 90; in the fourth 105, and ſo on; hence any of the combinations adopted will be equal in value reſpectively to thoſe large ſimple numbers uſed as pallet-wheels without ſuch combination, which, it has been ſaid, are objectionable in practice.

Let our firſt example be to aſcertain the requiſites contained in the table for a half-ſeconds' pendulum, where a pinion of 8 is uſed?

In the firſt place, 12 with 40 may be taken as the required numbers for the two wheels; in the ſecond, 15 with 32; in the third, 20 with 24; and, laſtly, 30 with 16; any one of which wheels may be the pallet-wheel, as the nature of the eſcapement may require; if the crown-wheel eſcapement is uſed, which requires an *odd* number of teeth for its action to take place at oppoſite ſides of the wheel, 15 muſt neceſſarily be the pallet-wheel, and 32 the other, with the given pinion of 8: but whichſoever of theſe couplets of wheels is adopted, the effective length of the pendulum muſt, according to the laſt vertical column, be 9.80 inches.

Again, for a pendulum that is required to vibrate 3 times per ſecond with a pinion of 12: we have, in the firſt place, 15 with 72; ſecondly, 18 with 60; thirdly, 30 with 36; and, laſtly, 45 with 24; ſo that either 15 or 45 may be in this inſtance the crown-wheel, and for a different eſcapement any of the eight numbers mentioned; and the choice is equally extenſive with any other pinion that may be choſen from 6 to 15: the pendulum in this caſe is only 4.35 inches.

In this way, by means of the table before us, the third portion of a clock-movement may be varied almoſt at pleaſure without affecting the other two portions, and a pendulum of any of the calculated lengths may be applied to works previouſly conſtructed; which circumſtance will enable the workman to metamorphoſe a portable clock into a large one, and the contrary, without difficulty, or without even a knowledge of the operations of arithmetic.

We might have extended this table to take in different intermediate lengths of the pendulum and correſponding number of vibrations per ſecond, but our object is to baniſh incommenſurate vibrations from clock-movements, and to introduce thoſe only which conſtitute ſome convenient ſubdiviſion of the ſecond, to anſwer the nicer purpoſes of philoſophy without extra labour and expence. The three or four laſt horizontal columns indeed, it may be ſaid, will not be of much ſervice in clock-movements, by reaſon of the ſhortneſs of the pendulums; but they will be found particularly uſeful in watch-work, as will alſo the other tables, which are ſo comprehenſive as to apply with equal propriety to clock and watch-movements.

Clock-*tools*. While clock-making was in its infancy, and the different parts of the machine continued to be made by the ſame workman, each clock-maker was obliged to deſign and manufacture his own tools agreeably to his own inclination; but as ſoon as the art branched out into different occupations, tool-making became alſo a buſineſs of itſelf, and is now quite diſtinct from clock-making, nay, has itſelf ramified into various branches. In the preſent ſtate of this manufactory by far the greateſt number of clock-tools are made in Lancaſhire, and become an article of commerce among the ironmongers all over his majeſty's dominions. In London there are a few houſes that deal chiefly in clock-tools, engines, and rough materials ready prepared, as to ſize and ſhape, for the workmen; one of the principal of theſe is Fenn's in Newgate Street, No. 105, where tools of all kinds may be had at moderate prices. It is much to be regretted that a Swiſs tool and engine-maker, called Petitpierre, who lately worked in an attic of No. 161 Fleet Street, and who made tools and engines in a very ſuperior manner, was ſome months ago obliged to quit the kingdom for want of regular employ, though his prices were by no means exorbitant.

It will not be expected of us, to preſent the reader with all the variety of tools that individuals have reſpectively contrived, but to lay before him ſuch a collection as cuſtom has ſanctioned in the trade; which we propoſe to do in three plates, devoted entirely to this purpoſe; neither will it be expected, that we ſhould particularize all the different uſes to which any individual tool may be applied, much leſs to point out the poſitions in which they ought to be held in the act of working, which would require almoſt an unlimited variety of plates; it ſeems to be ſufficient for our general purpoſe, if we give a liſt of the different tools at preſent in common uſe, with references to the plates, where the reader will comprehend the nature and uſe of each tool by a ſurvey of its figure, better than from any verbal deſcription without the figures. We ſhall, therefore, confine the remaining portion of this article to a ſimple explanation of the plates.

Plate XIX. *of Horology.*

Fig. 1. A motion-arbor, or arbor for turning wheels on, with a faſtening nut.
2. Motion-arbor, that ſcrews up to the ſhoulder, with a ſmall nut to faſten.
3. A plain arbor for collets, or tubes, to hold by friction.
4. A ſlit arbor for holding and turning ſmall pieces of metal.
5. A pair of cutting bullet-compaſſes for fitting any central hole, in deſcribing or cutting circles.
6. A cutting-leg for ditto.
7. A marking-leg for ditto.
8. A ſtake, or ſmall anvil, for hammering, &c. on.
9. Common flat, ſhort-noſed pliers for holding any piece of metal.
10. A pair of callipers, with a ſtraight edge, adjuſtable by a thumb-ſcrew, of uſe for trying if a wheel is placed at right angles to its arbor, or what is called in the flat, and alſo if it is perfectly concentric, or in the round.
11. Common callipers for meaſuring diameters.
12. A frame-guage, inſide and out.
13. A pinion-guage, with ſpring and ſcrew adjuſtment.
14. Beam-compaſſes for cutting out circular pieces of metal from a ſolid plate, deſcribing large circles, dividing rectilinear and curvilinear lines, &c.
15. A ſquare or rectangular piece of braſs.
16. A clamp for holding pieces of metal to be filed or riveted.
17. A drill-arbor and drill in a ſocket for various drills, to be uſed with a bow and gut.
18. A drill detached to fit the ſaid arbor.
19. A drill of larger ſize.
20. A tool or graver for cutting grooves, which may be of various ſhapes and ſizes.

Plate XX. *of Horology.*

Fig. 1. A ſaw for metal, with a wooden handle.
2. Cutting pliers for ſhortening pins or for cutting wire.
3. A bench-vice, or vice to be clamped to a bench.
4. A hand vice for holding a ſmall piece faſt.
5. Clamping pliers for holding pins, &c. faſt in filing.
6. Pendulum-pliers or long-noſed pliers.
7. Pivot-drill with a friction-ferril.
8. Drill-arbor in a drill-frame, to be held in a bench-vice.
9. A drill to fit the ſocket of the arbor, when it has a ſquare tapering hole.
10. Ditto of larger bore.
11. Screw-head tool, including the arbor and frame with a reſt, to be put into a bench-vice.
12. A holding piece of ditto, detached from the end of the arbor, and tapped with a female thread, to hold the ſcrew to be dreſſed.
13. Ditto with a different thread.
14. A detached ferril for a drill or arbor.
15. Ditto in two halves, with adjuſting-ſcrews to fit any arbor or drill.
16. A ſcrew plate with different holes tapped.
17. A tap to be held in a hand-vice, for making a female thread in any hole. *N. B.* When long ſcrews are required to be made, a die, ſuch as the mathematical inſtrument-makers uſe, is better than a ſcrew-plate, for preſerving the ſcrew from bending; there muſt be as many taps as the plate has different holes tapped.
18. A ſcrew-driver, of which there are various dimenſions.

Plate XXI. *of Horology.*

Fig. 1. A brace for receiving various bits.
2. A chamfering or counter-ſinking tool to fit the brace, for which a large drill may be ſubſtituted.
3. A pentangular or five-ſided broach to fit ditto.
4. A round broach to fit ditto.
5. A ſquare broach to fit ditto.
6. A deepening tool, for adjuſting the engagement of wheels with wheels or pinions, not as yet much uſed in England.
7. Turning-frame, or clock-lathe, of which there are various ſizes, and conſtructions; ſome going by a bow like the preſent one, ſome by a hand-wheel, and ſome by the foot with a large wheel and crank actuated by a lever which is trodden upon. See LATHE.
8. A graver for cutting the metal in a turning-fame.
9. A large ditto.
10. An adjuſting-tool for fuſees, with ſliding weights, to ſuit any given maintaining power of a clock or watch.
11. A tool for turning pivots in, when inſerted into the end-hole of the turning-frame.
12. A triangular tapering-file.
13. A file for ſlitting or cutting the teeth of pinions.
14. An equalling file, or file for the ſpaces between the teeth of a wheel, when cut in an engine.
15. A common hand-file with a ſafe edge for ordinary work.
16. A rounding-off file, for the ends of the teeth in wheels and pinions.
17. A file for croſſing-out, or forming the croſſes and rim of a wheel.

Beſides the above there are various other files differing in ſize, ſhape, and coarſeneſs, according to the work they are deſigned to perform.

CLOCK-*work*. The word *Clock-work*, in its original ſignification, imported thoſe wheels and pinions, latches, catches, ſprings, fly, hammer, &c. which conſtitute the ſtriking, or what was formerly called the clock, part of the works of a large horological machine; but ſince clocks became common and portable, the term has been applied in a more general ſenſe to the mechaniſm of the going part, as well as of the ſtriking part, and even ſometimes to the works of thoſe machines, which reſemble the works of a clock in their appearance and action. Under this head, therefore, we mean to deſcribe ſuch detached pieces of clock-work as are not to be generally met with, but which ſeem, either from their utility or curioſity, to merit a public notice.

1. *Striking Part, with one Wheel and one Pinion.*—*Fig.* 1, of *Plate* XXV. of *Horology*, is a front view of the ſtriking part of a clock, purchaſed in the year 1806, at the ſale of a gentleman in Suſſex, who is now deceaſed, but who indulged his fondneſs for mechanical contrivances, at an almoſt incredible expence; this ſtriking work is ſo ſimple, that it has only one wheel and one pinion, and no other fly but the hammer, itſelf, and is, notwithſtanding, capable of repeating the laſt hour at any time, with the addition of a ſtring attached to the lifting piece; after our minute deſcription of the ſtriking mechaniſm of an eight-days clock, with the ſnail and rack, it will not be neceſſary for us to repeat what we have already ſaid on their action, but merely to confine ourſelves to the movement, bell, and hammer. The frame of this clock is in the ſhape of a croſs, confined by the pillars A, B, C, and another below, not ſhown; the great wheel of the ſtriking part has 300 teeth, with a barrel and ratchet as uſual on its arbor; it is actuated by a weight ſuſpended by the chain D, and drives a pinion of ſix leaves, when at liberty to move; F is a rack placed on a long lever, the tail of which, as uſual, reſts on a ſnail, on the 12-hour wheel; and G is a lifting piece to raiſe the click or hawk's-bill H, which it does by means of a pin ſliding underneath the piece H, whenever the pin in the one hour wheel moves its tail, as uſual: on the protruding end of the pinion's arbor, a gathering pallet is fixed in the common way, the long tail of which reſts on the pin at the right-hand end of the rack, when the rack is gathered up to the laſt tooth; and the click, H, is heavy enough to fall by its own weight, after ſliding over the inclined part of any tooth; all which actions are ſimilar to thoſe we have before deſcribed in *Plate* XII. The bell is mounted on the uppermoſt pillar, as ſhown in the figure, and a lever, I, is faſt to the middle of the pinion's arbor within the frame; this lever has what may be called a leg, ſuſpended by a pin at its remote end, forming what we will call the knee-joint of the leg, the foot of which leg forms the hammer: now, it is eaſy to perceive, that when the pinion begins to revolve ſuddenly, the foot of the leg flies out by its centrifugal force, and the toe moves in the curve *a*, where it meets with the edge of the bell, againſt which therefore it ſtrikes and rebounds, by permiſſion of the knee-joint, to *b*, we will ſuppoſe, the place where it would have been found if the motion had been ſo ſlow as to have no centrifugal force; but this point is in the interior part of the bell, the foot therefore proceeds within the bell, and the revolution is completed ſilently, but at the next, and at every ſubſequent revolution, this ſtroke and conſequent rebounding are repeated, till the rack is gathered up, which regulates the number of ſtrokes. The ball, K, is only a counterpoiſe fixed on the tail of the lever I, and aſſiſts with it to form a kind of fly, to regulate the velocity with which the ſtrokes are ſucceſſively made. This mechaniſm is very ſimple, and appears to have been made many years, from the dirty ſtate in which we ſaw it; but has not, that we know of, been before deſcribed.

In the year 1803, the Society of Arts, in the Adelphi, London, voted to Mr. Edward Maſſey, of Hanley in Staffordſhire, a premium of twenty guineas, for a new ſtriking part of a clock; and in the ſame year, another premium of thirty guineas, to Mr. John Prior, of Neſsfield in Yorkſhire, for another contrivance to anſwer the ſame purpoſe: the drawings and accounts of both theſe inventions, were publiſhed in the tranſactions of the ſaid ſociety, for the year above ſpecified; but the deſcriptions, as there given, are ſo imperfect, that we have found it neceſſary to have new drawings taken from the models themſelves, which are preſerved in the repoſitory of the ſociety, from ſuch points of view that the action of the different parts may be rendered as intelligible as poſſible. We ſhall deſcribe Mr. Maſſey's contrivance firſt, as being ſomewhat analogous to the one we have juſt deſcribed, inaſmuch as that it has one wheel and one pinion only, inſtead of a train of wheels and pinions, as is uſual.

2. *Maſſey's ſtriking Part.* *Fig.* 1, of *Plate* XXVI. of *Horology*, is a perſpective view of Mr. Maſſey's model, with the front plate of the frame removed, or ſuppoſed to be tranſparent, to ſhow the mechaniſm included. A is the great wheel with 78 teeth, like the ordinary count-wheel, impelling the pinion *a* of eight leaves; on the arbor of pinion *a*, but at the oppoſite end, is a circular plate, B, with eight pins placed in a concentric circle, at equal diſtances, ſo that one pin correſponds to one tooth of the pinion; theſe pins being near the circumference of the circular plate act with the pallets *b*, *b*, and form a kind of eſcapement; the pallets are connected with a pendulum of about 9 inches long, which therefore vibrates pretty nearly half-ſeconds, between the eſcape of each ſucceſſive pin reſpectively. It is not neceſſary to ſhow the pendulum which may be hung on a cock, or on the pivot of the pallet's arbor, which is more ſimple for this purpoſe, and not objectionable, as it would be in the going part. The lever, *d*, is a locking detent, with a claw for locking the pins of the plate B, when it falls in the way of any one of them; on the arbor of the detent, *d*, is another detent with a triangular claw, *e*, which falls in the way of the pins of the great wheel, placed at unequal diſtances, like the notches in the locking-plate of a count-wheel; on which account the great wheel may be conſidered as a count-wheel alſo; to the ſame arbor of *d* and *e*, is alſo attached a third concealed lever, which reaches to the one hour wheel, and is moved by its pin once in each hour, in the ordinary way. On the poſterior face of the locking-plate, B, are eight pins in a ſmall concentric circle, dotted in the figure, which lift the hammer tail as uſual, to which a counteracting ſpring is applied, to give a ſmartneſs to the ſtroke of the hammer, as it ſtrikes the ſide of the horizontal bell, mounted over the frame, as ſhown in the figure. The action is thus; when the detent, *d*, is raiſed, by the pin of the one hour wheel of the dial-work not ſeen, the weight ſuſpended by the cord C, draws the barrel on the arbor of the great wheel round, and with it its ratchet, which takes the click of the great wheel, and therefore carries it alſo, the detent *e* being lifted at the ſame time with the detent *d*; the wheel now impels the pinion and plate B, which is not only the locking but ſtriking plate alſo; the pins begin to lift the hammer in ſucceſſion, and the ſtriking goes on; in the mean time the detent, *d*, falls within the circle of pins, as in the figure, in conſequence of the lifting pin of the one hour-wheel letting go the concealed lever, but ſo as not to impede the paſſage of the pins of the locking plate; preſently the neareſt following pin of the great wheel ſliding on the inclined face of the detent *e*, raiſes it far enough to move the claw of the detent, *d*, into the way of the pins of the locking plate, and then all motion is arreſted, till the dial-work raiſes the detents again at the end of another hour, when the ſame proceſs is repeated, the vibrations of the pendulum regulating at all times the velocity with which the lifting pins of the hammer-tail ſhall move ſucceſſively during the period of ſtriking.

3. *Prior's ſtriking Part.* *Figs.* 2 and 3 of the ſame plate, exhibit in perſpective the mechaniſm of Mr. Prior, which we have already mentioned. A is the great wheel of 78 teeth, which impel the double endleſs ſcrew, B, cut on the arbor of the fly C C; like *fig.* 1, this figure has the front plate of the frame ſuppoſed to be tranſparent, to expoſe the different levers, &c. to view in their reſpective ſituations of action; on the arbor of the great wheel is the barrel, as in

fig. 1; in a concentric circle, near the edge of the large wheel, are ſeven pins, at unequal diſtances, which catch the claw of a detent *a*, placed faſt to the arbor *b*, which arbor *b* has a play or motion in the direction of its length, that will allow its pivots to go more or leſs into the plates of the frame reſpectively, as circumſtances may require, and a ſpring preſſing on the end of the pivot, which comes to the front plate, puſhes it back towards the wheel, whenever this preſſure is not taken off; the ſpring alluded to being on the front plate, of courſe cannot be ſeen in the figure; alſo a ſmall circular plate of metal, carried by the arbor of *b*, juſt fits into a circular groove turned out on a contiguous and parallel arbor *d*, in ſuch a way that the arbors can revolve independently; but when one moves lengthwiſe acroſs the frame, the other muſt neceſſarily move with it, for which purpoſe the ſecond arbor, *d*, has alſo liberty or play lengthwiſe like the arbor *b*; to this arbor *d*, is fixed a ſecond detent *e*, with a claw turning inwards; *f* is a third arbor, parallel to the other two, but below them in the frame, carrying about its middle the long tail *i* of the hammer K, and at the end next the front plate a ſmaller tail, to be preſſed by the ſpring, *g*, in the act of ſtriking; on the plane of the great wheel next the eye, are 13 pins, which ſucceſſively lift the hammer by the tail *i*, while the great wheel revolves; on the face of the great wheel, beyond the inferior circle of pins, and within the ſuperior one, is a ſpiral groove, with ſix complete turns, into which the outer end of the detent *e* ſlides as the great wheel revolves; ſo that if the groove were equally deep and ſmooth throughout, the bent end of this detent would be carried gradually from the innermoſt to the outermoſt helix without ſtopping; but the fact is, that at certain intervals in the ſix-fold ſpiral, there are deep notches at the bottom of the groove into which the detent inſerts its claw by the preſſure of the ſpring, which we have ſaid is not to be ſeen; and whenever one of theſe depreſſions of the detent *e* takes place, not only its arbor *d*, but alſo the arbor *b* are carried towards the great wheel by their motion lengthwiſe, ſo that the claw of the detent *a* comes in the way of the ſuperior pins of the great wheel; the excavated notches in the bottom of the ſix-fold groove are ſo arranged, in point of relative diſtances, that the 12 are placed at ſuch intervals of the ſpiral as gradually increaſe, like the intervals between the notches of the locking plate on a count-wheel. The action takes place in this manner; the arbor *b* has a lever connected with the pin of the one-hour wheel of the dial-work, by which it is lifted every hour; this lever is not ſeen by reaſon of its being at the other ſide of the plate B A; at the ſame time the detent *a* is raiſed, and ſets the pins at liberty, the weight ſuſpended by the cord *h* now turns the wheel and fly; the detent *e* in the mean time advances in the ſpiral groove, and the 13 pins in the inferior circle raiſe the hammer, which as often ſtrikes the bell mounted horizontally over the frame; when the detent is at the beginning of the firſt ſpiral of the half dozen, one ſtroke only is made, until the excavation at the bottom of the groove allows the claw to drop into it, which drop preſents the claw of the detent *a* to the neareſt pin, and ſtops the ſtriking; after another hour the detent *a* is again raiſed, and the wheel proceeds to move, ſo that when the detent drops again it does not fall in the way of the pins, but continues at a little diſtance from their heads, ſo long as the bent end of detent *e* does not fall into the next excavation of the groove; when this happens, however, it then falls in the way of the ſaid pins, but in the mean time two ſtrokes have been given, and in the ſame manner the hours 3, 4, 5, &c. will be ſtruck till the hour of 12 arrives; at this hour the wheel is unlocked as before, and as ſoon as 10 out of the 12 ſtrokes of the hammer are made, the end of the detent *e* comes at an inclined plane *l*, which it aſcends till it is above the plane of the wheel, and at that inſtant falls by its own grávity to the beginning of the ſpiral neareſt the centre, in which it then begins to move, while the remaining two ſtrokes of the 12 are making, after which it falls into the excavated notch where we firſt found it, and the whole proceſs has now been gone through. It may have occurred to the reader, that during the fall of the detent *e*, by its own weight, from the outermoſt to the innermoſt groove of the ſix-fold ſpiral, the ſpring acting on the neareſt pivot of the arbor *b*, would carry it againſt the plane of the wheel, and make it catch one of the ſuperior grooves before it arrived at the bottom one; this would actually have been the caſe, if there had been no precaution taken to prevent ſuch accident; but the contrivance ſhown in *fig.* 3, is introduced as a preventive, which acts thus; the little lever under the ſlender ſpring turns on a ſtud ſcrewed into the interior face of the pillar plate, or that which we have repreſented as the pillar plate; this lever reſts on the ſhoulder of the projecting pivot, which is brought forwards into the frame, when the end of *e* aſcends the inclined plane we have mentioned; at this inſtant the ſpring forces the lever down between the ſhoulder of the pivot and the pivot hole, and prevents the return of the pivot, when the lever *e* is falling; and for a ſhort time after; but while the two laſt ſtrokes of 12 are making, a pin in the back face of the great wheel ſeizes the tail of the lever, and raiſes it from the ſhoulder and pivot hole again, until the pivot has returned to the ſituation it occupies when the wheel is locked. This mechaniſm, we think, is ingeniouſly contrived, and is very ſimple; inaſmuch as only one wheel is uſed as great wheel, count-wheel, locking wheel, and ſtriking-wheel, without even ſo much as a ſingle pinion; there are 78 teeth in the wheel, and 13 pins for the hammer-tail, $\frac{78}{13} = 6$, therefore, are the teeth that paſs at each ſtroke; but the ſcrew is double, and takes two teeth at once, hence the fly makes juſt three revolutions at each ſtroke of the hammer; and a ſmall weight is ſufficient, not only to maintain the motion of the wheel, but alſo to overcome all the obſtacles it meets with, which recommendations bid fair for bringing this ſtriking mechaniſm into uſe in thoſe clocks, where the repetition is not deſired.

4. *Strike or ſilent.* When we deſcribed an eight-days clock with the mechaniſm of repetition, we had occaſion to explain one of the methods of cauſing the clock to ſtrike or be ſilent by the mere ſliding of a pin to the right or left; but there is alſo another method of doing the ſame thing, which we propoſe to deſcribe here as a detached piece of mechaniſm. *Fig.* 2, of *Plate* XXV. ſhows all the parts that are neceſſary for explaining the mechaniſm we have alluded to. A is a cock on the front plate of the frame, into which a ſmall circular plate *b* is pivoted, on the arbor *a*, of which is inſerted the ſquare hole of a hand ſeen on the dial, pointing to one of the words *ſtrike*, or *ſilent*, engraved, or otherwiſe marked, in a ſmall circle near one corner of the dial uſually, but ſometimes at the top, accordingly as the other works require; B is a lever ſlit open at the top, and moveable on a ſtud, at the angular point where the tail *c* is inſerted; and *d* is the portion of an ordinary rack with two pins in it, one at the end of the circular part as uſual, and the other at *d*, where the tail, *c*, of the ſlit lever, B, is ſeen reſting; laſtly, *e* is the pin in the front plate againſt which the rack falls as uſual, when the ſnail is off, or when the clock ſtrikes 12. The uſe of this mechaniſm may be explained in a few words thus; when the hand on the arbor *a* is turned to *ſilent*, as in the preſent poſition, the tail *c*, of B, falls in the way of pin *d*, and

d, and prevents the ſpring of the rack-tail from throwing the rack back; in conſequence of which obſtacle, the tail of the gathering pallet continues on the other pin, at the end of the curved part of the rack, and the ſtriking mechaniſm continues to be locked: but when the hand we have ſpoken of is turned to the word *ſtrike* on the dial, the tail, *c*, of the ſlit lever is raiſed above the pin, *d*, the rack falls without impediment, and the ſtriking takes place as though the mechaniſm before us had not been in the clock.

5. *Endleſs Cord of Huygens.* The reader has already read a partial deſcription of an endleſs cord, for keeping a clock in motion during the act of being wound up, when he peruſed our account of a thirty-hours clock; to do juſtice to Huygens, the original inventor, and to make the contrivance more clearly underſtood, we beg leave to refer the reader to *fig.* 3, of *Plate* XXV. where the contrivance in queſtion is diſtinctly exhibited in a way that we preſume will make it clearly underſtood. A is a metallic pulley, with pins inſerted into the bottom of its groove, and placed faſt to the centre-wheel without a ratchet; B is a ſimilar pulley, with pins and a ratchet wheel faſtened to it; the pulley and wheel, together with the click C, and its ſpring D, are all placed faſt in a detached ſtate on the frame, or caſe of the clock, as may be moſt convenient; E is a pulley, round which the endleſs cord goes, after this cord has embraced both the ſuperior pulleys, and to this pulley is attached the maintaining power, F, one half of the weight of which reſts on the pulley, A, and the other half on the pulley, B, ſo that this power is double the weight of an ordinary power, ſuſpended by a ſingle cord round a barrel; the cord, G, which goes round all the pullies, as repreſented in the figure, is made ſhort in the plate, for the ſake of being made an endleſs one, and is kept ſtretched by the ſmall weight H, and correſponding pulley. Suppoſe it to be neceſſary now to draw up the power, F, at any time; the hand takes hold of the cord at G, and pulls it down, the pulley, B, turns round in conſequence of its pins being caught by the cord; and the click ſlides over the inclined teeth, and holds the ratchet in whatever ſituation it is left when the hand lets go the cord: the pulling down of the cord, G, pulls up the part, I, of the cord, and with it the power, F, while the pulley, F, rolls along the part, K, of the ſame as it aſcends, which part, K, does not alter its ſituation, except by the ſlow revolution of the pulley, A, *i. e.* by the going of the clock; in the mean time the ſmall weight, H, falls towards G, and deſcends at the ſame time that F aſcends, till this power, F, approaches the two pulleys A and B, when the winding concludes by means of a ſtop applied over the pulley, E, to prevent the further aſcent of the power, F. From this brief account of the mechaniſm before us it is evident, that one half of the power, F, continues to actuate the pulley, A, during its aſcent, as well as during its deſcent, and that the quantity of fall compared with half the circumference of the pulley, A, will determine the continuance of going after each winding up.

6. *Forcing Spring.* We have ſeen the application of an auxiliary ſpring, attached to the fuſee of a chronometer, and to the barrel of an aſtronomical clock, conſtituting the former a going fuſee, and the latter a perpetual ratchet, both of which anſwer the ſame purpoſe as the endleſs cord we have juſt deſcribed; but there are other applications of a ſpring to produce the ſame effect, that have not yet been deſcribed. *Fig.* 4, of *Plate* XXV. repreſents a ſpring of this kind acting in the teeth of the ſecond wheel of the train, as we have ſeen it in ſome old Engliſh clocks. A and B are portions of the two plates of a clock frame; C, the ſecond wheel of the train; D, the arbor of a ſliding pallet; H, moveable in the ſmall oblong frame; I, attached to the arbor; K, a ſlender ſpring on the arbor preſſing againſt the ſtraight tail-piece of the pallet, which paſſes through a hole in the arbor; E, a ſpring ſcrewed to one of the plates of the frame, and preſſing on the tail-piece; F, of the arbor's pivot; and G, a lever with a pin projecting through the dial, with its oppoſite end reaching over the hole of winding, which it covers when the clock is going. The mode of application is thus; when the clock is to be wound up, the pin of the lever, G, is puſhed down a circular aperture of the dial to uncover the hole for the key that is uſed in winding up, which key could not otherwiſe be put into its hole in the dial; the lever, G, being faſt to the front pivot, the arbor, D, turns it a little way round during this motion, for uncovering the key-hole; the tail, F, of the arbor, conſequently is lifted upwards, and with it the ſpring, E, which is the auxiliary ſpring that moves the train by its effort to return the tooth of the pallet, H, is ſo ſhaped, that it will ſlip over a tooth of the ſecond wheel in one direction, but not in the other, without carrying the wheel with it, as may be ſeen from its ſhape in the figure; when, therefore, the pin of G is moved downwards, before winding, a ſmall ſpace, or portion of a revolution of the arbor, D, which bears the pallet and its frame, it carries the end of the pallet next the wheel over a tooth or ſometimes over two teeth; the ſmall ſpring, K, in the mean time allowing the pallet, H, to recede in its frame, I, till it has paſſed the ſaid tooth or teeth; but as the ſpring, K, inſtantly puſhes the pallet into the ſpace next to the tooth it has juſt paſſed, and holds it there, the pallet is urged back again by the auxiliary ſpring E, and carries with it the wheel ſo far that it has room to eſcape from the end of the tooth actuated by it, which eſcape does not take place till ſome time after the clock is wound up: hence the clock continues to go during the period of its being wound up, and when the force of the ſpring is an equivalent for the maintaining power, which it may be made to be when ſtretched back to a certain point; the contrivance will be a convenient temporary ſubſtitute for the maintaining power.

7. *The French Forcing-ſpring.* The forcing-ſpring made uſe of in ſome of the French clocks is ſomewhat different from the one we have juſt deſcribed, and we think more ſimple in its conſtruction, which is this; F A E, in *fig.* 5, of *Plate* XXV., is a rod of metal, moveable on a ſtud ſcrewed into the front plate at A, where is a ſmall tail-piece in contact with a quieſcent ſpring, B, alſo ſcrewed to the ſame plate; at F is a pin in the rod, which comes through a curved aperture in the dial, deſcribed from the point, A, with the radius A F; C is as before the ſecond wheel of the train, or at leaſt a portion of it; D is a pallet moveable on a pin ſcrewed into the ſuperior part of the lever F A E; and E is a ſlender ſpring preſſing againſt the pallet to keep it into the teeth of the wheel; the application of this mechaniſm is in this wiſe; the lever is ſuppoſed to cover the key-hole at ſome point near F, to uncover which the pin, F, is carried upwards towards G in the aperture of the dial; the end, E, of the lever is by this motion brought downwards, and the pallet, D, being curved on the back of it, ſlides over a tooth, or ſometimes two teeth, below it, by its motion on the pin at its upper end, the ſlender ſpring, E, during this time receding; but when the pallet, D, has paſſed the required tooth or teeth, its ſpring, E, puſhes it into the ſpace contiguous, and its ſtraight interior face lays hold of the tooth next above it; in this ſituation the mechaniſm is ready for action, but would remain inactive if the ſpring, B, or auxiliary ſpring, had not at the

ſame time been ſtretched back by the tail-piece at A; this ſpring, B, however, exerts its force to come back to its quieſcent ſtate; that is, to bring the pin back again from G to F, its original ſituation, and conſequently raiſes the end, E, with the pallet and pallet-ſpring, to its original ſituation, which cannot take place without urging the wheel, C, round along with the pallet; this contrivance, therefore, is a ſubſtitute for the maintaining power, ſo long as its action continues; and it is eaſy to perceive, that after a few minutes continuance the pallet will eſcape the tooth which it impels *pro tempore*, and the maintaining power will then reſume the ſole command of the train.

8. *The Bolt and Shutter.*—Another contrivance to anſwer the purpoſe of making a clock go while it is under winding is the bolt and ſhutter, in which a weight is ſubſtituted for a ſpring; *fig.* 6, of *Plate* XXV., repreſents the great wheel and barrel, together with the temporary apparatus, to be ſubſtituted for the maintaining power thus; the arbor, A, is pivoted into two collars, *a* and *b*, within the frame of the works, in which it is at liberty to revolve; this arbor carries three levers or arms, B, C, and D, all of which are made faſt to it, and conſequently revolve with it, whenever it is turned round; the lever, B, is juſt long enough to extend to the hole in the dial for winding, oppoſite the ſquare end of the barrel-arbor, which hole it juſt covers when in its ſtationary ſituation, by means of its circular extremity; the lever, C, carries a ſmall bolt at its extremity, which is puſhed out by a cylindrical ſpring of moderate ſtrength, while it is confined to move in the direction of the length of this lever; and D, the third lever, has the weight appended, which is uſed *pro tempore* as a ſubſtitute for the maintaining power. From this ſhort deſcription it is eaſy to perceive, that, when the clock is to be wound up, the lever, B, muſt neceſſarily be removed up or down, to allow the key to enter the hole in the dial's face; it is prevented from aſcending, and therefore any perſon unacquainted with the nature of the mechaniſm, who is going to wind up the clock, finds that he muſt puſh down the covering end of B, to gain admiſſion for his key; this motion of the lever, B, downwards, pulls down at the ſame time the ſecond lever C, and alſo elevates the third lever D, which is behind the centre of motion; but the lever, C, cannot deſcend till the bolt, which meets with the teeth of the wheel, is puſhed in by them, after which it will paſs; the cylindrical ſpring however inſtantly puſhes it out again, and makes it fit a ſpace between two teeth; in this ſituation the weight, D, acting on the third lever, now urges both the levers, B and C, back again to their original ſituations, and conſequently urges the wheel forwards by means of the bolt, till they have attained thoſe ſituations; which will require ſome minutes when the bolt is applied to the great wheel, according to our figure; but we are of opinion that it would be better to apply the bolt to the centre, or even the ſecond wheel, where a ſmaller weight would ſuffice, and where it would continue to act a ſhorter time; for the objection to the bolt and ſhutter, as well as to the forcing-ſprings juſt deſcribed, is, that their action continues for ſome time after the act of winding in addition to the maintaining power, which therefore it doubles for a time, ſuppoſing the temporary power to be exactly equal to the permanent one, agreeably to the intention of the contrivance.

Clock-*Seaves*, in *Rural Economy*, a term applied to the black-headed bog-ruſh.

CLOD, in *Agriculture*, a term frequently applied to a lump of earth, clay, or any other earthly material in a lumpy ſtate.

CLODAGH, in *Geography*, the name of a river in Ireland, which riſes in the north-weſt angle of the county of Cavan, and paſſing by Swanlinbar falls into Lough Erne. It is alſo the name of a ſmall river in the King's county which joins the Broſna.

CLODAWA, a town of Poland, in the palatinate of Kaliſh; 24 miles E.S.E. of Gueſna.

CLODDING-Beetle, in *Agriculture*, a large beetle, formerly uſed in ſome diſtricts for breaking the clods in clayey and other ſtiff tenacious ſorts of ſoil. But at preſent this ſort of buſineſs may be much more expeditiouſly performed, and at leſs expence, by means of rollers conſtructed for the purpoſe. See Roller.

CLODDY, in *Rural Economy*, a word ſometimes applied to cattle, when thick, ſhort, or full of fleſh. It has the ſame meaning as lumpy, when applied to beaſts.

CLODEN, in *Geography*, a town of Germany, in the circle of Upper Saxony, and electorate of Saxony; 4 miles S.S.W. of Jeſſen.

CLODIA Fossa, in *Ancient Geography*, a city of one of the iſlands of Venice, near the iſland Brendolo. Pliny.

CLODIÆ Leges, in *Roman Antiquity*, comprehend a variety of laws, enacted by the inſtrumentality of the tribune P. Clodius, in order to ſerve his own purpoſes of intereſt or revenge. Thus, it was enacted in the year of Rome 695, 1. That the kingdom of Cyprus ſhould be taken from Ptolemy, and reduced into the form of a province. This law was paſſed in order to puniſh that king for having refuſed Clodius money to pay his ranſom, when taken by the pirates, and to remove Cato out of the way, by appointing him to execute this order of the people, that he might not thwart the unjuſt proceedings of the tribune, nor the views of the triumviri, by whom Clodius was ſupported. 2. That corn ſhould be diſtributed gratis to the citizens. 3. That no magiſtrates ſhould take the auſpices, or obſerve the heavens, when the people were actually aſſembled on public buſineſs. 4. That the old companies or fraternities of the city, which the ſenate had aboliſhed, ſhould be revived, and new inſtituted. Theſe three laws were paſſed with a view of conciliating the attachment of the people. 5. In order to pleaſe thoſe alſo of higher rank, it was enacted, that the cenſors ſhould not expel from the ſenate, or inflict any mark of infamy on any man, who was not firſt openly accuſed and convicted of ſome crime by their joint ſentence. The true deſign of theſe ſeveral laws was to introduce the baniſhment of Cicero; for which purpoſe they were enacted; 6. That whoever had taken the life of a citizen uncondemned and without a trial, ſhould be prohibited from fire and water. In this law Cicero was not named; but ſoon after, in an aſſembly of Clodius's hired ſlaves and incendiaries, it was expreſsly decreed that he ſhould be interdicted from fire and water; that nobody ſhould preſume to harbour or receive him on pain of death; and that whoever ſhould take any ſtep towards recalling him ſhould be treated as a public enemy; unleſs thoſe ſhould firſt be recalled to life, whom Cicero had unlawfully put to death. At the ſame time it was decreed, with a view of rewarding the conſuls Piſo and Gabinius, who had favoured Clodius in his meaſures; 7. That the province of Macedonia, with Greece and Theſſaly, ſhould be granted to the former, and to the latter, Cilicia, which was ſoon after exchanged for Syria, with a power of making war upon the Parthians; the law enabled them to defray their expences out of the public treaſury. In the ſame aſſembly it was further enacted; 8. That the Ælian and Fuſian laws, by which the people were left at liberty to tranſact all public buſineſs, even in the days called Faſti, without being liable to be obſtructed by the magiſtrates, on any pretence whatſoever, ſhould be repealed. Theſe laws had been in force about 100 years; and Cicero frequently laments the loſs of them, as fatal to the republic: he calls them the moſt ſacred and ſalutary laws of the ſtate; the fences of their civil peace and quiet; the very walls and bulwarks of the republic, which had held out againſt the fierceneſs of the Gracchi, the audaciouſneſs of Saturninus, the mobs of Druſus, the bloodſhed of Cinna, and the arms of Sylla. (In Vatin. 9. In Piſon. 4.) 9. Another law was made by Clodius, to give relief to the private members of corporate towns, (municipia) againſt the public injuries of their communities. The real deſign of this ſpecious law was to ſerve a creature of his own, one Merula, of Anaguia, who had been puniſhed or driven from his city for ſome notorious villainies, and who, in return for this ſervice, erected a ſtatue to his patron, on part of the area of Cicero's houſe, and inſcribed it to Clodius, "the author of ſo excellent a law." Among other laws one was enacted, 10. To deprive the prieſt of Cybele, at Peſſinus in Phrygia, of his office, and to ſubſtitute another in his room.

CLODIANA, in *Ancient Geography*, a town of Macedonia, near Dyrrachium. The Itinerary of Antonine places it between Seampis and Apollonia.

CLODIANUS, a river of Spain, in the Tarragonenſis, mentioned by Mela, and alſo by Ptolemy, who places the mouth of it in the country of the Ilercaonians.

CLODII, Forum. See Forum *Clodii.*

CLODIUS, Publius, in *Biography*, a Roman deſcended from an illuſtrious family, and remarkable for his licentiouſneſs, avarice, and ambition. He was ſuſpected of having a criminal intercourſe with his three ſiſters; of whom one was married to Lucullus, the general, under whom he ſerved in Aſia. Diſappointed in his hopes of military rank, he ſucceeded in exciting a mutiny in the army. In the famous conſpiracy of Catiline, Clodius defended the ſenate, and was himſelf one of Cicero's guards. Soon after this he introduced himſelf, by means of female attire, into the houſe of Julius Cæſar, while Pompeia, Cæſar's wife, of whom he was enamoured, was celebrating the myſteries of Ceres. As it was reckoned a very high crime for any male to be preſent at thoſe myſteries, he was accuſed, the next day, by one of the tribunes of impiety and ſacrilege, but either through bribery or intimidation his judges acquitted him. He contrived by the intereſt of Pompey and Cæſar to be choſen tribune of the people, and while he held that office, favoured the ambitious deſigns of thoſe who had aſſiſted him in obtaining it. He procured alſo a decree of the people for the dethroning of Ptolemy king of Cyprus, and Cato, who was a check upon the meaſures of Clodius, was ordered to carry the unjuſt ſentence into execution. Cicero became now the object of Clodius's hatred, and he ſucceeded in driving him into baniſhment, and then cauſed the houſe and villas of the Roman orator to be demoliſhed. Clodius, at this time, uniting himſelf to Cæſar's intereſt, began to inſult Pompey, who in his turn exerted himſelf to procure the recal of Cicero, in which he was not ſucceſsful till the tribune Milo had driven Clodius and his followers from the forum. As ſoon as Cicero was permitted to return, he cauſed all the records of the tribunitial acts of Clodius to be deſtroyed, on the plea that he had been elected to the office contrary to law. In the year, before Chriſt, 53, Clodius was killed by Milo, as he was returning from his country houſe. Cicero undertook the defence of Milo, and endeavoured to prove that the deceaſed had been the aggreſſor for which there was probably no juſt ground, and his client was baniſhed. The attachment of the people for Clodius was exhibited by the burning of Milo's houſe, and making a funeral pile for the body of their hero of the benches of the ſenate. Plutarch. Anc. Univer. Hiſt. Ciceronis Opera.

CLODRA, in *Geography*, a town of Germany, in the circle of Upper Saxony and circle of Neuſtadt; *3* miles E. of Weyda.

CLODY, a river of the county of London-derry, Ireland, riſing in the Carntogher mountains, and joining the river Baun, a little below Portglenone. On it is a village of the ſame name.

CLOERE, a priſon or dungeon; it is conjectured from Britiſh original; the dungeon or inner priſon of Wallingford caſtle, temp. H. 2. was called *Cloere brien,* i. e. *carcer Brieni,* &c.

CLOG. See Runic Staffs.

Clog, in *Rural Economy,* a word ſometimes applied to a log of wood. It alſo ſignifies a piece of wood faſtened to an animal's foot to prevent its doing miſchief.

CLOGHEEN, in *Geography,* a market and poſt-town of the county of Tipperary, Ireland, on the great road from Dublin to Cork. The ſurrounding country is fertile; and there are ſome good flour mills in and near the town, on a ſmall river that falls into the Suire. It is 93 miles S. W. from Dublin, and 31 N. by E. from Cork.

CLOGHER, a ſmall poſt-town, or rather village, of the county of Tyrone, Ireland, though ſometimes dignified with the name of city, as being the ſeat of a biſhopric, and having before the union returned two members to parliament. There was a rich abbey here, which with its revenues was annexed by James I. to the ſee of Clogher. Some antiquarians ſay that this was a Druidic ſanctuary, and that the ſtone of divination was kept here from which its name is derived, ſignifying the place of the ſtone. St. Patrick is alſo mentioned as the founder of the ſee, before he went to Armagh. The barony to which it gives its name has land of as good a quality as any in Ireland, and is very rich in limeſtone. Clogher is 77 miles N.W. from Dublin. M'Evoy's Tyrone. Dodd.

Clogher, an Iriſh biſhopric in the province of Armagh, which ſtretches 60 miles from N.W. to S E. by a breadth of 20, and compriſes ſome portion of the counties of Donegal, Fermanagh, Tyrone, Monaghan, and Louth. It contains 41 pariſhes, of which only two are united; and there are in theſe no leſs than 49 churches. The cathedral, which is alſo the pariſh church, is a plain handſome modern ſtructure. The biſhop's palace is large, with a remarkably fine park and demeſne. Mr. Young ſtates the income of this ſee to be 4000 *l.* being the next in value to Derry. At preſent it muſt be much more conſiderable. Beaufort. Young.

CLOGHER HEAD, a cape on the eaſt coaſt of Ireland in the county of Louth. N. lat. 53° 47'. W. long. 6° 12'.

CLOGH-JORDAN, a ſmall poſt-town of the county of Tipperary, Ireland, 70 miles W.S.W. from Dublin.

CLOGHNAKILTY. See Clonakilty.

CLOHARS Carnoet, a town of France, in the department of Finiſterre, and diſtrict of Quimperlé; 1½ league S. of it.

CLOISTER, Clauſtrum, an habitation ſurrounded with walls, and inhabited by canons, or religious.

In a more general ſenſe, cloiſter is uſed for a monaſtery of religious of either ſex. In a more reſtrained ſenſe, cloiſter is uſed for the principal part of a regular monaſtery, conſiſting of a ſquare built around; ordinarily, between the church, the chapter houſe, and the refectory; and over which is the dormitory, which ſee.

The cloiſters ſerved for ſeveral purpoſes in the ancient monaſteries. Petrus Bleſenſis obſerves, that it was here the monks held their lectures; the lecture of morality at the north ſide, next the church; the ſchool on the weſt, and the chapter on the eaſt; ſpiritual meditation, &c. being reſerved for the church.

Du Cange concludes, that all theſe different exerciſes were performed in the cloiſter itſelf; but by miſtake.

The church, the chapter-houſe, and the ſchool, were not parts of the cloiſter, but buildings adjoining to it.

Lanfranc obſerves, that the proper uſe of the cloiſter was for the monks to meet in, and converſe together, at certain hours of the day.

The form of the cloiſter was ſquare; and it had its name *clauſtrum* from *claudo, I ſhut, or cloſe*, as being incloſed on its four ſides with buildings. Hence, in architecture, a building is ſaid to be in form of a cloiſter, when there are buildings on each of the four ſides of the court.

CLOISTERED MONKS. See MONK.

CLOLUGH, in *Geography*, a river of Ireland, which riſes in the Commeragh mountains, in the county of Waterford, and paſſing by Curraghmore, runs into the Suire. Pearl-muſcles are found in this river. Smith's Waterford.

CLOMANNORUM *Civitas*, in *Ancient Geography*, a town of Aſia, towards Babylonia.

CLOMPANUS, in *Botany*, minor and major: Rumph. See STERCULIA.

CLONAKILTY, or CLOGHNAKILTY, in *Geography*, a market and poſt-town of the county of Cork, Ireland. It was incorporated by the intereſt of the firſt Earl of Cork in 1605, and ſent two members to parliament before the Union. It is ſituated near the ſea, but this, ſays Dr. Smith, affords it more pleaſure than profit, as the mouth of the harbour, being choaked with ſand, prevents veſſels of burden from coming to it. M'Kenzie deſcribes this harbour as fit for ſmall veſſels only; and very dangerous ſailing in or out, when the wind is at the ſoutherly quarter. There is a pretty good market for linen yarn and coarſe linens, which is attended by the Bandon merchants. In the neighbourhood is a mine, which contains ſome good lead ore, of the kind called galena, and abundance of black blende; but the working of it was ſoon dropped, from want of ſufficient capital to proceed, as it was not immediately productive. Clonakilty is 145 miles S.W. from Dublin, and 22 miles S.W. from Cork. N. lat. 51° 37'. W. long. 8° 42'. Smith. M'Kenzie.

CLONARD, a poſt-town of the county of Meath, Ireland. It was formerly of ſome importance, having been a biſhop's ſee, which was conſolidated with ſeveral others in 1152, this being the reſidence of the biſhop; but in 1216, they were formed into the preſent ſee of Meath. There was an abbey here, the ruins of which ſhow it to have been extenſive, and the endowments of which were great. The old town is now gone to decay, and the new one which has a bridge over the Boyne, is a place of no trade. It is 26 miles W. from Dublin, on the road to Mullingar, and very near the place where the royal canal croſſes the Boyne. Thompſon's Meath, &c.

CLONEGALL, a ſmall poſt-town of the county of Carlow, Ireland, on the confines of Wexford, 47 miles S. by W. from Dublin.

CLONES, a market and poſt-town of the county of Monaghan, Ireland, the weekly ſales of linens at which is eſtimated at 700*l*., and its other trade thriving. There are ruins of two or three religious buildings in and near this town. It is 62 miles N.W. from Dublin.

CLONEY, a ſmall lake in Glaneroughy Kerry, about ten miles from Nedeen, and communicating with Kenmare river, which is ſaid to poſſeſs all the charms of Killarney in miniature. Beaufort.

CLONFERT, an Iriſh biſhopric, under the metropolitan ſee of Tuam. It was founded near the cloſe of the ſixth century, and was united to the ſee of Killmacduagh in 1602. There are in this united ſee ſixty pariſhes, all of which, except three, are in the county of Galway. Theſe are by unions reduced to fifteen benefices, and fourteen of them have churches. The cathedral and pariſh church are the ſame, and the biſhop has a palace in the neighbourhood; but Clonfert is ſo ſmall as not to deſerve even the name of a village. Beaufort.

CLONIA, in *Ancient Geography*, a marſh of Africa, in Interior Libya, near mount Riſadius. Ptolemy ſays that the marſh is formed by the river Stachir.

CLONMACNOISE, or CLUAIN-MAC-NOIS, i. e. *the retirement of nobles*, in *Geography*, a place in the King's county, Ireland, once the ſee of a biſhop, and at preſent remarkable for the extent of its monaſtical ruins. An abbey was founded here by St. Kiaran, in 548, which afterwards became a cathedral; this preſided over nine other churches, in one church-yard, as it were, for they were within leſs than the compaſs of two Iriſh acres; and at the weſt end of this ſpace the biſhop's palace was erected. It was ſituated on the banks of the Shannon, ten miles from Athlone, raiſed above the river on ground compoſed of many ſmall elevations. The abbey, which belonged to the regular canons of St. Auguſtine, was peculiarly and univerſally eſteemed, was uncommonly extenſive, and was enriched by many kings and princes. Its landed property was ſo great, and the number of cells and monaſteries ſubjected to it ſo numerous, that almoſt half of Ireland was ſaid to be within its bounds. This was alſo the *Iona* of Ireland, where the princes of the country were buried; and it was imagined that all who were interred there had inſured an immediate aſcent to heaven. Several of the churches are ſuppoſed to have been erected as places of ſepulture. Yet, notwithſtanding the opinion of its ſanctity, the abbey was often plundered and deſtroyed by deſpoilers of every kind, by the unpoliſhed Iriſh deſperado, by the barbarous Oſtmen, and, with concern it is added, by the Engliſh ſettlers. Theſe, who ought to have conciliated the affections of the natives, and ſet them an example of obedience to the laws, and of a peaceable demeanour, too often joined in the greateſt outrages, and, amongſt other tranſactions of a like kind, repeatedly diſturbed the retired ſeminary of Clonmacnoiſe. In 1568 the ſee was united to Meath by act of parliament, and the deanery alone remains of the ancient chapter. There are remains of ſeveral churches, and one is ſtill uſed as the pariſh church. There are alſo two round towers. They are now ſurrounded by extenſive bogs, and the appearance of the country is wild and uncultivated. Ware. Archdall's Monaſt. Hibern.

CLONMELL, a market and poſt-town of the county of Tipperary, Ireland. It is the ſhire town, large and opulent, where the woollen and cotton manufactures were formerly in a flouriſhing ſtate, but, as in other places, have declined. Though very inconveniently ſituated for the aſſizes, at the extremity of ſo large a county, it is admirably ſeated for trade, on the banks of the Suire, which is ſo far navigable for large boats, the tide flowing a little way above the town. The adjoining country is uncommonly fertile, and there are in and near Clonmell a number of boulting mills, from which flour is ſent to Dublin. The county-court houſe is a new and handſome building; and the jail, which is alſo of late conſtruction, was built on Mr. Howard's plan. Clonmell was formerly a place of ſtrength, and was able to make ſome ſtand againſt Cromwell, who beſieged it in perſon. Before the Union it ſent two members to the Iriſh houſe of commons, and has at preſent one repreſentative in the Imperial parliament. It is 84 miles S W. from Dublin; N. lat. 52° 21′. W. long. 7° 13′. Beaufort, &c.

CLONMINES, a village of the county of Wexford, on an arm of the ſea, not far from the place where Strongbow landed. Some ruins bear teſtimony to its former importance, and until the Union it ſent two members to parliament. It is 81½ miles S. from Dublin, and about 15 W. from Wexford.

CLONTARF, a village in the county of Dublin, Ireland, on the ſtrand between the city of Dublin and Hoath. It is much frequented for ſea bathing, and is a pleaſing object to thoſe entering the harbour. Clontarf is remarkable in the hiſtory of Ireland for a battle fought, in the year 1014, between the Danes, or Oſtmen, and the Iriſh, in which Brien Boronche, who commanded the latter, loſt his life, though his troops gained a deciſive victory. It is 3 miles from Dublin.

CLOPPENBOURG, a town of Germany, in the circle of Weſtphalia, and biſhopric of Munſter, the principal place of a bailiwick; 64 miles N.N.E. of Munſter. N. lat. 52° 53′. E. long. 7° 35′.

CLOSE, a term in *Heraldry*, uſed to expreſs the wings of the eagle, falcon, kite, &c. being kept cloſe to their bodies, but muſt not be uſed to the peacock, dunghill-cock, or any others not addicted to flight. It is alſo applied to a helmet with the vizor down.

Close, in *Muſic*, ſimply means an end or termination to a movement, vocal or inſtrumental. See Cadence, Cadenza, Counterpoint, and Composition. But ſince the eſtabliſhment of the opera, or muſical drama, and ſingers of great abilities, taſte, and execution, have been employed and frequently left to themſelves, *ad libitum*, at a pauſe, or at the concluſion of an air, by a cloſe or cadenza is underſtood ſuch an extemporaneous effuſion of taſte and fancy, terminated by a ſhake, as could be executed in one breath. See Toſi, chap. viii. p. 126, and Italian Tour; Reflections on the length and abuſe of cloſes.

Long cloſes were a nuiſance in Italy thirty years ago. When it was obſerved that at Rome, Criſtofero, who ſung in Guarducci's poliſhed manner, though his cloſes were excellent, full of fancy and good taſte, yet they appeared too long; this fault was then general throughout Rome and Naples, where ſuch a long-winded licentiouſneſs prevailed in the cadences of every ſinger, as was always tireſome, and often diſguſting; even thoſe of great performers needed compreſſion, and thoſe made by performers of an inferior claſs, not only wanted curtailing, but correction. A few ſelect notes, with a great deal of meaning and expreſſion given to them, is the only expedient that can render a cadence deſirable, as it ſhould conſiſt of ſomething ſuperior to what has been heard in the art, or it becomes impertinent. This abuſe in making cloſes is not of very ancient ſtanding, for in a ſerious opera of old Scarlatti, compoſed in 1717, there is not a ſingle place for a cadence, *ad libitum*, to be found. But, to length is now added another complaint, by that part of an audience who have heard the great performers of former times; which is, the taking breath, ſometimes even more than once, before the concluding ſhake is made, after which the performer expects to be "welcomed home."

Close, in *Rural Economy*, a ſmall incloſed field or paddock. A ſmall incloſure of any kind.

Close-*Feeding*, the practice of eating graſs herbage down in a cloſe or bare manner, by ſheep or other animals. It is of much conſequence to the grazier, to have his paſtures kept in a ſtate of cloſe-feeding, as the animals are found to do much better under ſuch circumſtances: and at the ſame time to be capable of ſupporting a larger proportion of ſtock. Speaking of cloſe-feeding, Mr. Young has given the following uſeful remarks. "In the preceding trials there was not, through the thirty weeks, ſcarcely a bent to be ſeen; the paſturage was conſtantly ſhorn to the ground, and in that ſtate it was remarkable to ſee how conſtantly, and, even rapidly, it ſprung, during the continuance of a drought that was deſtructive of all produce in fields on the ſame farm, ſuffered to run to bent, for hay or other views. The compariſon was the moſt deciſive that can be imagined. He had many fields, better than any there regiſtered, that yielded ſo contemptible a produce of hay, as to be ſcarcely worth mowing; and he was amazed to ſee in ſome of them how poor the *rouen* or after-graſs was, ſo that both united, or the entire growth of at leaſt forty weeks, has amounted not to the fourth of the value of the produce of ſimilar ſoils pared cloſe by ſheep." And he adds, "a Romney-marſh grazier would be ruined if he had ſo much graſs on his land," ſays Mr. Boys, in his Farming Tour, ſpeaking of a field underſtocked."—Annals, vol. xix. p. 118. "Nothing ſo bad," ſays another, "in Romney-marſh, as mowing, ſo that ſome landlords prohibit it." Pliny, ſays Mr. Young, knew this.—*Eſt enim in primis inutile, enaſci herbas ſementaturas.* Plin. Hiſt. Nat. lib. xviii. cap. 28. And of the fact he has not the leaſt doubt, from various experiments and obſervations; and there is no man but has remarked it, he thinks, in the caſe of ray-graſs, the produce of which is loſt if the bent be allowed to riſe. In all plants cultivated for paſturage, there is a great effort the moment the ſeed ſtem runs, to which the whole growth of the plant is directed to form the ſeed; till then the growth is in the leaves: it is therefore palpable, that the way to have the greateſt abundance of leaf, is by feeding ſo cloſe as to prevent thoſe ſtems riſing at all. And he may further obſerve, that, on this ſyſtem of feeding, thoſe graſſes which yield a very great but coarſe produce, become ſweet, fine, and valuable, by thus keeping them cloſe fed. The *avena elatior*, or tall oat-graſs, is very coarſe, but in a field of that graſs, thirteen acres and half, it never was ſuffered to riſe, and conſequently was found, on examination, to appear as fine and pleaſing to the eye as any of the more delicate graſſes. It is with this view that he is cultivating it largely, and alſo the *dactylus glomeratus*; and both are remarkably early."

He ſuggeſts it as "an inquiry that deſerves attention, whether the ſuperior profit of grazing ſheep, on compariſon with oxen, does not depend very much on this point of cloſe feeding: for large cattle, the herbage muſt be kept to a good head to give a full bite; and conſequently innumerable ſeed-ſtems form, which tend to reduce the produce greatly." There can be no doubt of the great benefit and advantage of cloſe-feeding, in all ſtates where the lands are covered with a coarſe graſſy turf or ſward. See Pasture and Grazing.

Close-*Teap*, a term ſometimes provincially applied to a ram, or male ſheep, where both the teſticles are within the barrel of the animal.

Close, *Breach of*, in *Law*, a ſpecies of treſpaſs, denoting every unwarrantable entry on another's ſoil, which the law ſuppoſes to be *incloſed*, either by a viſible fence, or an inviſible boundary. Accordingly, the words of the writ of treſpaſs command the defendant to ſhew cauſe, "quare clauſum querentis fregit." Every ſuch entry, or breach of a man's cloſe, carries neceſſarily along with it ſome damage or other; for, if no other ſpecial loſs can be aſſigned, yet ſtill the words of the writ itſelf ſpecify one general damage, *viz.* the treading down and bruiſing his herbage. F. N. B. 87, 88. See TRESPASS.

CLOSE *Rolls*, and **CLOSE** *Writs*, charters, or letters of the king, containing grants of lands, &c. ſealed with his great ſeal, and directed to particular perſons, and for particular purpoſes, which, not being proper for the public inſpection, are *cloſed* up and ſealed on the outſide, and are therefore called *writs cloſe*, *literæ clauſæ*, and they are recorded in the *cloſe rolls*. See LETTERS, and PATENT.

CLOSE *Field.* See FIELD.

CLOSE *Fights*, aboard a ſhip, are bulk-heads put up fore and aft in the ſhip, for the men to ſtand behind in a cloſe engagement, and fire on the enemy; or, if the ſhips be boarded, to ſcour the decks.

CLOSE *Fire.* See FIRE, and REVERBERATION.

CLOSE-*hauled*, in *Sea Language*, denotes the arrangement or trim of a ſhip's ſails when ſhe endeavours to proceed in the neareſt direction poſſible to that point of the compaſs from which the wind blows. The keel of larger ſhips makes an angle of about ſix points with the line of the wind: but ſloops and ſmaller veſſels ſail almoſt a point nearer. All veſſels, when cloſe-hauled, make nearly a point of lee-way, and this angle increaſes with the increaſe of wind and ſea. The ſails, in this diſpoſition of them, are all extended ſideways on the ſhip; and the term *cloſe hauled* is then applied to it, becauſe her tacks are drawn cloſe down to her windward ſide, the ſheets hauled cloſe aft, and all the bow-lines are drawn to their utmoſt extenſion, in order to keep the ſails ſteady.

CLOSE *Quarters*, denote ſtrong beams of wood extended along a merchant-ſhip in ſeveral places; as they are a place of retreat, when the ſhip is boarded by an adverſary, they are fitted with ſmall loop holes, through which the ſhip's crew may fire ſmall arms to defend themſelves, and annoy the enemy. They are likewiſe furniſhed with powder-cheſts, filled with powder, old nails, &c. which may be fired upon the boarders.

CLOSE *Pound.* See POUND.

CLOSET, in *Heraldry*, is the diminutive or half of the bar.

CLOSET, *Clerk of the.* See CLERK.

CLOSET, *Water*, in *Architecture*. See WATER-*cloſet*.

CLOSH, in our old cuſtoms, an unlawful game, forbidden by ſtat. 14 Edw. IV. c. 3. and 33 Hen. VIII. c. 9. It is ſaid to have been the ſame with our *nine-pins*, and is called *cloſh-coyls* by the 33d. Hen. VIII.

CLOSTER NEWBURG, in *Geography*, a town of Germany, in the archduchy of Auſtria; 11 miles N.N.W. of Vienna.

CLOSTER-SEVEN, a town of Germany, in the circle of Lower Saxony, and duchy of Bremen, famous for a convention or capitulation, called the treaty of Cloſter-ſeven, by which the duke of Cumberland, commanding 38,000 Hanoverians, was obliged in 1757 to ſurrender to the French under the duke de Richelieu, and to lay down their arms. It is diſtant 19 miles S. from Stade, and 24 N.N.E. from Bremen.

CLOSTERMAN, or **KLOOSTERMAN**, N., in *Biography*, a portrait painter, who was born at Hanover in 1656, and was much eſteemed in his time. It is not known from whom he firſt received inſtructions, but he came to London in 1681, and for ſome time aſſiſted Riley in the draperies and other acceſſorial parts of his pictures. After the death of his maſter, Cloſterman got into vogue, and was employed to paint the portraits of many of the principal nobility. In the year 1696, he was invited to Madrid to paint the king and queen of Spain, together with the principal grandees of the court; he returned, loaded with riches and honour, to England; ſoon after which he painted a whole length portrait of queen Anne in her robes, a rich and ſtriking picture, which was afterwards placed in Guildhall. He died in the year 1713, aged 57, having previouſly to his death been robbed of all his hard-earned wealth by an inſidious miſtreſs. Deſcamps. Pilkington.

CLOSTRA, in *Ancient Geography*, a maritime place of Italy, between Antium and the promontory of Circé.

CLOT-*Bird*, in *Ornithology*, a name by which the common OENANTHE is called in many parts of England.

CLOTAIRE I. king of France, in *Biography*, was the third ſon of Clovis, by his wife Clotilda, and born A. D. 497. When he was only 14 years of age, he inherited as his patrimony the kingdom of Soiſſons. In 516, he united with two of his brothers in declaring war againſt Sigiſmond, king of Burgundy, and his brother Gondimar. The latter they put to flight, but Sigiſmond, with his wife and children, they took priſoners. In this expedition Clodimir, one of the three, was killed, having firſt cauſed the king of Burgundy to be deſtroyed, and Clotaire, with his brother Thierri, took poſſeſſion of his dominions as guardians to the ſons of the unfortunate monarch. They afterwards invaded Thuringia, in which Clotaire ſhewed great military proweſs, but from certain jealouſies that ſubſiſted between the brothers, he narrowly eſcaped aſſaſſination at a conference. Clotaire and his brother Childebert ſeized their nephews, the ſons of the deceaſed Clodimir, two of whom the ſavage Clotaire ſtabbed with his own hands; and the third eſcaping, he cauſed all the tutors and even domeſtics of the young princes to be ſacrificed at the ſhrine of his mad ambition. Clotaire and Childebert invaded and ranſacked the Italian territories of the Romans and Oſtrogoths. In 543 they attacked Spain, and penetrated as far as Saragoſſa, but on their return with conſiderable booty, they were defeated and plundered by the Goths. The death of Thierri placed the ſceptre wielded by that monarch in the hands of his natural ſon Theobalde; and on the demiſe of that prince, his ſubjects agreed to acknowledge Clotaire as their ſovereign, who, by the ſubſequent deceaſe of Childebert, united the dominions of Clovis under his ſole government. Clotaire was not permitted long to enjoy in peace his ill-gotten power and dominion. His eldeſt ſon, Chramnes, twice took up arms againſt him, but being defeated, and compelled to ſeek for mercy, he was once reſtored to favour, but the ſecond time Clotaire ordered his ſon with his wife and children, to be burnt to death in his preſence. As an atonement for crimes of which his own conſcience muſt have been a perpetual monitor, the bloody Clotaire made very conſiderable preſents to the church, which he frequently accompanied with ſuch acts of devotion as the ignorance of the times preſcribed. He died in the year 561, having reigned fifty-one years. He had been married to ſix wives, and left four ſons, who divided his kingdom among them.

There were three other princes of France of the ſame name, of whom we ſhall only notice the ſecond.

CLOTAIRE II. was but four months old when he ſucceeded to his father Chilperic's kingdom. In his youth he ſpent much of his time in warfare, and by his conduct to his kinſmen, two of whom he cauſed to be murdered, he ſhewed himſelf entitled to the name of Clotaire. When, however, he had gained the great object of his ambition, and was become the ſole monarch of the Franks, he ſeemed anxious to atone for his former cruelties by the exerciſe of a mild and juſt government. He ſubmitted the civil and eccleſiaſtical affairs of his kingdom to a council compoſed of people celebrated for their high rank and attainments in wiſdom. He inſtituted a kind of parliaments in his own palace, the powers of which, though not now to be clearly aſcertained, were probably exerciſed for the benefits of the people. Clotaire attained to conſiderable celebrity as a warrior. In 627 he routed the Saxons, who had revolted from him, on the banks of the Weſer, with great ſlaughter. The next year he died in the height of reputation, having acquired the titles of the *Great* and *Debonair*. Du Freſnoy. Hiſt. Univer. Hiſt. de France.

CLOTH, in *Commerce*, in its general ſenſe, includes all kinds of ſtuffs woven or manufactured on the loom, whether their threads be of wool, hemp, or flax.

Cloth is more peculiarly applied to a web, or tiſſue of woollen threads interwoven; whereof ſome called the *warp*, are extended lengthwiſe, from one end of the piece to the other; the reſt, called the *woof*, are diſpoſed acroſs the firſt, or breadthwiſe of the piece.

Cloths, *Superfine*; the beſt of theſe are made entirely of Spaniſh wool; the fineſt ſorts of which are the Leonera and Segovia.

Of Engliſh wools, thoſe of Hereford and Suſſex approach the neareſt in fineneſs to the Spaniſh, and from the choiceſt of theſe are manufactured ſuperfines of an inferior ſort. From the reſt of the Engliſh wools are made the ſeconds, liveries, and coarſer cloths, varying in price according to their qualities.

The goodneſs of cloth conſiſts, 1ſt. In the fineneſs of the wool. 2d. In the clearneſs, richneſs, and beauty of the colour. 3d. In its being evenly ſpun, always obſerving that the thread of the warp be cloſer twiſted, and one-fourth part ſmaller than that of the woof. 4th. In the cloth's being well wrought and beaten on the loom, ſo as to be in every part equally cloſe and compact. 5th. In being milled or fulled evenly, clean ſcoured, and of a proper thickneſs or ſubſtance. 6th. In being well dreſſed, ſo that the hair or knap of the wool be fully and evenly drawn out and ranged on the ſurface, and in being ſhorn cloſe, yet without laying the ground or threads bare. 7th. In its not being overſtretched in the rack, or pulled farther than is neceſſary to ſet it ſmooth, and bring it to its juſt length and breadth. Laſtly. In the cloth itſelf appearing ſmooth and neat on the face, free from ſmall knobs, ſpots, and other imperfections; in being firm yet pliable, and feeling ſoft and fine to the touch.

Cloth, *manufacture of*. A detail of the manner in which ſuperfine cloths are manufactured in Wiltſhire, may ſerve for the whole; the inferior ſorts differing little, but in the coarſer and leſs delicate modes of performing the ſame operations.

It is previouſly to be obſerved, that all the cloths which are deſigned for ſcarlets, greens, and blacks, as well as many of the moſt lively and delicate colours, are manufactured white, and dyed in the piece after they are finiſhed.

The wool, being taken out of the bale, muſt firſt be picked, to clear it from the pitch which adheres to it, and from the other extraneous ſubſtances with which it abounds. It muſt then be ſcoured, by putting it into a furnace containing a liquor compoſed of three parts of water, and one of urine. After it has been well ſtirred about therein, and the greaſe it contains diſſolved, it muſt be taken out, drained, and waſhed in running water, and in that ſtate it is fit to be committed to the dye-furnace.

After dyeing it muſt be again waſhed and well dried, when it muſt be beaten with rods on wooden hurdles, to free it from the dye-ſtuff, which ſtill hangs about it; or elſe the ſame effect is produced by putting it into a wool mill, formed of a four-flapped vane or fan thinly ſet with iron ſpikes, and ſwiftly revolving within a hollow cylinder, compoſed of ſmall wooden rods or ſtaves, ſufficiently wide apart to ſuffer the duſt to fall through, as the wool becomes ſlightly ſeparated by the motion of the fans. It is then once more carefully picked, in order to take out the locks which are unevenly dyed, and alſo the lint, and other filth with which wool in this ſtate generally abounds.

In making mixed cloths, wool of the different colours, being weighed out in their requiſite proportions, are firſt ſhaken well together; they are then further mixed by being well turned in the wool mill, and by being afterwards *twice* paſſed through the ſcribbling engine inſtead of *once*, they are generally found to be ſufficiently intermixed.

The wool, thus prepared, muſt now be ſpread abroad on a floor, and oil of olives (in the proportion of 3lb. to 20lb. of wool), evenly ſprinkled over it, and beat into it with heavy rods, when it is in a proper ſtate to be carried to the ſcribbling engine.

This is a machine compoſed of ten or more wooden cylinders, of various ſizes, covered with cards, the teeth or wire of which are of different degrees of fineneſs, and bent or hooked in oppoſite directions. Theſe are combined in a ſtrong wooden frame, and ſo fitted as juſt to touch and work againſt each other, as they ſwiftly revolve on being ſet in motion by a common handle, adapted to be turned either by men's labour, or any ſort of mill work. By paſſing through this engine, the locks of wool, which before were cloſe and matted together, are drawn abroad, the fibres are ſeparated, and it is formed into light flakes; it is then taken to the carder, which is a ſmaller engine of the ſame kind, only covered with finer cards, and with the addition of a fluted roller revolving in a trough at the tail of the machine; by which the wool, after being ſtill finer and better mixed and carded, is formed, as it drops out, into ſeparate and ſmooth rolls of 28 inches long, and half an inch in thickneſs, which are immediately taken by boys, and joined or attached to the ſpindles of the roving or ſlubbing machine.

This is a contrivance, by which 50 or more iron ſpindles, being ſet upright in a wooden frame, are twirled by one motion, yielding their threads to a common ſlider, at every move of which the 50 rolls of wool are drawn out and formed into as many large ſlightly twiſted threads, and at the ſame time wound off into balls of a ſize and ſhape adapted to the next operation, or ſpinning.

This is performed by a machine called the *ſpinning jenny*, which alſo is a frame containing 70 or more upright ſpindles, twirled like the former by a common motion, and yielding their threads to one and the ſame ſlider; by this the large hollow threads are further twiſted and drawn out to the degrees of ſmallneſs and ſtrength requiſite for the different purpoſes for which they are deſigned. The threads, being thus ſpun, are reeled into ſkains and prepared for the loom. The larger ſort, deſtined for the woof, is wound on ſpools, which are ſmall tubes, ſo formed as to be eaſily placed in the eye or hollow of the ſhuttle. That for the warp is wound on large wooden bobbins, from which, by the warping bar, it is conveniently formed into the proper lengths and diviſions, and ſo arranged and diſpoſed as to form the chain or warp of the piece.

The chain, thus prepared, muſt be ſtiffened by a ſize, which is made by diſſolving 3lbs. of glue (the beſt ſort of which is made from ſhreds of parchment) in a quantity of water ſufficient to moiſten and ſaturate the whole, and when dried it is ready to be turned on the loom.

In weaving broad-cloth, there are two weavers in a loom, one on each ſide, who at the ſame time tread alternately on the ſame treadle, *i. e.* now on the right ſide and now on the left; which raiſes and lowers the threads of the warp equally, between which they throw, tranſverſely, the ſhuttle from the one to the other. At each time that the ſhuttle is thrown (and ſo a thread of the woof inſerted within the warp), they ſtrike it conjointly with a moving frame, wherein is faſtened the ſlay, which is a kind of comb, compoſed of thin pieces of cane, between whoſe teeth the threads of the warp are paſſed, repeating the ſtrokes ſix or ſeven times with the warp open, and again as many times after it has croſſed and cloſed on the woof. The whole warp being filled with woof, the cloth is finiſhed.

Being next taken to the fulling-mill, it is there ſoaked with urine or hog's dung, and afterwards ſcoured with clean water; it is thus freed from the oil and filth contracted in dyeing, and delivered perfectly clean, in a ſtate fit for the next operation, which is burling.

By this proceſs (performed by women with little iron nippers) the cloth is cleared from all the knots, lint, ſmall ſtraws, and leſſer filth; and if, by the careleſſneſs of the ſpinner, it contains any large uneven threads, they muſt now be gently taken out; and if any ſmall hole or rent is made, it muſt be carefully drawn up, and mended with ſome of the warp-yarn of the ſame cloth.

But that compactneſs and denſity which diſtinguiſh woollen cloth from all other manufactures, and renders it ſo peculiarly adapted to our wear in theſe northern climates, are derived from the next operation, which is fulling, or milling, by which a cloth of 40 yards long, and 100 inches wide, being firſt ſprinkled over with a liquor prepared from 5lbs. of fine ſoap (made from the oil of olives) diſſolved in hot water, is laid in the mill-trough, and there pounded or ſtamped on by two heavy wooden hammers, alternately raiſed and depreſſed by the cogs of a mill-wheel. By this proceſs it becomes by degrees (generally in about 8 hours) ſo thickened and ſhrunk up, as to be reduced to 30 yards long and 60 inches wide, which renders it of the proper ſubſtance and thickneſs of common ſuperfine cloth. During this operation, it muſt be taken out from the trough from time to time, to have more ſoap added, and to be ſmoothed from the wrinkles and creaſes which it would otherwiſe contract.

This faculty of being rendered thicker by compreſſion, is peculiar to woollen ſubſtances. In vain may fabrics of ſilk or cotton be ſubjected to the ſame proceſs; they would not, in any length of time, be rendered thicker by it, or more compact in the ſmalleſt degree. To account for this, it has been obſerved, that the ſingle hairs of wool, when viewed in a microſcope, are diſcovered to be thickly ſet with rough and jagged protuberances, adapted to catch and entangle with each other. Whence it ſeems probable, that during the violent agitation the cloth undergoes in the mill-trough, the fibres being, at every ſtroke of the mill hammer, ſtrongly impelled together, and driven into the cloſeſt poſſible contact, at length hook into each other, drawing cloſer and cloſer as the proceſs continues, till they become thus firmly and inextricably united; each thread, both of the warp and the woof, being ſo joined and compacted with thoſe that are contiguous to it, that the whole ſeems formed into one ſubſtance, not being liable, like other fabrics, when cut with ſhears, to unravel and become ragged at the edges.

The cloth, thus milled to its proper thickneſs, muſt be ſcoured with clean water till it be perfectly free from the ſoap. In this part of the proceſs, a preparation of fullers-earth and bullock's gall is found very ſerviceable, rendering the cloth at the ſame time ſoft and mellow.

The cloth muſt now be taken to the cloth-worker, in order to be dreſſed, which is performed by firſt properly drawing out, and arranging in one direction, all the hairs or fibres of the wool that can poſſibly be brought to the ſurface, and then ſhearing it as cloſe as it will admit, without diſcovering the ground of the cloth, or laying the threads bare.

The inſtruments employed in this operation, are the wire cards, and teazels, to raiſe and draw out the hair, and the ſhears to cut off what is too long and ſuperfluous. (The teazel is a large kind of thiſtle, with the points growing very ſtrong and hooked; to uſe them the heads are cut off, and ſet cloſe together in ſmall wooden frames called *handles*.) Theſe inſtruments, although hitherto worked by men's hands, with great labour and expence, have of late been ſo ingeniouſly adapted to machinery turned by mill-wheels, as to perform the ſame operations with much more preciſeneſs and effect, as well as great ſaving in point of expence; and the machines for this purpoſe are various, and continually improving. The method hitherto employed is generally as follows.

The cloth being drawn over a frame, conſtructed of boards laid ſloping, and covered with hair-cloth, is, during its paſſage, in order to raiſe the wool, regularly ſcraped, or rubbed from one end to the other, with the cards or teazels, being all the time kept as wet as poſſible by continually pouring water upon it. It is then laid on the ſhearing boards, which are made of wooden planks covered with coarſe cloth, and forming a kind of hard cuſhion, where the wool thus raiſed is cut off with long heavy ſhears, which are preſſed cloſe to the cloth with leaden weights, and gradually ſlide forward at every motion or cut, till they have proceeded from one liſt to the other. The cloth is then returned to be again ſcraped or rubbed; theſe operations are repeated three times, every time with finer cards, or teazels, when the wool becomes ſufficiently raiſed. It muſt now be taken to the rack, on which being faſtened by the liſts with ſmall hooks or tenters, it muſt be drawn or ſtrained thereon, until it be of an even breadth throughout; when dry it is returned to the ſhearing boards, on which the cutting is repeated three times more on the right ſide, and once on the other or back ſide. After this it is given to the cloth drawers, who, having firſt, with ſmall picking irons, made very ſharp at the points, drawn out all the ſmall ſtraws and bits of lint which have before eſcaped notice, carefully fine-draw or mend the ſmall holes or rents, if any ſuch have been made in it.

Nothing now remains to be done but preſſing; preparatory to which, the cloth being doubled and laid in even folds, a leaf, or ſheet of glazed paſteboard, is inſerted between each fold or plait of the cloth; it is then laid in the preſs, and covered with thin wooden boards or fences, on which are laid iron plates properly heated, and on the whole (by means of a lever turning a ſcrew) the top of the preſs is brought down, with the degree of force judged neceſſary to give it the proper gloſs. When cold, it may be taken out of the preſs, in order to be folded and packed, ready for ſale.

The ſtatute book contains a variety of laws relating to the *woollen manufacture*; the principal of which will be recited under that article: we ſhall here ſubjoin an account of the moſt important laws pertaining to cloth and clothiers. Every fuller of cloth ſhall uſe tayſels, or teazels, and no cards, deceitfully impairing the ſaid cloth, on pain of double damage, to be determined by a juſtice of the peace, mayor, maſter, warden, bailiff, portreeve, conſtable of hundred, and ſteward of leet, who may commit the offender to the next gaol till payment; information may be made by any perſon not grieved to any of the above magiſtrates or officers; and the offender ſhall forfeit to the king, or to ſuch perſons as ſhall be intitled to fines or amercements within their juriſdiction, *3s. 4d.* 4 Edw. IV. c. 1. No cloth, not fulled, ſhall be exported, on pain of forfeiting the ſame, half to the king and half to him that will ſue. 7 Edw. VI. c. 3. For the meaſuring of cloth, the ſtatutes generally provide that the yard ſhall conſiſt of a ſtandard yard, and the breadth of a man's thumb; or 37 inches in the whole. In every pariſh or hamlet where cloths are made, two juſtices ſhall appoint overſeers for taking care that the ſtatutes relating to the regulation of cloth be obſerved. 3 and 4 Edw. VI. c. 2. 39 Eliz. c. 20. 43 Eliz. c. 10. Theſe overſeers are empowered to ſearch or try the cloth, and perſons refuſing or reſiſting ſearch ſhall, on conviction at the ſeſſions, forfeit for the firſt offence 10 *l.* for the ſecond 20 *l.* and for the third, ſtand upon the pillory in the next market town; of the forfeitures one third ſhall belong to the overſeers, one third to the king, and one third to the poor. 39 Eliz. c. 20. The length, breadth, and weight of the ſeveral ſorts of cloth are ſettled; allowance in weight, for dyeing, dreſſing, roving, and chaſing, in broad cloth 4lbs. in long cloth 5lbs. and ſo in proportion, is adjuſted, and an increaſe of weight by any liquid is forbidden on pain of 40 *s.* half to the king, and half to the buyer that ſhall ſue, by 4 Jac. 1. c. 1. c. 2. Before ſale the maker ſhall fix his ſeal of lead to the ſame, containing the length and weight, to be tried by the water, and the overſeer ſhall fix ſuch ſeal to the cloth, with the word "ſearched." 39 Eliz. c. 20. On the penalty of his recognizance he ſhall ſet his chriſtian and ſirname upon the ſeal, and no other ſhall be good. 21 Jac. c. 18. Any perſon ſetting any ſeal to cloth, or taking any ſeal away, without warrant, ſhall on conviction at the ſeſſions, for the firſt offence forfeit 10 *l.* for the ſecond 20 *l.* and the pillory; one third of the forfeitures to the overſeers, one third to the king, and one third to the poor. Cloth offered to be ſold unſealed ſhall be ſeized by the overſeers. 39 Eliz. c. 20. For each of the cloths under the ſealed meaſure in length, *6 s. 8 d.* per yard ſhall be forfeited, beſides abatement of the price for what is wanting; for every yard of the ſaid cloth above the lengths, 10 *s.* ſhall be forfeited; and for the ſame wanting breadth throughout, ſhall be forfeited 20 *s.* wanting for half the length 10 *s.* under half, 5 *s.*; and for every pound wanting above 2lbs. in weight ſhall be forfeited 10 *s.* Jac. c. 20. For the encouragement of dreſſing and dyeing of cloth, no perſon ſhall export any white woollen broad cloth, until he have paid duty of 5 *s.* for every ſuch cloth, on pain of forfeiting the ſame, or value; half to the king, and half to him that ſhall ſeize, inform, or ſue. 6 Ann c. 8. The legiſlature has enacted other laws with regard to dyeing of cloth, for which ſee DYEING. No perſon ſhall have or uſe any tenter, with a lower bar, &c. for ſtretching any rough and unwrought woollen cloth, on pain of 20 *l.* half to the king, and half to him that ſhall ſue. No perſon ſhall ſtretch (or ſell the ſame ſtretched) any wrought woollen broad cloth above one yard in length, and half a quarter in breadth; or half cloth, above half a yard in length, and half a quarter in breadth, &c. on pain of forfeiting the ſame, half to the overſeer or informer, and half to the poor. 43 Eliz. c. 10. If any cloth remaining on the tenters be ſtolen in the night, and the ſame is found on any perſon, on a juſtice's warrant to ſearch, ſuch offender ſhall forfeit to the owner treble value, leviable by diſtreſs and ſale, or be committed to gaol for three months, or till the fine be paid; but for a ſecond offence he ſhall ſuffer ſix months impriſonment; and for the third offence, he ſhall be guilty of felony, and tranſported for ſeven years. 15 Geo. II. c. 27. No woollen cloth ſhall be exported, till it be barbed, rowed, and ſhorn, on pain of forfeiting the ſame, half to the king, and half to him that will ſue. 3 Hen. VII. c. 11. No perſon ſhall uſe iron cards, or pickards, in rowing of cloth, on pain of forfeiting the cards, and 20 *s.*; nor ſhall any perſon put any flocks, chalk, flour, or ſtarch, or other deceivable thing on cloth, on pain of 40 *s.* 3 and 4 Edw. VI. c. 2. No cloth ſhall be rowed or raiſed with oil, greaſe, or any liquid, except on the edge of the ſhears with ſemet or oils, on pain of 13 *s.* 4 *d.*; and there ſhall be no cutting of wool from the backſides of cloth, except with ſhears, in pain alſo of 13 *s.* 4 *d.*; nor ſhall any liquid be uſed on the ſide of the cloth, to make it look better than the inſide; nor ſhall the ſides be raiſed, fulled, rowed, or ſhorn, better than the middle, on the like penalty. 4 Jac. c. 2. No perſon ſhall preſs cloth with a hot preſs, on pain of forfeiting the ſame or value. 5 and 6 Edw. VI. c. 6. And preſſing of cloth with hot boards ſhall be puniſhed with like forfeiture. 21 Jac. c. 18. With regard to mixed or medley broad cloth, it is provided by 10 Ann. c. 16. and 1 Geo. ſt. 2. c. 15. that the fulling miller ſhall take an oath before a neighbouring juſtice, to duly meaſure ſuch cloth fulled at his mill, when fulled and wet, affix to it a ſeal of lead, marked with a crown, and ſtamped with his name; together with the length and breadth of the cloth; for which he ſhall have one penny, and enter in a book the marks, ſort, number, length, and breadth of it; under a penalty of 20 *l.* on conviction in 40 days, before one juſtice, or on oath of one witneſs, leviable by diſtreſs; or, in want of diſtreſs, commitment to the gaol or houſe of correction for three months. Counterfeiting, defacing, or altering the ſeal incur the ſame forfeiture of 20 *l.* Selling cloth before it is ſo ſealed ſubjects to a forfeiture of one-ſixth part of the cloth. If the buyer is not ſatisfied with the meaſure, he may have it again meaſured in the water, within eight days after delivery; the buyer and ſeller chooſing each a meaſurer; and if it does not contain the quantity ſpecified in the ſeal, the owner or ſeller ſhall forfeit one ſixth part of the value. By 13 Geo. c. 23. inſpectors of mills and tenters ſhall be appointed by juſtices at Eaſter ſeſſions, in the counties of Glouceſter, Wilts, and Somerſet, for examining and ſealing cloths; and millmen ſending home cloths before inſpection ſhall forfeit 40 *s.* perſons refuſing entrance to the inſpector ſhall forfeit 10 *l.*; and the inſpector acting againſt his oath, ſhall forfeit 20 *l.* Such inſpectors ſhall be paid 2 *d.* for each cloth by the clothiers; the Yorkſhire manufacture is ſubject to peculiar regulations by 11 Geo. II. c. 28. 5 Geo. III. c. 51. 6 Geo. III. c. 23. No foreign woollen cloth ſhall be imported, on pain of forfeiture, and further puniſhment at the king's will. 11 Edw. III. c. 3. 4 Edw. IV. c. 1. Woollen manufactures ſhall be exported cuſtom free. 11 and 12 W. c. 20. By 12 Geo. c. 34. if any weavers of cloth enter into any combination for advancing their wages, or leſſening their uſual hours of work, or depart before the end of their terms agreed, return any work unfiniſhed, &c. they ſhall be convicted by two juſtices of peace to the houſe of correction for three months; and clothiers are to pay their work-people their full wages agreed upon in money, under the penalty of 10 *l.* &c.

CLOTH, *Caſting of Lead on.* See CASTING.

CLOTH, *Cocking.* See COCKING *cloth.*

CLOTH, *Frizing of.* See FRIZING, and CLOTH.

CLOTH, *Green.* See GREEN.

CLOTHS, *Hair*, in *Military Affairs.* See HAIR.

CLOTH, *Houſewife's.* Se HOUSEWIFE.

CLOTH, *Incombuſtible.* See ASBESTOS, and LINUM *Incombuſtibile.*

CLOTH, *Painting on.* See PAINTING.

CLOTH, *Sear.* See SEAR-*Cloth.*

CLOTHO, in *Mythology*, the youngeſt of the Fates, Deſtinies, or Parcæ. It was her office to ſpin the thread between her fingers; that is, to give and prolong life. She is repreſented as holding the ſpindle, dreſſed in a long gown of ſeveral colours, and having a crown on her head with 7 ſtars.

CLOTNIZA, in *Geography*, a town of Poland, in the palatinate of Lublin; 18 miles W.S.W. of Lublin.

CLOUD, a viſible aggregate of minute drops of water ſuſpended in the atmoſphere.

The word is probably derived from the Anglo-Saxon Lehlob, *covered, hidden*, the face of heaven being ſo in thoſe parts where clouds appear. The ſame aggregate, which in this ſituation is called cloud, obtains the name of miſt, when ſeen to ariſe from the earth or waters; and fog, when it envelopes and covers the obſerver. Yet the two latter, viewed from a greater diſtance or elevation, preſent all the appearances of clouds; while theſe, in their turn, become miſts and fogs, in proportion as we approach and penetrate them. It may be proper, therefore, for the ſake of preciſion, that the term cloud, in philoſophical language, ſhould be made a general one, comprehending all ſuch aggregates, however ſituated.

It is concluded, from numerous obſervations, that the particles of which a cloud conſiſts are always more or leſs electrified. The hypotheſis, which aſſumes the exiſtence of veſicular vapour, and makes the particles of clouds to be hollow ſpheres, which unite and deſcend in rain when ruptured, however ſanctioned by the authority of ſeveral eminent philoſophers, does not ſeem neceſſary to the ſcience of meteorology in its preſent ſtate; it being evident that the buoyancy of the particles is not more perfect than it ought to be, if we regard them as mere drops of water. In fact they always deſcend, and the water is elevated again only by being converted into inviſible vapour.

Clouds, *Natural Hiſtory of.* Since the general introduction of accurate inſtruments for determining the changes of denſity, temperature, humidity, and electricity, which continually occur in the atmoſphere, our knowledge of its conſtitution and properties has been conſiderably advanced. It is nevertheleſs true that the philoſopher of the preſent day is not more weather-wiſe than his predeceſſors in ancient times. He is ſtill obliged to yield the palm in the ſcience of prognoſtics to the ſhepherd, the ploughman, or the mariner; who, without troubling his head about the reaſons of things, has learned, by tradition and experience, to connect certain appearances of the ſky with certain approaching changes; of which thoſe appearances are, in fact, a commencement or continuation, diſcoverable while the cauſe is yet at a diſtance. Undoubtedly the union of theſe two kinds of knowledge would beſt deſerve to be entitled the ſcience of meteorology; and it muſt tend, equally with the invention or perfection of philoſophical inſtruments, to the improvement of this ſcience, could we reſtore to its place the ancient and popular branch of it, now too much neglected by philoſophers, which is founded wholly on natural phenomena. If we except the changes of the wind, ſome indications of moiſture and dryneſs, and a few others of leſs importance, the whole of theſe may be traced to one common origin in the product reſulting from the decompoſition of vapour; which remains, during a certain interval, in a ſtate of ſimple diffuſion or ſuſpenſion in the atmoſphere. To give to the extenſive collection of facts, which it is eaſy to make on this ſubject, a communicable and uſeful form; to render that attainable in a ſhort time, which has been hitherto the excluſive treaſure of the adepts of long experience, is the object of the writer of the following ſyſtematic nomenclature and natural hiſtory of clouds.

Clouds are ſuſceptible of various modifications.

By this term is intended the ſtructure or manner of aggregation, in which the influence of certain conſtant laws is ſufficiently evident amidſt the infinite leſſer diverſities reſulting from occaſional cauſes.

Hence the principal modifications are as diſtinguiſhable from each other, as a tree from a hill, or the latter from a lake; although clouds, in the ſame modification, compared with each other, have often only the common reſemblances which exiſt among trees, hills, and lakes, taken generally.

There are three ſimple and diſtinct modifications, which are thus named and defined.

1. Cirrus. *Def.* Nubes cirriformis tenuiſſima, quæ undique creſcat.

The Cirrus. A cloud reſembling a lock of hair, or a feather. Parallel flexuous, or diverging fibres, unlimited in the direction of their increaſe.

2. Cumulus. *Def.* Nubes denſa cumulata, ſurſum creſcens.

The Cumulus. A cloud which increaſes from above in denſe, convex, or conical heaps.

3. Stratus. *Def.* Nubes ſtrata, aquæ modo expanſa, deorſum creſcens.

The Stratus. An extended, continuous level ſheet of cloud, increaſing from beneath.

There are two modifications, which appear to be of an intermediate nature; theſe are:

4. Cirro-cumulus. *Def.* Nubeculæ ſubrotundæ connexæ vel ordinatè poſitæ.

The Cirro-Cumulus. A connected ſyſtem of ſmall roundiſh clouds, placed in cloſe order, or contact.

5. Cirro-ſtratus. *Def.* Nubes extenuata, ſub-concava vel undulata. Nubeculæ hujuſmodi appoſitæ.

The Cirro-ſtratus. A horizontal or ſlightly inclined ſheet, attenuated at its circumference, concave downward, or undulated. Groups or patches having theſe characters.

Laſtly, there are two modifications, which exhibit a compound ſtructure, *viz.*

6. Cumulo-ſtratus. *Def.* Nubes denſa, quæ baſi cumuli ſtructuram patentem cirro-ſtrati, vel cirro-cumuli ſuperdat.

The Cumulo-ſtratus. A cloud in which the ſtructure of the cumulus is mixed with that of the cirro-ſtratus, or cirro-cumulus. The cumulus flattened at top, and overhanging its baſe.

7. Nimbus. *Def.* Nubes denſa, ſupra patens et cirriformis, infra in pluviam abiens.

The Nimbus. A denſe cloud, ſpreading out into a crown of cirrus, and paſſing beneath into a ſhower.

Of the Cirrus.

This is always the leaſt denſe, and commonly the moſt elevated modification. It is ſometimes ſpread horizontally through a vaſt extent of atmoſphere; the whole breadth of the ſky being inſufficient to ſhew where it terminates. In this caſe, its parallel bars appear, by an optical deception, to converge in oppoſite points of the horizon. At others, it is exhibited in unconnected perpendicular bundles, of the moſt minute ſize. Between theſe extremes, it may be traced in every degree of extent and inclination to the horizon. In a ſerene ſky the cirrus is firſt indicated by a few threads, pencilled in white, on the azure ground. Its increaſe takes place in various ways, and may be compared ſometimes to vegetation, more often to cryſtallization. Thus, 1. Parallel threads are added to each other horizontally, and occaſionally other ſtrata of the ſame, croſſing the firſt at right or oblique angles, until a delicate tranſparent veil is formed. 2. Parallel threads are collected into diſtinct groups, lying at various angles with the horizon. 3. Flexuous and diverging fibres are extended from the original ſtem, forming the reſemblance of creſts of feathers, locks of hair, &c. 4. The firſt-formed threads become, as it were, the ſupports from whence others obliquely aſcend or deſcend into the atmoſphere. Laſtly. A denſe nucleus is ſometimes formed, and ſhort fibres ſhoot out from it in all directions. The great elevation of the cirrus has been aſcertained by geometrical obſervations. "The ſmall, white ſtreaks of condenſed vapour, which appear on the face of the ſky, I have found," ſays Dalton, "by ſeveral careful obſervations, to be from three to five miles above the earth's ſurface."

Viewed from the ſummits of the higheſt mountains, they appear as diſtant as from the plains. A more eaſy and not leſs convincing proof of their elevation may be deduced from their continuing to be tinged by the ſun's rays in the evening twilight with the more vivid colours of the priſm, while the denſer clouds, having already paſſed through the ſame gradation, are in the deepeſt ſhade.

The duration of this cloud varies according to its ſtation in the atmoſphere; and the preſence or abſence of other clouds; it is long, extending ſometimes to thirty-ſix hours, when it appears alone, and at its greateſt elevation; but ſhorter, or even very tranſient, when formed lower, and in the vicinity of the cumulus.

By an inexperienced obſerver the cirrus would be pronounced abſolutely motionleſs. On compariſon with a fixed object, however, it is ſometimes found to have a conſiderable progreſſive motion. The propagation of the cirrus, and the variable direction of its flexures, merit attentive obſervation, as being intimately connected with the variations of the wind, although undoubtedly not produced by the mere motion of the air.

The general principles, which the imperfect notice hitherto beſtowed on it ſeems to point out, are the following:

1. Its appearance is a general indication of wind; and it is moſt conſpicuous and abundant before ſtorms.

2. It is often a leeward cloud; or, when a group of cirri appears on the horizon, it ſeems to invite a current towards it; and the wind very often ſhifts into that quarter towards which the points are directed.

3. Horizontal ſheets of the cirrus, more particularly thoſe which carry ſtreamers pointing upward, are among the indications of rain approaching, while the fringe-like depending ones are found to precede fair weather.

Of the Cumulus.

Clouds in this modification are commonly of denſe ſtructure. They are formed in the lower atmoſphere; and move with the wind, or more properly with that current which flows next the earth. The phenomena of the cumulus are uſually theſe: In the latter part of a clear morning, a ſmall irregular ſpot appears ſuddenly at a moderate elevation. This is the *nucleus*, or commencement of the cloud, the upper part of which ſoon becomes convex and well defined, while the lower continues irregularly plane. On the convex ſurface the increaſe viſibly takes place, one heap or protuberance ſucceeding another, and again loſing itſelf in a ſubſequent one, until a pile of cloud of an irregular hemiſpherical form is raiſed; which floats along, preſenting its apex to the zenith, while the baſe, or rather the lower ſurface of the baſeleſs fabric, continues parallel to the horizon.

When theſe clouds are of conſiderable magnitude, they remain at proportionately great diſtances. When ſmaller, they croud the ſky by a nearer approach to each other. In each caſe the baſes range in the ſame plane; and the increaſe of each keeps pace with that of its neighbour, the intervening ſpace remaining clear.

The cumulus often arrives at its greateſt magnitude early in the afternoon, when the temperature of the day is at its maximum. As the ſun declines, it gradually decreaſes, retaining its character till towards ſun-ſet, when it is more or leſs haſtily broken up, and evaporates, leaving the ſky clear, as in the early part of the morning. Its tints are often vivid, and paſs through the moſt pleaſing gradation during this laſt hour of its exiſtence.

The preceding phenomena form the hiſtory of the pure cumulus, as it may be termed, when no other modification appears along with it. They are both the accompaniments and prognoſtics of the faireſt weather.

Of the Stratus.

The ſtratus has a moderate degree of denſity. It is the loweſt of the modifications, being formed in contact with the earth or water. It comprehends thoſe level creeping miſts, which, in calm evenings, ſpread like an inundation from the valleys, lakes, and rivers, to the higher ground.

Unlike the cumulus, which belongs to the day, and rarely ſurvives the ſetting ſun, this cloud accompanies the ſhades of night, and commonly vaniſhes before the aſcending luminary. The evaporation commences from below. "At the moment of the ſeparation of the ſtratus from the earth, its character is changed, and it puts on the appearance of the naſcent cumulus.

The nocturnal viſits of the ſtratus have been always held a preſage of fair weather. Thus Virgil:

"At nebulæ magis ima petunt campoque recumbunt."

Then miſts the hills forſake and ſhroud the plain.

The meteorological axioms of this great poet were probably ſelected from the popular ones of his age, as confirmed by his own experience. Hence they ever agree with that of his readers. There are few days in the whole year more calm and ſerene than thoſe whoſe morning breaks out through the ſtratus. They are the halcyon-days of our autumns; an interval of repoſe beween the equinoctial gales and the ſtorms of winter.

Of the Cirro-cumulus.

The intermediate nature of this cloud may be aſcertained by tracing its origin, as well as inferred from its ſtructure. The cirrus, in its ſlow deſcent through the air, may be ſeen to paſs into this and the next modification; although its previous appearance does not ſeem abſolutely neceſſary to the production of either.

Moſt of our readers will recollect the appearance of the icy effloreſcences on the panes of windows, gradually melting into an aſſemblage of drops, which adhere to the glaſs, retaining ſomewhat of the ſame figure, deprived of its right lines and angles. Such is the change of form which the cirrus undergoes, in paſſing to the ſtate of the cirro-cumulus. And, as the water on the windows is occaſionally converted again into ſpiculæ of ice, ſo theſe ſmall rounded maſſes ſometimes ſuddenly reſume the forms of the cirrus. In the oblique denſer tufts of the latter, the change to the ſpheroidal form often begins at one extremity, and proceeds gradually to the other, during which the cloud reſembles a ball of flax, with an end left unwound and flying out. All the cirri in the ſame group, and frequently all thoſe in view, obſerve the ſame law in theſe changes.

The cirro-cumulus forms a very beautiful ſky. Numerous diſtinct beds are ſometimes ſeen floating at different altitudes, which appear to conſiſt of ſmaller and ſtill ſmaller clouds, as the eye traces them into the blue expanſe. It is moſt frequent in ſummer; is the natural harbinger of increaſed temperature; and, conſequently, one of the beſt indications of fair weather, when permanent or frequently repeated. A more tranſient diſplay of it is, however, frequent in the intervals of warm ſhowers, and in winter. There are alſo certain forms of it, more deep and denſe than ordinary, and arranged on a curved baſe, which enter into the peculiar features of thunder-ſtorms.

It is uſually found to accord with a riſing barometer.

Of the Cirro-ſtratus.

This is a multiform cloud, and can only be detected in its various appearances by an attention to its diſtinctive characters. It is always an attenuated ſheet, or patch, floating on the air, in a poſition nearly or quite horizontal. As we have compared the cirrus to dry flax, we may here conſider it as drenched in water, and having its ſpreading fibres reduced to a cloſer and recumbent form. Viewed over head, it is remarkable for its uniform hazy continuity, and in the horizon for its great appearance of denſity, the conſequence of its being ſeen edgewiſe. In this ſituation, alſo, it ſometimes cuts the ſun's or moon's diſk acroſs with a dark line; of which Virgil,

"Ille ubi naſcentem maculis variaverit ortum
Conditus in nubem, medioque refugerit orbe,
Suſpecti tibi ſint imbres: namque urget ab alto
Arboribuſque, ſatiſque notus, pecorique ſiniſter."
Georgic. lib. i.

Or ſhould his riſing orb diſtorted ſhine
Thro' ſpots, or faſt behind a cloud's dark line
Retire eclipſed; then let the ſwain prepare
For rainy torrents; a tempeſtuous air,
Swift from the ſouthern deep, comes fraught with ill,
The corn and fruits to waſte, the flocks to chill.

The cirro-ſtratus is the natural indication of depreſſion of temperature, wind and rain. In order to make a proper uſe of it in this reſpect, it is neceſſary to attend to the time of its appearance, to its continuance, and its accompaniments. This cloud ſometimes alternates with the cirro-cumulus, either at different intervals of the day, or in the ſame ſky, or even in the ſame ſtratum, which may conſequently be ſeen ſucceſſively in each modification, and at intervals, partly in one, partly in the other. In this caſe the prognoſtic is doubtful, and regard is to be had to that which ultimately prevails.

Again, there is a tranſient appearance of the cirro-ſtratus, which often accompanies the production of dew in the evening, and denotes an atmoſphere but lightly ſurcharged with vapour. Not ſo when it appears earlier in the day, or at ſun-riſe (according to the preceding quotation), and attended with the rudiments of the cumulus. In general, the weather may be ſuſpected of a ſtrong tendency to wind and rain, as often as the ſky is both hazy, and deformed with numerous ſmall patches of cloud, in which the extenuated character predominates; and theſe appearances, together with an abundance of cirro-cumulus, indicate thunder. Before ſtorms of wind, there is in particular a feature of cirro-ſtratus, often very ſlightly expreſſed, and in one quarter only, which reſembles the architectural cyma.

But the moſt formidable appearance of the cirro-ſtratus, is that of extenſive ſheets, deſcending from the higheſt regions of the atmoſphere, and ſcarcely diſcernible for a time, but by the priſmatic colours which they aſſume in the vicinity of the ſun's or moon's place. Theſe are the ſkreens on which are deſcribed the immenſe circles of halos, forming, by their occaſional interſections, parhelia, and paraſelenia, mock ſuns and moons, which ſometimes vie in ſplendour with the luminaries themſelves. It is eaſy for thoſe who are acquainted with the principles of optics, to conceive how theſe interſecting circles are produced by light paſſing through ſheets of cloud placed at different heights and angles.

Conſiſtent with this is the prognoſtic of foul weather commonly deduced from the appearance of the halo. After a ſolar halo in ſpring, or the early part of ſummer, a ſeries of wet and cold weather may be expected, although it ſhould not commence for ſome days; during which, nevertheleſs, the ſame ſtate of the atmoſphere ſubſiſts, as is often manifeſt from the repetition of the halo. Thoſe which ſurround the moon in clear nights, indicate rain or ſnow, according to the ſeaſon of the year.

In mountainous and even hilly countries, the cirro-ſtratus is frequently ſeen adhering to the more elevated points of land. In winter it alſo viſits the plains, in the form of a very wet and durable miſt, the drops of which are nevertheleſs too ſmall to be viſible, and which, unlike the ſtratus, is more denſe on riſing grounds than in the valleys.

The cirro-ſtratus uſually accords with a ſinking ſtate of the barometer.

Of the Cumulo-ſtratus.

The formation of the cirro-cumulus, or cirro-ſtratus, by condenſed vapour, deſcending from the higher atmoſphere, does not prevent the cumulus from being produced out of the water, which, in the mean time, evaporates, from the earth and aſcends to the middle region. In this caſe, the two modifications after a while come into contact, and preſent to the attentive obſerver a ſucceſſion of curious appearances.

While the cumulus is rapidly increaſing upward, a delicate fleece, of a ſtructure viſibly different, ſometimes attaches itſelf to its ſummit; where it repoſes as on a mountain. This fleece is a cirro-ſtratus; and the materials of which it is formed are brought by a ſuperior current overtaking or meeting the cumulus. Frequently, the cumulus in its increaſe breaks through the cirro-ſtratus, and appears again above it, but with a viſible change in the aggregation, which now becomes rocky, perpendicular, and, finally, overhanging. If the cirro-ſtratus ſhould itſelf increaſe too faſt to be ſwallowed up by the cumulus, the latter after a while extends its protuberances laterally, and attaches itſelf by them to the ſuperior maſs of cloud.

When the cirro-cumulus, in like manner, occupies the ſuperior place, a cumulus riſing beneath it is ſuſceptible of the ſame union by mutual attraction; the reſult of which, as in the former caſe, is a large, lofty, and denſe cloud, which often ſubſiſts through the day; and in the evening undergoes the uſual evaporation.

It is not, however, abſolutely neceſſary to the production of this cloud, that either of the ſuperior modifications ſhould be previouſly formed. In a favourable ſtate of the atmoſphere, the cumulus itſelf, after having arrived at a certain magnitude, ſuddenly begins to over-grow its baſe, and produces a cloud, which, in regard both to its form and its rapid growth, may be compared to a muſhroom.

The cumulo-ſtratus uſually prevails in the completely overcaſt ſky. In this it preſents appearances not eaſy to be deſcribed, but which may be claſſed by a due attention to the theory of this cloud. At preſent it is intended to comprehend under it every mode of union between different ſtrata, which is not productive of rain. Future inveſtigation may point out diſtinctions, which at preſent we are not prepared to make.

This modification is moſt frequent during a mean elevation of the barometer, or that which is denominated *changeable*, when the wind blows from the weſt, with occaſional deviations towards the north and ſouth. In reſpect to temperature, it has a wide range, and may uſher in a fall of ſnow, as well as a thunder-ſtorm. Of the latter, indeed, it is among the regular harbingers, but with peculiar appearances. During the ſuffocating calm which prevails before the firſt diſcharge of the atmoſpheric electricity, it may be ſeen in different points of the horizon, rapidly ſwelling to a ſtupendous magnitude, moſt curiouſly wreathed and curled, "fretted and emboſſed" in its ſubſtance, and flanked at different heights by the delicate opake ſtreaks of the cirro-ſtratus. The whole preſents a ſpectacle of peculiar magnificence, in contemplating which, one may imagine an inviſible agent collecting in this immenſe laboratory the energies of the ſtorm, and arranging innumerable batteries for the ſubſequent exploſions.

It will appear by what we have already ſtated, that the cumulo-ſtratus affords in general a doubtful prognoſtic. When it is formed in the morning, the day often proves fair, though overcaſt; and if the cirro-ſtratus has contributed to its formation, there will probably enſue heavy ſhowers on the ſecond or third day. When it ſubſiſts a long time, the character of its ſuperior ſpreading part may be conſulted, which, if it be decidedly either that of the cirro-ſtratus, or cirro-cumulus, the uſual reſult of their appearance may be expected.

Of the Nimbus.

To have a correct notion of this cloud, the reader has only to take the opportunity of examining a ſhower in profile as it approaches from the horizon. He will ſee the denſe gloom, which experience teaches him to regard as a maſs of deſcending rain, loſing itſelf above in a cloud which commonly ſpreads in one continuous ſheet to a great diſtance all around the ſhower; inſomuch that while the latter is on the horizon at ſeveral miles diſtance, the edge of the cloud has frequently arrived in the zenith. He will perceive that this ſpreading crown of the ſhower advances regularly before it, and that, whether viewed from a diſtance or over-head, it exhibits in a greater or leſs degree the fibrous ſtructure of the cirrus. After the ſhower has paſſed over, he will commonly obſerve the ſame appearances in the part of the cloud which follows it; and in ſqually weather he will ſometimes be able to repeat theſe obſervations on many different ſhowers appearing ſucceſſively; or at the ſame time, in different quarters. The term *nimbus* is intended ſtrictly to denote no more than this inverted cone of cloud, from which a ſudden or denſe local ſhower, whether of rain, ſnow, or hail, for the difference is not eſſential in either caſe, is ſeen to deſcend. As it riſes to a great height in the atmoſphere, it may be ſeen from a diſtance of many miles; and ſo conſtant is the reſult of a ſhower arriving with it, that though, in a few inſtances, perhaps from the ſmall quantity of the rain, we have not been able to diſcover the uſual obſcurity beneath it, while at a diſtance, we believe it may be laid down as a general rule, on as good grounds as in moſt other caſes, that rain, ſnow, or hail, is falling on the tract over which it is ſpread.

> "Qualis ubi ad terras abrupto ſidere *nimbus*
> It mare per medium, miſeris heu preſcia longé
> Horreſcunt corda agricolis." Virgil.

> So while far off at ſea the ſtorm-cloud lowers,
> And on the darken'd wave its fury pours,
> Mid crops unreap'd the hapleſs peaſants ſtand,
> And ſhuddering view its rapid courſe to land.

There is a great difference, at different times, in the proportion which the inverted cone of cloud bears to the column of rain, &c. in which it terminates; and in a very turbid and moiſt atmoſphere, the character of the upper part often approaches more nearly to the cirro-ſtratus than the cirrus. The more perfectly diſtinct and local the ſhower, and the clearer the reſt of the air from other clouds, the more perfect the crown of cirrus, which, indeed, ſometimes aſſumes an almoſt geometrical preciſion in its form and internal ſtructure; the threads of the cirrus tending from all ſides directly towards the top of the column.

The pure nimbus commonly moves with the wind, and from the rapidity of its paſſage affords but little to the rain-gauge. But it often happens, that it is formed in the midſt of cumuli which have already arrived at a great ſize. In this caſe the latter may be ſeen to enter ſucceſſively into the focus at the top of the column, from whence they never emerge; being viſibly converted to the purpoſe of ſupplying materials for the irrigation, which thus becomes more abundant; and the ſhower is alſo occaſionally thus propagated in a direction oppoſite to the wind.

The nimbus, moreover, does not always originate in a cirrus. The cumulus, and more often the cumulo-ſtratus, may be ſeen to expand at their ſummit into a cirroſe ſheet, while the lower part is reſolved into rain. On the contrary, the rain ſuddenly ceaſing, and the nimbus remaining entire, the ſharp extremities of the crown often retire into it; the ſides aſſume the ſwelling folds, and the character is exchanged for that of cumulo-ſtratus. When the ſhower has expended itſelf, and the ſheet breaks, the ſuperior portions uſually turn to the cirro-cumulus or cirro-ſtratus, and the lower to the cumulus. When a total evaporation of the remaining cloud follows a ſhower, it is a very favourable prognoſtic. A nimbus is frequently accompanied by a cirro-ſtratus or two lying near it, and on a level with the denſeſt part of the cloud. The nimbus of thunder-ſtorms has many of theſe, as before obſerved of the cumulo-ſtratus, arranged at different heights; which, with the groteſque form of each cloud, and the hazy ſtate of the medium, are ſufficiently characteriſtic of the high electric ſtate of the air at ſuch times, and want only an attentive peruſal (in nature) to enable the obſerver to aſcertain it on future occaſions. It appears that the cumulo-ſtratus paſſes to the nimbus by a ſudden change in its electricity: for in tracing the progreſs of a thunder-ſtorm, through a long range of theſe clouds in the horizon, we have been ſatisfied, that the clouds, which had ceaſed to afford exploſive diſcharges, had undergone this change in their ſuperior part, and were pouring down rain; while others, among which the lightning ſtill played, or which were ſituated beyond it, retained their ſwelling and rounded forms ſome time longer.

Of the Origin, Suſpenſion, and Deſtruction of Clouds.

Theſe aggregates conſiſt of water, raiſed by evaporation, and become viſible by condenſation in the atmoſphere. Reſpecting evaporation, and the ſtate in which vapour ſubſiſts, there has been much diverſity of opinion: and, of the ſeveral theories propoſed, there is not one comprehenſive enough to merit excluſive adoption. A number of general principles, however, have been eſtabliſhed; which we ſhall employ, with the aid of thoſe of electricity (hitherto not enough conſidered in its ſilent and gradual effects), to explain, though in an imperfect manner, the principal phenomena of clouds.

Evaporation conſiſts in the union of water with caloric, and the eſcape of the compound as an inviſible fluid, which we ſhall excluſively denominate *vapour*.

The ſolvent action of the air, to which this effect has been attributed by chemical philoſophers in general, has been proved by comparative experiments on the force of vapour in air, and with air excluded, to have no perceptible ſhare in it. The laws which govern the natural proceſs, (for theſe alone here intereſt us) may be thus briefly ſtated. The force by which water is converted into vapour is directly as its temperature, other things being equal: but this force has to overcome an oppoſing one, of the ſame nature, inherent in the vapour which already exiſts in the atmoſphere. For ſuch vapour, by its elaſtic property, tends to exclude from the ſpace it occupies every additional portion; and conſequently to prevent the eſcape from the water of new vapour. Hence the temperatures being equal, the quantity of vapour produced will be leſs, the greater the quantity already diffuſed in the air.

But though the *chemical* action of air is imperceptible, its *mechanical* effect is great. A moving atmoſphere may double or triple the rate of evaporation, according to its velocity. For not only is the ſurface, from whence only the vapour eſcapes, thus enlarged and changed; but the naſcent vapour itſelf, which would otherwiſe hover a while upon it, to the obſtruction of the proceſs, is immediately bruſhed away and diffuſed.

By applying theſe principles, we may explain to ourſelves various natural phenomena: as for inſtance; why the wind, after rain, becomes colder than even the rain which fell; being robbed of its caloric by the evaporation of the floating and depoſited water, with which it is in contact: why ſnow ſometimes totally diſappears without melting, and the ſurface of ice becomes ſenſibly waſted and channelled; for theſe are warm, compared with the dry and froſty air which blows at ſuch times, and conſequently evaporate freely. In what manner, again, a ſtrong weſterly wind in ſummer or autumn brings up clouds, which on its ceſſation deſcend in rain: for it promotes evaporation by its mechanical effect, and the vapour eſcapes into an atmoſphere already too moiſt to carry it off to any great diſtance. This will be evident by recurring to the principle before ſtated, that the vapour eſcapes by the force of the temperature of the water out of which it is formed; and, conſequently, into a colder atmoſphere it will ſtill eſcape, though continually decompoſed thereby.

Vapour is decompoſed by air, in conſequence of the ſuperior affinity of the latter to caloric. This happens in two ways. 1. When vapour eſcapes or is propelled into air colder than itſelf; the reſult being a local denſe cloud. 2. When a mixture of air and vapour is cooled; in which caſe there enſues a general turbidneſs, which we ſhall excluſively denominate *haze*. It is occaſioned by minute floating particles of water; the caloric which, united to theſe, formed tranſparent vapour, having paſſed into the air.

Out of this haze clouds may be afterwards formed, by ſimple aggregation, or by electrical attraction. It abounds in the atmoſphere during moſt part of the year, occupying ſometimes the higher, ſometimes the lower, part thereof. The quantity in which it exiſts may be judged of, at ſome periods, by the appearance of diſtant objects ſeen horizontally: at others, by the degree of intenſity of the blue colour of the ſky, which becomes paler by it, if indeed the blueneſs is not wholly due to this part of the medium.

Of the Nature of the Stratus.

This cloud is an example of the decompoſition of vapour thrown into air of a lower temperature. The earth or water on which it repoſes is always warmer than the cloud, as is alſo the clear air above. Thus, in a ſtratus, formed over a field with ponds, the temperature of the earth juſt below the turf was 57°; of the water, 59°; of the air, at an elevation of thirty feet, 55°; while that of the cloud, at four feet from the ground, was 49.5°. Hence this cloud preſerves a level ſurface; and hence it uniformly vaniſhes, or begins to be driven upward, as ſoon as its temperature becomes equal to that of the earth. It is conſequently due to the decompoſition (in a ſmall portion of the atmoſphere) of the vapour which the earth and water continue to emit, after ſunſet, by the force of a temperature previouſly acquired. But the change in the lower air, which gives occaſion to this local decompoſition, is not ſo eaſily to be explained: for it appears that very often, in the evening of a clear day, the decreaſe of temperature in the atmoſphere takes place in the ſame order in which the increaſe did in the morning: *viz.* beginning from the ſurface of the earth and proceeding upward. If the air never became colder, on theſe occaſions, than the contiguous ſoil, the effect might very well be aſcribed to the abſorption of a quantity of caloric by the latter. But we ſee that, in the preſent inſtance, it became colder by ſeven degrees, though vapour was ſtill decompoſing: and this in a perfect calm, which, in a great degree, forbids another ſuppoſition, of the exchange of a quantity of heated air below, for as much cold air from the higher atmoſphere; otherwiſe this would ſeem a ſufficient account of the matter.

The electric charge of the ſtratus, which is always poſitive, and ſometimes highly ſo, notwithſtanding the contact of its lower ſurface with the earth, ſeems to prove that a cloud is not even ſo good a conductor as has been ſuppoſed, and that the fluid, in certain caſes, may be very gradually tranſmitted through it. Poſitive electricity being that proper to the atmoſphere in fair weather, we ſhould naturally expect to find it in this cloud.

It might be worth while to examine the air above, with a view to diſcover whether there exiſts in the latter a negative counter-charge. It will appear, from a conſideration of the principles before ſtated, why this cloud is almoſt peculiar to the autumn. The gradual decline of the ſun, at this ſeaſon, keeps the atmoſphere conſtantly ſurcharged with vapour, which is ultimately diſpoſed of in rain; and hence follow gales of wind. The ſtratus, therefore, though an immediate indication and accompaniment of fair weather, affords an unfavourable prognoſtic in the early part of ſummer; as it ſhows that a tendency has already begun to extenſive precipitation, at a time when the uſual predominant feature is increaſing dryneſs.

Of the Nature of the Cumulus.

The heating effect of the ſun's rays on the atmoſphere is greateſt near the ſurface of the earth, and diminiſhes gradually in aſcending. The diminution proceeds in fair weather at the rate of about one degree for each hundred yards, as appears by obſervations with the thermometer on ſtations of known difference in altitude.

This inequality appears to give riſe to the cumulus, on the ſame principles as thoſe of the ſtratus, but the effects are more complicated. Vapour is generated, as before, at the ſurface of the earth, but it is thrown into an atmoſphere heated by the ſun. Here it maintains its elaſtic ſtate, and, in proportion to the ſupply from below, the whole quantity exiſting in the atmoſphere is compelled to riſe. In doing this, it changes its climate, and arrives among air of a lower temperature, where a portion is continually decompoſed, filling the middle region with haze. Of this, ſmall aggregates begin to be formed, the increaſe of which is at firſt determined by no particular law. But the aggregate is not in equilibrium with the air. It tends to ſubſide, and in the mean time the increaſe of temperature is proceeding upward. Hence the lower part ſoon finds a poſition in a plane of air ſufficiently warm to evaporate it: and as this effect is regulated, in general, by the elevation alone, we ſee theſe aggregates aſſume each a flat baſe, reſting as it were on the ſame plane, parallel to the earth's ſurface. The remainder of the cloud ſports in all the varieties of the ſpheroid, and more rarely of the cone; according to the courſe of the ſhowers of minute particles of water, which we may conſider (though inviſible in their progreſs) as deſcending upon it. The vapour generated at the baſe is, probably, in part condenſed on the ſurface of the colder particles of the cloud above. While the ſupply from the haze exceeds the waſte by evaporation, the cloud increaſes: when the latter has begun to prevail, it may be traced through various ſtages of diminution to its final wreck, on ſinking wholly into the warmer atmoſphere. This happens commonly about ſun-ſet; becauſe the aſcending current of vapour, the ſource of the phenomenon, then ſlackens or ceaſes; and the lower air parting with its redundant caloric to the higher, we unexpectedly ſee the denſe clouds evaporate, at the very time when the chill of the evening is felt below, and the dew falls.

But it does not appear that the cauſes we have hitherto enumerated are fully adequate to the phenomenon. The increaſe of the cumulus is often more rapid than conſiſts with the notion of ſimple attraction, exerciſed between diſtant particles of water, in a reſiſting medium. When a cumulus is thus increaſing, the ſmall aggregates in its way do not uſually join it, but ſeem to vaniſh before it. Laſtly, the cumulus itſelf, however denſe, never deſcends in rain. It is difficult to conceive that ſo powerful an attraction could exiſt for many hours, without bringing the particles together into larger and larger drops, until they were too heavy for longer ſuſpenſion. If we ſuppoſe, however, that, from the commencement of its aggregation, the cumulus becomes a poſitively electrified maſs, theſe difficulties vaniſh. This maſs may electrify negatively, and attract into itſelf, from great diſtances, both the diſperſed particles of water and thoſe which have already united in much ſmaller maſſes. Its particles muſt be mutually repulſive, and cannot come into contact without a change of ſtate: the ſame may be ſaid of the reſpective clouds in this modification, when they do not differ too much in ſurface.

Of the Nature of the Cirro-ſtratus.

When a portion of the atmoſphere, charged with vapour, is brought over a tract of land of lower temperature than itſelf, its caloric is abſtracted in ſufficient quantity, uſually to occaſion a decompoſition of ſome of the vapour, and a conſequent general turbidneſs.

The ſweating, as it is improperly called, of walls and pavements in a thaw, and when rain is about to come on, is from this cauſe; the vapour being decompoſed on their ſurfaces. The miſt which enſues at theſe times obſcures diſtant objects, and occaſions the trees, againſt which it is borne by the wind, to drip plentifully. It is in fact a cirro-ſtratus in contact with the earth, and no phenomenon is more familiar to the inhabitants of hilly tracts. The ſame general depreſſion of temperature may happen in another way, and higher in the atmoſphere. When a cold and moiſt air flows over a warmer vaporous one, it is obvious that the former may be warmed, and become more tranſparent, at the expence of the latter; which, from the ſame cauſe, muſt become turbid. The haze thus produced will not ſubſide with the uniform motion of dew, but rather in ſheets, becoming more denſe as they deſcend, both from the approximation of their particles, and addition from the vapour they meet with. But the cirro-ſtratus is far from aſſuming always the ſimple form, to which the mere effects of gravity might be ſuppoſed to give riſe. It exhibits changes, which can only be attributed to the acquiſition, or paſſage through it, of ſuch ſmall portions of electricity, as in a humid medium we may conceive a cloud to be ſuſceptible of. On theſe occaſions it tends either to the ſtate of cirrus, or that of cirro-cumulus, of which we ſhall treat preſently.

The reaſon of the prognoſtic afforded by the cirro-ſtratus will now be evident. It gives us notice of a change in the ſtate of the ſuperior atmoſphere, which we could not otherwiſe be certain of, until the current, in its courſe of propagation downward, had begun to affect the denſer clouds, thrown up by the ſuperficial evaporation. It is not very uncommon to ſee the cirro-ſtratus evidently brought by a wind, moving in a different direction from that wherein the cumuli are immerſed on which it ſettles. In this caſe the latter are ſpeedily arreſted by it, and aſſume the new courſe, or deſcend in rain, by a change of their electricity.

Of the Nature of the Cirro-cumulus.

Let us now reverſe the former caſe, and conſider the upper current as both vaporized, and warmer than the air below. It is probable that the upper is then cooled by that part of the lower which is next to it, though very ſlowly, from the difficult tranſmiſſion of caloric downward. The decompoſition of the vapour in the upper current by this means may give origin to the cirro-cumulus; and the peculiar aggregation of this cloud, as diſtinguiſhable from that of the cirro-ſtratus, may be the reſult of its acquiring electricity in its deſcent in a much greater degree. Such, at leaſt, is the inference we may deduce from its abundance before thunder ſtorms; when it is occaſionally ſeen to arrive with the wind in extenſive flocks or ſtrata, moving with unequal velocity, and by conſequence overtaking each other, until they form a denſe ſtationary maſs.

This explanation of the origin of the cirro-cumulus is principally deduced from an obſervation, which we have now ſo often repeated, as to regard it as a meteorological axiom; *that the temperature of the day following, exceeds that of the day on which it appears*. Hence, when it continues to recur daily, the weather ſtill grows warmer, until a thunder-ſtorm, in ſome quarter of the heated tract, puts a period to the inſulation of the clouds.

Of the Nature of the Cumulo-ſtratus.

In attempting to aſſign cauſes to phenomena ſo complicated, as thoſe which this modification preſents, we may be in danger of admitting a greater number than are really neceſſary. It is apparent, however, that in the ſtate of things moſt favourable to the production of the cumulo-ſtratus, there exiſts a precipitation, independent of that which gives riſe to the cumulus, and ſituated in a higher region. As this precipitation affords ſometimes the cirro-cumulus, at others the cirro-ſtratus, we need not aſſign to it any other cauſe than the one already mentioned, *viz.* a ſuperior vaporized current of air. It is not inconſiſtent with the principles we have laid down reſpecting the cumulus, that this cloud ſhould alſo be produced at the ſame time; it being requiſite only that there exiſt a ſufficient action of the ſun on the earth's ſurface, or a ſufficient temperature derived therefrom. The inoſculation of theſe two orders of cloud, the ſingular union which follows, and the eſtabliſhment of a new centre of attraction, towards which the whole future increaſe tends, is the prominent feature in this modification, and the chief fact which remains to be accounted for. As this effect is not conſtant and uniform, it cannot be aſcribed to gravity alone. Reaſoning from analogy, rather than from direct experiment, which it is not eaſy here to apply, we may attribute it to a difference in the electric charge of the reſpective clouds; which difference, though ſmall, ought to produce the uſual appearances of bodies charged plus and minus; *viz* mutual approach and contact. This effect however appears to enſue rather with regard to the maſſes than to the individual particles.

The effect of the highly vaporized ſtate of the higher atmoſphere is often diſcernible in the cumulus from its earlieſt appearance; and it is eaſy to determine, at certain times, that this cloud, if it continue long, will paſs to the preſent modification. The effect we mean to point out is the uneven growth of the cloud; numerous ſmall maſſes attaching themſelves to its ſurface, and giving it an appearance not unlike the curls of a fleece of wool; particularly when ſeen beneath the ſun, in a ſituation where the projecting parts may catch the light. If we admit that the cumulus acts, as well by electrical attraction, as by that of gravity, on the ſurrounding materials, we may here conſider them as arriving by ſubſidence in too great plenty to be immediately aſſimilated; in conſequence of which they tend to unite among themſelves. A ſtill greater quantity of haze, in the region next above the cumulus, gives riſe to the curious phenomenon of the *cloud-capped* cloud; when the cumulus is covered at its ſummit with a cirro-ſtratus; in the ſame manner as, in mountainous tracts, this cloud repoſes on an elevated point of land. The cauſe is probably alike in each caſe, whether it be a lower temperature on a diminiſhed electricity which determines to this particular ſpot, the commencement of the aggregation of the cirro-ſtratus. We may next conſider the cumulo-ſtratus perfectly formed, and endeavour to aſſign a cauſe for its occaſional long continuance: which, however, exceeds the day of its formation only on the approach of thunder: this cloud, as well as the cumulus, very commonly vaniſhing about ſun-ſet, and re-appearing the next day, for ſome time. The two ſtrata of the atmoſphere, which form the ſuperior and inferior boundaries of the cloud, are probably, during this time, in ſomewhat different ſtates of electricity; the one alſo depoſiting water, the other receiving it; the broad ſurface of the cumulo-ſtratus may be regarded as a coating, applied to the upper ſtratum; and receiving from it a continual acceſſion of charged particles of water, the electricity of which is ſlowly tranſmitted, through the intermediate portion, down to the baſe of the cloud, which is often ſome hundred feet below; and where a continual evaporation counteracts the increaſe above. Here, while the maſs continues in this modification, the progreſs of the electricity downwards is arreſted by the dry air: for although the inſulated rod is found ſometimes to be affected with poſitive, ſometimes with negative ſigns, while the baſe of ſuch clouds is over it, this effect is commonly influential; and the rod is not charged, as by the paſſage of the nimbus. How the electricity of this cloud is affected by the conſtant evaporation of a portion at the baſe remains to be aſcertained; and the ſame may be ſaid as to the cumulus.

Of the Nature of the Cirrus.

It was neceſſary to defer the conſideration of the nature of this cloud, until we had developed, in a conſiderable degree, the principles on which our theory proceeds. The reader will have ſeen that we aſſume the fact of the ſlow tranſmiſſion of the electric fluid through clouds: which in this, as in a former inſtance, we apply rather analogically than by induction; the modification in queſtion being uſually ſo high in the atmoſphere, that the electric ſtate of the latter, above and below it, cannot eaſily be found by actual experiment. Proceeding, however, on this aſſumption, we ſuppoſe that the cirrus reſembles in its ſtate a lock of hair, or a feather, inſulated and charged; or rather, that its arrangements reſult from the ſame cauſe with thoſe of the coloured powders, which electricians project on a cake of wax, after having touched it with the knob of a charged phial, and which fall into a variety of configurations on the ſurface. Thus the cirrus may be formed in the air, out of ſuch floating particles of water as are preſent, and may ſerve the purpoſe of collecting and tranſmitting the electric fluid. It is during the prevalence of variable winds that the cirrus moſt abounds; and it is reaſonable to conclude, that the portions of air, which at theſe ſeaſons are tranſported from place to place, gliding over or interſecting each other, uſually differ ſufficiently in temperature to occaſion a ſlight decompoſition of the vapour of one of the currents, and in their electric charge ſufficiently to induce a communication by means of the conducting medium ſo formed. Again, in the gradual cooling of a perfectly calm plate of air, ſituated at a great elevation, and conſequently free from the occaſional cauſes of diſturbance which prevail below, it is not improbable that the ſeparation of the caloric from the vapour, and the collection of the electrified water from the air, may go on together, by a proceſs ſimilar to the cryſtallization of ſalts, in which much caloric is liberated into the medium. This opinion at leaſt ſeems to be advanced by Kirwan, in his "Eſſay on the Variations of the Atmoſphere," and we may conſider the vegetating cirrus as the proper example of it.

Another conjecture might yet be ſtarted as to the cirrus. It might be regarded as a cloud wholly formed of minute ſpiculæ of ice; ſince the air, at a certain elevation, is ſufficiently cold throughout the year for this effect. But if it ſhould be found that the particles of clouds are ſuſceptible of a rectilinear arrangement in any caſe at a temperature exceeding 32°, there would be no neceſſity for this ſuppoſition.

If the appearances of the cirrus are as frequent and various at ſea as on land, it cannot be doubted that intelligent mariners would find their account in keeping a regiſter of them, as connected with the changes of wind, &c. making due allowance for the change of ſtation in different obſervations when under ſail.

The buoyancy of the cirrus ſeems to be moſt perfect during its firſt increaſe. It always follows, at length, the common courſe of gravity, and the change to the cirro-cumulus, or cirro-ſtratus, which certainly depends on the ſtate of the medium it falls into, may be aſcribed to the retention or loſs of the electricity.

Of the Nature of the Nimbus.

This phenomenon may be thought to be improperly denominated a modification of cloud, ſince it conſiſts uſually of a column of deſcending rain, ſnow, or hail, ſeen in connection with the cloud affording it. As the concluding link in the chain of atmoſpherical precipitation, it ſeems, nevertheleſs, moſt advantageouſly placed here; and its hiſtory, though far from including all that we may obſerve, and could wiſh to have explained, on the ſubject of rain, is more decidedly illuſtrative of the nature of clouds in general than that of any other modification. Moreover, it is ſometimes obſerved to be formed before the rain begins, which affords ſufficient ground for conſidering it as a diſtinct modification of cloud. We owe to the bold and penetrating conjecture of Franklin, on the identity of lightning and the electric ſpark, the invention of a method of inveſtigating the electricity of clouds; which, in the hands of experimentaliſts, has ſince brought out a maſs of facts abundantly ſufficient to eſtabliſh that propoſition; and which alſo throws conſiderable light on the theory of rain, and other depoſitions from the atmoſphere. By this method the ſtructure of the nimbus may at any time, when it paſſes over us, be demonſtrated to be that of a natural conductor, by which the poſitive charge of the higher atmoſphere is brought down to the earth. For this purpoſe, there is provided a rod of iron, or other metal, well inſulated on a pillar of varniſhed glaſs, the latter being defended from rain by an inverted funnel, ſoldered or cemented to the part of the rod next above it. The rod ſhould be furniſhed with ſeveral points of wire, a few inches long; and it need not be an elevated one for this purpoſe, provided the extremity is clear of other objects capable of drawing off the fluid. The charge is aſcertained by pith balls, of a larger or ſmaller diameter, to ſuit the occaſion, ſuſpended by flaxen threads, on a wire fixed into the lower part of the rod, and terminating in a ball. Near the latter, it is proper to have another ball fixed on a ſtout wire, paſſing into the ground, to which the fluid, when abundant, may eſcape in ſparks. This inſtrument exhibits a charge of the ſame kind with that of the air in which it is immerſed; or, in caſe of rain, &c. the charge of the latter, as compared with that of the air. We will give, in the firſt place, the appearances which we have recently obſerved during the paſſage over the rod of a nimbus of the moſt ſimple ſtructure, having neither a cumulus nor a cirro-ſtratus attached to it; which moved along with the lower current through the clear atmoſphere, and diſcharged a ſhower of large opaque hail, the air below being very dry. During the approach of the cloud from the north-eaſt, the pith-balls remained cloſe until the ſpreading crown, which characteriſes this modification, had arrived in the zenith. At this time, and while the ſhower itſelf was ſtill three or four miles diſtant, they opened negative. As the cloud came nearer, their divergence increaſed until it amounted to full two inches, at which time ſparks of conſiderable ſtrength might be drawn from the rod. After this the negative charge gradually went off, and the balls touched again. In a few moments the edge of the ſhower, mixed with a few drops of rain, arrived at the conductor, and the balls inſtantly opened poſitive, the charge gradually increaſing until ſparks were emitted more freely than before. This charge continued during the paſſage of the hail, and went off gradually as ſoon as it was clear of the inſtrument. After having cloſed, the balls opened again negative, and this charge increaſed to a conſiderable intenſity, as the ſhower receded towards the ſouth and ſouth-weſt, after which it gradually went off: the balls cloſed, and finally were left ſlightly poſitive. From theſe facts, the reader, who is converſant in electricity, will deduce the ſtructure of the lower part at leaſt of the ſhower. He will ſee that the deſcending hail formed a column poſitively electrified. This, which might be ſix or ſeven miles in diameter, was ſurrounded with a cylinder of negative electricity, probably extending in every direction three miles further, and reſulting from the action of the poſitive centre on the dry atmoſphere, in which it was moving. Now the amount of the hail, when melted, was conſiderably leſs than $\frac{1}{100}$th of an inch in the rain gauge; and could the deſcent of the electric fluid, through the whole ſpace, have been rendered as obvious to our ſenſes as that of the hail, we ſhould probably have ſaid that the ſhower conſiſted of fire more truly than of ice.

The queſtion that naturally preſents itſelf is, Whence came this flood of electricity which accompanied the hail? It was not from the circumſtance of the water being frozen, ſince a hard ſhower of rain equally exhibits a charge, but with this remarkable difference, that whereas ſnow, ſleet, and hail, are always poſitive, rain is found ſometimes poſitive, ſometimes negative. The reader may conſult, on this head, an extenſive collection of facts in Read's Journal of Atmoſpherical Electricity. "Phil. Tranſ." vol. lxxxii. The probable ſources of negative rain will be preſently mentioned; but to return to the queſtion of the origin of the poſitive charge; if we attentively conſider the ſtructure of the nimbus, it is preciſely that which, from the known properties of the electric fluid, we ſhould propoſe for a conductor formed to acquire the latter. If we detach from it the falling column, and extraneous clouds which uſually attend its progreſs, it will be found to conſiſt of a cloſe collection of fibres, diverging from the region of the cumulus, (where it appears the rapid union of the particles into drops is accompliſhed,) to a vaſt height and extent in the ſuperior atmoſphere. The conducting-line, therefore, may be conſidered as prolonged from the top of the column, to the very extremity of each of theſe fine fibres of cloud, which are often extended, in all directions, as correctly as thoſe of a lock of hair inſulated on a charged conductor. The intention in this caſe ſeems to be not ſo much the precipitation of water, as that of the electric fluid which keeps it in ſuſpenſion. This purpoſe accompliſhed, (and the reader may conceive how great a diſcharge muſt be effected by a number of ſuch machines acting at once on a ſmall tract of country,) the water unites into larger drops through the whole extent of the atmoſphere; it ſubſides in a continuous ſheet, under which the condenſed product of the ſuperficial evaporation moves along, in the form denominated *ſcud*; and the rain comes down freely and generally, until the atmoſphere is diſburthened, or until the partial vacuum which is formed brings in a drier air from the northward.

Negative, as well as non-electric rain (which ſometimes falls, though ſtrong poſitive and negative ſigns precede or follow it in the clear air) muſt neceſſarily reſult from the action of a central maſs of cloud, in which a ſtrong poſitive charge exiſts, on the clouds of leſs extent which fall in its way; and it is to be conſidered alſo, that rain, at the elevation in which it is formed, may be perfectly non-electric, (*i. e.* it may reſult from the union of clouds differing in electricity, and hence uniting in rain,) yet at the moment of arriving at the earth, it may differ ſo much in its charge from the atmoſphere below, the only ſtandard of compariſon, as to be ſtrongly negative or poſitive with reſpect to the latter. But theſe conſiderations belong more properly to the ſubject of atmoſpheric electricity.

We ſhall conclude with a brief review of the modifications; aſcending from the ſtratus, formed by the condenſation of vapour, on its eſcape from the ſurface, to the cumulus, collecting the water arreſted in the ſecond ſtage of aſcent; both probably ſubſiſting by virtue of a poſitive electricity. From theſe proceeding, through the partially conducting cumulo-ſtratus, to the cirro-ſtratus and cirro-cumulus; the latter poſitively charged, and conſiderably retentive of its charge; the former leſs perfectly inſulated, and, perhaps, conducting horizontally; we arrive thus at the region, where the cirrus, light, elevated, and extended, obeys every impulſe or invitation of that fluid which, while it finds a conductor, ever operates in filence; but which, embodied and inſulated in a denſer collection of watery atoms, ſooner or later burſts its barrier, leaps down in lightning, and glides through the nimbus from its elevated ſtation to the earth. See Electricity Atmospherical, Evaporation, Rain, Meteorology.

Clouds, *Magellanic*. See Magellanic *clouds*.

Cloud-Berry, in *Botany*. See Rubus *Chamæmorus*.

CLOUD'S-HILL *Lime-works*, near Bredon on Charnwood Foreſt, in Leiceſterſhire. The lime produced from the rock in this part is often called Barrow-lime, and is in ſuch general repute for water-works, that rail-way branches have been conſtructed to theſe works, from two different navigations in oppoſite directions, *viz.* from the *Aſhby-de-la-Zouch* canal, a branch of 6¾ miles, and from the *Leiceſter* navigation, a branch (including a water-level) of 12 miles in length; while a third rail-way therefrom, to be called the *Bredon* rail-way in another direction, was in contemplation at the time that the *Derby* canal was formed, with which and numerous others it was intended to connect; ſee our article Canal.

CLOVE, in *Commerce*, is uſed for the two and thirtieth part of a weigh of cheeſe, or barrel of butter, *i. e.* eight pounds avoirdupoiſe = $\frac{1}{14}$ cwt. = $\frac{1}{15}$ quintal, (120 lb.) = 9.78, &c. lb. troy. 9 Hen. VI. cap. 8. A clove of wool weighs 7 pounds, and 2 cloves make a ſtone = ¼ tod = $\frac{1}{16}$ cwt. = $\frac{1}{52}$ ſack, = 8.5069 lb. troy.

Clove *Cinnamon*. See Cinnamon.

Clove *iſlands*, in *Geography*. See Molucca.

Clove-*july-flowers*, a ſpecies of caryophyllus, greatly recommended as cordials, and given in diſorders of the head, palpitations of the heart, and in nervous complaints of all kinds. See Dianthus Caryophyllus.

Clove-*Pink*, in *Botany*. See Dianthus Caryophyllus.

Clove-*tree*. See Caryophyllus.

Clove-Water, is prepared of brandy, and cloves bruiſed therein and diſtilled.

CLOVER, in *Botany*. See Trifolium.

Clover, in *Agriculture*, is the name of a well known plant of the artificial graſs kind, of which three ſorts are cultivated in the field; the red clover, the middle clover, or cow red clover, and the white clover. The red clover (*trifolium pratense*) is a biennial perennial plant, which riſes to a conſiderable height, has a long tap root, and flowers from May to September.

It has been remarked by Mr. Banniſter, in his "Synopſis of Huſbandry," that it is "in ſome places called broad clover, and is diſtinguiſhed by a large leaf, and blows, as its name implies, with a red bloſſom. It delights in a rich earth, and of a ſtiffiſh nature, but will proſper well on gravels, ſands, or chalks. It probably, however, thrives beſt in clayey or ſtrong deep loamy ſoil. And the above author thinks, that the moſt convenient time for ſowing this graſs is with the oats in February or March, or among the green wheat in thoſe months; though it is not unfrequently ſown with the barley in April; but in this latter caſe, there is danger of its growing to ſuch a height among the corn, as to occaſion the barley to lie ſo long abroad at harveſt that the clover may be withered, and hence great miſchief may accrue to the barley, if much rain ſhould fall ere it can be brought into the barn; or the barley may be much lodged, ſo as to deſtroy the clover; either of which are inconveniencies that one would wiſh, he ſays, to avoid; and for theſe reaſons, clover is rarely ſown among barley on good lands; but on thin ſoils theſe accidents are leſs to be apprehended."

But Mr. Young ſays, "there are ſeveral methods of ſowing this ſeed, which is ſo profitable upon almoſt every farm, that it muſt be had if poſſible. 1ſt. In the drill huſbandry, it may be ſown and harrowed in, at the time the barley is ſown broadcaſt; a pair of light harrows at the ſame time following the drill machine, to cover the clover ſeed. 2dly. It is ſown before the roller, when the barley is four inches high; and 3dly. It is hand or horſe hoed in, when the corn receives either of theſe operations, if the farmer is in the practice of giving them.

"Theſe are the methods moſt commonly uſed. But Mr. Ducket, he ſays, drilled the ſeed in the ſame drills as the barley, but that way is very uncommon. Another way he has known, has been that of ſcarifying the barley ſtubble in harveſt on light ſoils, and ſowing the ſeed alone then." But "of theſe methods, the firſt is, he thinks, the ſureſt for a crop, and the moſt to be recommended, notwithſtanding the admitted evil which ſometimes takes place in a wet ſeaſon, of the clover growing ſo luxuriantly as to damage the barley. The ſecond ſucceeds well, if rain follows in due time, and would perhaps generally ſucceed, if the farmer ventured to harrow it in, which he might ſafely do. In the third method it often ſucceeds, but it alſo often, as he ſays, fails; nor is it neceſſary, in many caſes, to hoe the barley."

It is further ſtated, that, "in regard to the quantity of clover which the farmer ſows, he has ſeveral conſiderations to govern his determination. In the firſt place, it is in many ſituations, and on many farms, as profitable a crop as any other he commonly reaps. On tolerably good land, he may expect, at two mowings, three tons of hay; on good, three and a half, and even four; or, if he applies it to ſoiling his teams for want of lucern, the produce, in a different way, is equally ſtriking. This produce is alſo gained at a very cheap rate; cheaper than he gets any other crop. Add to this, that it forms an excellent preparation for either beans or wheat. Still, however, the quantity to be ſown will depend in ſome meaſure, on his having lucern, ſaintfoin, or a great plenty of meadow land. If he is deficient in theſe, it becomes more than uſeful; it is eſſential." But, ſays he, "the unfortunate circumſtance which attends clover is, its being extremely apt to fail, in diſtricts where it has been long a common article of cultivation. The land, to uſe the farmer's term, becomes ſick of it. After harveſt, he has a fine plant, but by March or April, half, or perhaps more, of it dead. This makes a new courſe of crop neceſſary. Inſtead of its occurring once in four years, in the common Norfolk courſe, it becomes neceſſary to ſow it only," he ſays, "in the ſecond round alternately, beans after barley, in one courſe, and then clover in the next. This has been found to anſwer. This obſervation, however, ſhould be made not without obſerving, that on a farm at Merton in Surry, Mr. Arbuthnot, by means of deeper ploughing than common, and ample manuring, ſucceeded well with clover every third year in this courſe: 1. beans; 2. wheat; 3. clover; on land that was ſaid to be ſick of it, though ſown before only once in four years. He viewed his crops in that new courſe during three rounds, and never ſaw finer." Much caution is neceſſary in repeating it frequently, as various facts in the different ſurveys of the kingdom fully ſhow.

In reſpect to the proportion of ſeed that may be neceſſary, the ſame able writer ſtates, that from "ten to twelve pounds an acre is the uſual quantity of ſeed, but that fifteen is better;" and that "as clovers are liable to decline or go off," very early in April, and in ſome ſeaſons in March, the young clovers ſhould be carefully examined, as a full plant in autumn often dies away in winter and ſpring ; ſo that, by this month, the farmer is in doubt whether he ſhall let it ſtand or plough it up. In this caſe, it is highly adviſable, he thinks, to dibble into all the vacant ſpots ſpring tares, which thus take extremely well, and between clover and tares a very ample crop is produced," and that of a ſort that is of the greateſt utility to the farmer.

But it has been ſtated by Mr. Donaldſon, in his account of the preſent ſtate of huſbandry in Great Britain, that in the northern diſtricts, " the quantity of ſeed allowed to the Engliſh acre, when it is intended to plough up the field after the firſt or ſecond year, is from ten to fifteen pounds; to which is commonly added about a buſhel of rye graſs ſeed. It was formerly, he ſays, conſidered improper to ſow graſs-ſeeds of any kind along with oats, barley, or other white-corn crops. This opinion, however, has been clearly and ſatisfactorily proved to have been ill founded, and muſt have been at firſt promulgated by thoſe who were better acquainted with the theory than with the practice of agriculture. Every practical farmer now knows," he adds, " that if a crop of graſs be the principal object in view, there is a greater chance of its proving abundant when the ſeeds are ſown with barley particularly, than when ſown alone. This fact is ſo completely eſtabliſhed, that there are, it is preſumed, few inſtances where the method above mentioned is ſtill adopted. The general practice is to ſow, not only red clover, but all other graſs-ſeeds, with oats or barley in the ſpring. When the ſeeds are ſown, which is uſually done as ſoon as the grain is harrowed in, the field is again gently harrowed, and afterwards rolled, ſo as to cover the ſeeds, and ſmooth the ſurface of the field, that the ſcythe may paſs eaſily over it the following ſeaſon. Red clover, when the ſeed is ſown along with, or rather immediately after, barley, and at the rate of twelve or fifteen pounds to the acre, frequently overtakes, or overtops, the crop of barley ſo much, as materially to injure it. Were the clover ſeeds not ſown till the barley had vegetated to the height of three or four inches, he thinks this loſs and inconvenience would in all probability be avoided; at the ſame time the crop of barley would rather be improved than injured by a light harrowing at that ſtage of its growth, while the clover ſeeds would vegetate as freely, and the crop of graſs prove as abundant, as if the ſeeds had been ſown at an earlier period, or at the time the grain was put in. As it is an eſtabliſhed rule or regulation in many diſtricts, eſpecially in Scotland, for an entering tenant to pay the one who removes a certain ſum, as from 10*s.* to 20*s.* the acre, for liberty to ſow graſs-ſeeds along with the outgoing tenant's barley ; it is fair to preſume, he conceives, that this rule has been eſtabliſhed on proper principles, and that the payment ſo made, is no more than an equitable compenſation for the injury which the removing tenant ſuſtains by granting this permiſſion. " If ſo," ſays Mr. Donaldſon, " the average loſs of 15*s.* the acre, which is incurred by ſowing red clover along with barley ſeed, muſt appear of conſiderable magnitude to thoſe who ſow a fourth, a fifth, or a ſixth part of their farms every year with barley and red clover-ſeeds. The method above ſuggeſted for obviating this loſs and inconvenience, cannot poſſibly be attended with any bad conſequences to either of the crops in queſtion ; and as it would in all probability prevent this evil, which is ſo generally complained of, it certainly merits the conſideration of thoſe who, having repeatedly ſuſtained heavy loſſes from the failure of their crops of barley, are of courſe more immediately intereſted."

The practical writer we have firſt mentioned has remarked, that " on farms where there are kept large flocks of ſheep, there is an abſolute neceſſity of ſowing annually many acres of this graſs, that there may be no want of food for the flock during the ſummer months. For this reaſon, clover is often ſown on land that is improper for its cultivation ; in which predicament may be ranked ſuch poor fields where the juices of the ground have been exhauſted by repeated crops of corn. But, though large burthens of clover cannot be expected from ſuch worn out ſoils, yet the farmer, in the circumſtances above alluded to, acts a prudent part in ſowing the ſeed, for this will conſiderably improve his grattens in the following autumn, and furniſh the ſheep with food during the firſt part of the winter ; and if the clovers may not have taken ſufficiently thick to ſtand for a crop, or that the ground be intended to come in courſe for corn that year, or for a fallow, ſuch mode of huſbandry may be purſued without an apprehenſion of the leaſt damage to accrue from the growth of the clover. On theſe accounts, it will redound much to the intereſt of a farmer who keeps a large flock, not only to raiſe many acres of this graſs annually, with the expreſs view of reſerving it for a crop to ſupply the ſtock with green meat throughout the ſummer; but in particular caſes, as when from the abundance of the crop the ſeed is but of inferior value, or there is a probability of there being required on the farm a larger ſupply of ſheep-keeping than uſual, to ſow a ſprinkling of clover-ſeed in a variety of fields among the wheat, oats, and barley, though ſuch ground be intended for tillage the following ſpring."

It is added that " the beſt clover ſeed is that where the purple colour chiefly prevails, and which is moſt free from the ſeeds of weeds, of whatever kind. When clover is deſigned to ſtand for a crop, the beſt method of preparing the land for this uſe is to allow a liberal quantity of dung on the turnip fallow, and the turnip ſeed being thus ſown on fallows, properly conducted, will, in all likelihood, produce a good crop of that root ; and if the ſpring ſhould turn out kindly, the turnips may be eaten off, and the ground reduced to a tilth for ſowing the oats and clover-ſeed in March. Three buſhels of oats in this caſe is a proper quantity to the acre ; if more ſeed were allowed, the crop from the extraordinary tillage beſtowed on the land would probably throw out too great a quantity of ſtraw ſo as to be early lodged, by which the welfare of the clover would be endangered. As it is of conſequence that the ground ſhould work kindly at the time of ſowing this and all other graſs ſeeds, the utmoſt care ſhould be taken to get it into a due preparation for that purpoſe ; and as the turnip ground is frequently baked very hard by the treading of the ſheep in a wet winter, ſo that ſuch ground is apt to break up in large clods at the firſt ploughing in the ſpring : in this caſe, two ploughings will be required previous to ſowing the oats and clover, which will not only diſpoſe the field to work kindly, and to lie ſmooth and level, ſo that the ſmall fibrous roots of the clover will meet with leſs reſiſtance, and the graſs will form its ſucceeding ſhoots with greater facility ; but this kindly diſpoſition of the ground at ſeed time, will enable the oats likewiſe more ſucceſsfully to withſtand the drought of the ſpring, or other accidents. As it is of eſſential conſequence that the clover ſeed ſhould be ſown in a bed of well pulverized earth, and at a time when the ground may be worked to the greateſt advantage with the harrow, care ſhould be taken to fix on a tolerably dry time for this work, otherwiſe much of the ſeed will not vegetate, and that which may grow will ſuſtain infinite prejudice : for in a wet ſeed time the ground becomes beaten down ſo very cloſe, that the ſeed is prevented from ſending forth its tender fibres; and in conſequence from ſhooting forward with vigour; whence the crop languiſhes in its ſeveral progreſſive ſtates, and fails to produce a return nearly adequate to what might have been expected from land in that improved ſtate; and this ſhows the neceſſity of breaking up ſuch ground which is meant to be ſown with clover ſeed, in the early part of the ſpring, that there may be time to give the field a ſecond ploughing, if it ſhould be found requiſite; and hence alſo appears the neceſſity of ſowing the ſeed before the dry weather ſets in, and this may generally be brought about, if the turnips are fed off by the latter end of February, or beginning of March. Though an early ſowing, as ſome time within the month of March, is by far the moſt likely method of inſuring a good crop of clover on thin ſoils, yet in the caſe above mentioned, there will be no time loſt in waiting till the land has been twice ploughed, though from this circumſtance, if the weather ſhould prove unkindly, the ſeed time may be protracted till April, as it will be far more prudent to wait till that time, than to ſow the ſeed in a rough and ill cultivated bed. Neither can ſuch early ſowing often be complied with on ſtiff ſoils, as this ſtubborn ground does never work kindly under the harrow, till the ſpring is farther advanced, and always requires a ſecond ploughing for the Lent corn, ſo that the clover is rarely ſown on theſe ſoils till the middle of April, and very frequently this buſineſs is procraſtinated till May; but this ſhould by no means be brought into a precedent; ſince on moſt grounds, as obſerved before, the early ſown clovers have a much fairer chance of ſucceeding, than thoſe which are ſown later in the ſpring ſeaſon. The ſeeds of clover, being very ſmall, require only a ſuperficial covering, and the uſual method is to ſow the clover previous to the laſt harrowing of the oats, by which the ſeed will be introduced to a proper depth; and this method of tining the ſeed in with the harrows is, in his opinion, greatly to be preferred to putting it in with a buſh or only rolling in the ſeed, as is the practice with many people; for though this ſeed, being of a diminutive ſize, will eaſily take root, and if harrowed in at too great a depth beneath the ſurface, would be in danger of not coming up at all: yet there is a medium to be obſerved, and the ſowing of it previous to the croſs harrowing of the corn, appears, he ſays, a more likely way of defending it from the caſualties of the weather, than the ſlight covering by a buſh or roller. Clover ſeed is often ſown amongſt green wheat in the ſpring, and covered with the ſmall harrows, and the ground afterwards rolled, except when the wheat is ſo thin upon the ground, and ſo looſe at the root, as not to admit of this practice, which ſometimes happens; and in this caſe we muſt content ourſelves with the uſe of the buſh-harrow and roll," as it would be dangerous to have recourſe to any other method.

It is well known that clover, in its infantine ſtate, and before it has attained its rough leaf, is very apt to be eaten by the fly or flea, which is another reaſon for ſowing early, that the plants may get into rough leaf before the approach of dry weather; and this is likewiſe an argument for reducing the ground to the fineſt poſſible tilth, that this inſect may not have ſo proper a nidus to generate in; ſince it is found by experience, that the fly or flea, which is the ſame inſect that preys on the ſeed leaf of the turnip, and on the firſt ſhoot of the hop, is more frequently met with, and commits more fatal depredations on ground that is rough and cloddy, than on thoſe fields which have been reduced to a fine tilth by the harrow. There is, the ſame writer ſays, a very common error which farmers are apt to run into at clover ſeed time, by which they are often conſiderable ſufferers in the future crop; and this is, to ſow a larger quantity of ground than they are able to harrow in the ſame day, ſo that if there happens a glut of rain, that they cannot get on their land till ſeveral days after it has been ſown, the ſeed muſt either lie uncovered, or a great part of the clover be torn up by the harrow after it has begun to vegetate. It is, he ſays, a very uſual method for the ſeedſman to continue ſowing clover or other graſs ſeeds in the afternoon after having ſown the barley in the morning, by which management the farmer thinks he is gaining time, as this ground may be harrowed the next day with the odd horſes, whilſt the team horſes are covering in the barley or oats. And were there a certainty of fine weather, this would doubtleſs be a very prudent and commendable practice; but as this is not to be depended on, it ſeems to him to be an experiment fraught with too much hazard, in ſuffering a dozen or ſixteen acres of clover ground to lie uncovered, which would be utterly ſpoiled if wet weather ſhould intervene, ſo as to prevent it being harrowed within three or four days, a ſpace of time ſufficient for the ſeed to have ſtricken root. Nor is this the only miſchief likely to follow from this practice; for the ſeeds of clover, as well as trefoil, being of a diminutive ſize, their veſſels ſoon become overcharged with moiſture, and when this happens, great part of the ſeed will in courſe never vegetate; ſo that on every account it ſeems to be highly imprudent to purſue this method, unleſs the weather be ſuch as to promiſe a dry day or two, which however, in our inſular ſituation, and at this time of the year, can rarely be depended on with any degree of certainty.

It is obſerved, that "though clover ſeed will grow at two years old, it is by far the moſt ſecure method, to ſow that of the laſt year, which is not only quicker in vegetating, but the plants likewiſe ſhoot away with greater expedition, and ſooner attain their rough leaf; a conſideration of no ſmall moment, ſince the fly is ſo peſtilent an enemy to this graſs in its infantine ſtate." It is always a matter of great importance, in theſe crops, to have well ripened freſh ſeed.

And it is further remarked, that, "in a dripping ſummer, the clovers grow to a conſiderable height amongſt the corn, and in this caſe, the barley often ſuffers after a wet and tedious harveſt. Oats take leſs damage by wet, and wheat, being reaped, may generally be cut above the clover. When it happens that the clover grows to ſo large a head during the ſummer, the ſtubbles will be found to produce great ſtore of food in the autumn, either for horſes or cows, eſpecially if warm dripping weather ſhould happen at that time: and when the large cattle are removed, their places may be ſupplied with ſheep, and by this management a very conſiderable advantage is gained; for thus the working horſes are maintained in good heart at that time when there will be but a ſmall ſupply of green meat remaining, the cows will be ſupplied with a wholeſome food that will cauſe them to yield abundance of milk, and the fatting cattle will be greatly improved in fleſh: old ewes, or indeed fatting ſheep of whatever denomination, will thrive in this keeping, and if they ſhould not be perfectly ready for the butcher when taken out at Michaelmas, will however be in much better condition to be driven into the turnip field, than if they had at that time been bare of fleſh: ſuch fatting lambs as are yet unſold, may likewiſe be brought into fleſh on theſe young clovers. In ſhort, among the various advantages to be derived from the cultivation of this graſs, it is none of the leaſt, that in the autumn after it is ſown, it will produce a ſupply of valuable food, which may be turned to ſo many different purpoſes, and, with the help of the faintfoin lays, preſerve the turnips untouched till Chriſtmas, if the early part of the winter ſhould prove mild and open.

To ſuch farmers who purſue the mode of ſuckling lambs, the young clovers are exceedingly uſeful, affording a valuable paſture for the ewes, and cauſing them to ſpring abundantly in their milk. But with all theſe advantages, there is ſome diſcretion to be uſed in the feeding young clovers, both with reſpect to the cattle and the graſs. Beaſts which are of the ruminant tribe, it is well known, are apt to feed with that greedineſs and avidity when turned on ſucculent paſture, as to occaſion a repletion; which, among the farmers, is technically called *hoving* or *blowing*. Many ſorts of food will occaſion this malady, and none has a greater tendency towards it than clover; for which reaſon the horned cattle ſhould not be turned into the field till towards nine or ten o'clock in the morning, eſpecially in wet weather; and whilſt they are feeding, they ought to be carefully watched, though there will be leſs need of theſe precautions when they have been ſome few days accuſtomed to the food, and have eaten down the rankeſt part of the graſs. The like precautions it will be neceſſary to take with reſpect to ſheep, when they are depaſtured with the cows; but if theſe latter are not permitted to graze on the clovers till the large cattle ſhall be removed, they will run little or no riſk of hoving." See HOVEN.

It may be neceſſary alſo to obſerve, that "this, as well as other ſown graſſes, is much injured by being depaſtured too low. It will be neceſſary with reſpect to feeding clovers in this period of their growth, to take the ſtock off them before the cloſe of the year, as it would be a ſpecimen of very ill huſbandry, Mr. Banniſter thinks, to ſuffer the cattle to remain in the field after Chriſtmas, at which time the clover ſhould be left a tolerable height; for if eaten down too cloſe, a great part of it would be deſtroyed, and the ſpring ſhoot would be languiſhing and weakly, which ſhould never be the caſe in this ſort of graſs.

The ſame writer has ſometimes known young clover, mown in the circumſtances above mentioned; but this method, he thinks, would be prejudicial to the future growth of the crop, ſince the cutting off the ſtalks with the ſcythe muſt cauſe the juices to evaporate, and thereby weaken the ſtocks. One advantage there is however, he ſays, which attends this practice: namely, the removal of the ſtubble, which when very ſtrong, and where the corn has been cut high, is apt to deaden the ſcythe at the mowing of the clover in the following ſummer, when cut for the general crop."

It has been remarked, that, "with ſome it is the cuſtom to apply manure over the clover land immediately after the grain has been taken from the land, which in ſoils that are not in a good ſtate of fertility, may be advantageous in preſerving and invigorating the plants; but under other circumſtances, it is not neceſſary. There is, however, another caſe in which the uſe of what is termed long ſtable dung, when not in the ſtate of fermentation, may be found uſeful, by preventing the plants from being too cloſely nibbled and eaten up by ſheep, which is that where the land is in the ſtate of commonage or not incloſed. And the writer thinks, that, "when the clovers are to be continued for two or more years, the application of a thin coat of manure, in the autumn or ſpring ſeaſon, is a practice from which great benefit may be derived, eſpecially on lands that are in the leſs perfect ſtate of heart. In the drier ſorts of ſoil, this buſineſs may probably be done with the greateſt advantage, about the latter end of February; but where the lands are ſoft, retentive of moiſture, and poachy, the early part of the autumn, while the ground is ſufficiently hard, may be the moſt ſuitable ſeaſon for the purpoſe. Well rotted dung is perhaps the moſt proper in theſe caſes." By performing the work at this period, "there is leſs danger," Mr. Middleton thinks, "of the clover plants dying away in the winter than is the caſe under other circumſtances." At whatever ſeaſon the manure may be applied, it ſhould be ſpread out over the ſurface in as even a manner as poſſible, and be beaten perfectly fine.

In the county of Hertford, "it is a pretty common practice to ſow coal aſhes in the months of January or February, on ſuch of the young clovers as are intended for mowing in the next ſummer. This is a very good practice where the land is not either fertile by nature, or much improved by the dung cart; but where the ground is in good heart, there remains little neceſſity for this top dreſſing on the clover: the method with the Hertfordſhire huſbandmen is to ſow thirty buſhels of coal aſhes on an acre, which they often fetch ten or fifteen miles, and purchaſe at fourteen or fifteen pence per ſack, for the purpoſe. Thoſe fields of clover which are intended for paſturage, unleſs in very late and unkindly ſprings, will have attained a ſufficient length to that purpoſe by the middle of April, and will afford ſtore of valuable feed throughout the ſummer, but if it ſhould be thought proper to reſerve any part of this growth for ſeed, the cattle muſt be taken out, towards the latter end of May, or early in June; and it is much more eligible to feed down thoſe fields which are intended for this purpoſe, in the fore part of the ſummer, than to take off the primary crop for hay; as ſuch repeated mowings have a great tendency to impoveriſh the land, and to render it improper for ſowing with wheat the next year: beſides, in the former inſtance, the farmer is not confined to a ſet time for laying in the field, as the ſtock may be taken out at an early period of the ſummer; whereas this advantage is loſt, when the firſt crop is reſerved for hay, and thus a dry time may ſet in and ſtop the growth of the rowens, ſo that the crop of ſeed clover may be protracted till late in the autumn, when bad weather may be expected, which will greatly injure the ſample," and produce other inconveniences.

As it is found that "clover will not perfect its ſeeds, if mown for that purpoſe early in the year; it is neceſſary to take off the firſt growth either by feeding or with the ſcythe, and to depend for the ſeed on thoſe heads that are produced in the early autumn. Seed clover is found to turn out to good account in thoſe years when the crops are not injured by the blaſt, which is often fatal to them, or by the rains in the autumn, which ſometimes prove their deſtruction: for the time of harveſting this ſeed falling out late, when rainy weather may be expected, renders it on that account a very tedious job. But where the ſeed has headed well, is not affected by the blaſt, has been properly harveſted, and the ſample is unadulterated by the ſeeds of dock or other weeds, it proves a very lucrative article to the farmer, ſince it is no uncommon circumſtance to grow a ſack on an acre, and to ſell it from thirty ſhillings to two guineas per buſhel. And the trouble attending it is but trifling. It is found that a buſhel of good clover ſeed, in kindly years, will weigh near 70lb. but in bad ſeaſons it ſeldom riſes higher than 65lb. Such clover ſeed as is of a deep purple colour, and is free from ſeeds of weeds of every kind, but more particularly of dock, which of all others is the moſt pernicious, fetches a price at market out of all proportion larger than that of an inferior kind, or where the ſample is adulterated with other ſeeds. It is therefore of great conſequence, at the laying in a piece of clover for ſeed, to be careful that the land be ſuch that is not prone to blaſt, and that it be free from weeds of every deſcription, the dock eſpecially, as without this it is impoſſible to produce clean ſeed."

It is remarked by the author of the "Preſent State of Huſbandry, in Great Britain" that, "when it is propoſed to ſave the ſeeds of red clover, the firſt crop of graſs ſhould be cut early, ſo that the ſecond, whence the ſeeds are procured, may be ready for cutting by the end of Auguſt, or beginning of September. The reaſon of making choice of the ſecond crop, is, he ſays, that it always branches out into more ſeed-bearing plants, or ſtalks, than the firſt crop, and conſequently a greater quantity of ſeed is procured from the ſame extent of land. Beſides, the hay of a firſt crop of clover, is more valuable than that of the ſecond; and as it is neceſſary to thraſh clover-hay very much, in order to ſeparate the huſks in which the ſeeds are incloſed from the ſtems, or ſtalks, the loſs of hay is, of courſe, leſs conſiderable in the one caſe, than it would be in the other, while the crop of ſeed is at the ſame time more abundant. A crop of clover, of which it is propoſed to ſave the ſeeds, ſhould, he thinks, be allowed to ſtand till the huſks become quite brown, and the ſeeds have acquired a degree of firmneſs. It ſhould then be cut, and harveſted in every reſpect like other hay; and the ſeeds thraſhed out at any period during the following winter, or ſpring, according to the farmer's convenience. The quantity, he ſays, commonly reaped, is from four to five buſhels the Engliſh acre; weighing, when thoroughly clean, from two to three hundred weight. The expence of thraſhing is, he ſays, conſiderable—not leſs than from 5 *s.* 6 *d.* to 7 *s.* the buſhel. This great expence, which, from the laborious nature of the work, cannot be reduced while the operation continues to be performed by manual labour, may, he hopes, ſoon induce ſome intelligent mechanic to conſtruct a machine, by which the labour may be greatly leſſened, while the work may be as completely, and more expeditiouſly performed." See Clover *Threſhing-Machine.*

It has been ſtated that "the principal objections to the feeding of clover crops, are thoſe of their uncertainty, on account of the ſtate of the ſeaſon at which they become ripe, the trouble and expence of threſhing out the ſeed, and the injury which they produce in leſſening the fertility of the ſoil. The high value of the ſeed, in moſt ſeaſons, is however, he obſerves, a great inducement to the letting of clover crops ſtand for that purpoſe." And froſty nights, and hot, ſunny, dry days in May, are very prejudicial, Mr. Banniſter ſays, to the clovers, and prevent a ſucceſſion in the growth of thoſe which have been eaten down, as doth likewiſe dry and ſultry weather in June; ſo that in backward ſprings and hot ſummers the clovers produce but a trifling return either for feeding or hay, when compared to the growth of thoſe years wherein the ſprings and ſummers have been more kindly and propitious. During the weather above mentioned, the ſtalk and leaves are often ſo totally ſcorched, that he has known in the fields of this graſs, when advanced to ſome height, ſo as to have formed the heads for bloom, and to promiſe fair for a crop, that the leaves have univerſally dropt off, and the juices have been ſo much exhauſted by the parching heat of the ſun, that the utter deſtruction of the crop has enſued. When this diſaſter happens, and the weather continues dry and ſultry till the middle of June, the beſt way is to ſet on the mowers, without waiting any longer in expectation of rain, and to truſt to future ſhowers for improving the lattermath. But although on thin lands, ſuch as gravels, chalks, &c. the clovers are often ruined by a hot and parching ſummer, yet on loams there is not that danger to be apprehended from this contingency, as theſe grounds, being of a ſtronger nature, will puſh on the clovers with greater vigour in their progreſs. This diſpoſition in the clovers to burn in a dry ſummer on thin ſoils, ſhows the neceſſity of laying them in early for the ſcythe, and ſtrongly enforces the rule before recommended, not to winter feed this graſs with cattle of any kind after Chriſtmas. Clover begins to form its head for bloom towards the middle of June, and will continue in a growing ſtate till it becomes in full bloſſom, at which time it is in the higheſt perfection to mow for hay; but this graſs differs in this particular from ſaintfoin, that, when its bloſſoms are fully expanded, they continue much longer in that ſtate than the laſt-mentioned graſs, ſo that if the weather ſhould prove wet and unkindly for the haying, the clovers will wait a fortnight, after they become in bloſſom, without ſuſtaining any material injury, either by the ſhedding of the leaf or bloom; for the ſame weather which renders it improper to mow this graſs, continues it in a growing ſtate, and prevents the bloſſom from dying away. When the crops of clover are large and heavy, it is neceſſary that the ſwaths ſhould be turned over at the making, the ſtalks of this graſs being very replete with juices. This may be done the next day after the mowing, or the ſecond day after, as the weather is more or leſs favourable, obſerving that, as the chief virtue of this hay reſides in the leaf and bloſſom, the leſs theſe are diſturbed the more valuable will be the fodder; on which account the tedding of this hay abroad, as is practiſed by ſome people, cannot fail to be of the greateſt injury. From the wind-rows it ſhould be made up into graſs cocks, which, having enjoyed the influence of the ſun and air for a day or two, may be thrown into large cocks for carting. But if wet weather prevails during the ſeaſon for making this hay, it cauſes an infinite deal of trouble to the farmer, and the clover, from having been frequently ſhaken abroad, is deprived of its moſt nutritious particles, namely, the bloſſom and the leaf of the plants. See Hay-*making.*

The ſame author ſtates further, that "there is an accident which ſometimes happens to young clovers that cuts off all hopes of a crop, and obliges the farmer to plough up his land for wheat. This malady takes its riſe from a worm which gnaws off the graſs juſt within the ground, ſo that the blade withers and dies away. A gentleman of great knowledge and experience in every article that relates to country affairs, aſſured him that, in December 1777, he had ſuffered very conſiderably from this inſect, which in the preceding ſummer totally deſtroyed ſeveral acres of clover on his farm, and that this happened on the beſt of his land, worth more than 20 *s*, per acre, whilſt that of inferior goodneſs, and thoſe fields which worked badly at ſeed time, eſcaped the diſaſter." It is obſerved that "clover is rarely ſuffered to continue longer on the ground than one year; after which the field is generally ſown with wheat at one ploughing, a mode of huſbandry exceedingly advantageous to the farmer, who thereby enjoys a crop during the fallow year, that yields him conſiderable profit, and leaves the ground in far better condition for wheat, than would have been the cleaneſt and beſt conducted fallow, there being no preparation ſo kindly for this grain as clover hay. It has been long ſince remarked, and every year's experience confirms the truth of the obſervation, that clover lays, which have been mown the preceding ſummer, do uniformly produce better crops of wheat, *cæteris paribus*, than thoſe which were depaſtured: whereas, on the firſt idea, one ſhould ſuppoſe the contrary would be the event, from a conſideration that the ſurface of the paſture had been improved by the dung of the cattle which fed on it. This preference in favour of the mown clover, he is inclined to think, ariſes partly from the ſhedding of the leaf, which acts as a manure to the ground, but it is chiefly owing to the ſhade which the land enjoyed, during the ſummer, from the ſcorching heat of the ſun, by which the nutritious particles were retained; whereas the field, which had been fed down cloſe, could participate of neither of theſe benefits;

and, with reſpect to the dung of the cattle, the moiſture of other nutritious matters having been exhaled by the ſun, but ſmall advantages could be derived from it. But thoſe who keep folding flocks generally begin to plough up their clover lays early in the ſummer, and having ploughed one day's work, ſet the fold on that part; and the whole of this ploughed ground being gone over by the ſheep, another journey is to be ploughed; and which buſineſs of ploughing and folding is to be continued till Michaelmas, when the whole field is to be broken up. By thus ploughing up the field at various times, a portion of feed is reſerved for the ſtock ſo long as the clover continues to grow, and the major part of it may be ploughed up ſome conſiderable time before the wheat ſeaſon, whereby the ground becomes ſufficiently cloſed, ſo as to guard againſt the ill effects of the worm: and this end is ſtill more eſſentially anſwered by the folding, which never fails to be of great advantage, and which he is inclined to think proceeds rather from the treading of the ſheep, whereby the ground is compreſſed to a texture more firm and compact, than from any virtue in their dung and urine, which can be of no material uſe in the heat of the ſummer: but when, after ſeed time, the ſheep are folded on the ground, this is undoubtedly of infinite ſervice, the invigorating moiſture of the dung and urine of the ſheep, being immediately waſhed down to the roots of the grain; for which reaſon this manner of folding claims a decided preference over all others, ſo long as the weather will admit of its being purſued with propriety.

The clover crops are often mown as a green fodder for the horſes in the ſummer, which purpoſe it anſwers extremely well, and, if the land on which it is raiſed be in good condition, will, in a kindly ſpring, be fit for the ſcythe ſome time within the month of May, and may be cut twice for this uſe; or the ſecond crop may be ſuffered to ſtand for ſeed, or be fed off, according as the farmer's exigencies may require. But ſince the culture of lucerne hath been brought into general practice, few farmers chooſe to be without a field of that valuable graſs, which in this reſpect has greatly the advantage of clover, being not only equally wholeſome and nutritious, but on good land may be mown three or four times in the courſe of the ſummer, and will remain many years on the ground. See LUCERNE.

It has been remarked by a late writer, that though much advantage may be derived from the converting of clover crops into hay, and letting them remain for ſeed, it is probable that a ſtill greater benefit may be produced by the practice of cutting the crops green, occaſionally, as they attain a ſufficient growth; and conveying them, when wanted, to the horſes or other cattle, in the ſtables and fold-yards, in order to their being conſumed in the ſtalls. It is contended, he ſays, by an experienced agriculturer, that in this manner it will certainly ſupport more than twice the ſtock it would do, if fed off upon the ground where it grew; and the additional quantity of manure that will by this method be made in the ſtalls and yards, if they are kept well littered with any ſort of ſtraw, or even ruſhes or fern, will fully compenſate the farmer for this expence in cutting and bringing the clover into the yards. In caſes where lucerne cannot be grown to advantage, this may, without doubt, be the caſe.

It is ſuggeſted, that it is a method which experience, in many parts of the kingdom, has proved to be of the greateſt advantage, eſpecially where the buſineſs is not upon too extenſive a ſcale; but in large concerns, it is, perhaps, impoſſible to attend to it ſo fully as may be neceſſary for deriving the greateſt benefit from it. The reſult of an experiment ſtated by a writer of conſiderable accuracy, however, he ſays, ſhows, that even on an extenſive ſcale it is a practice which is attended with vaſt advantage. “In this trial ſeven acres of clover, cut green, were found to be ſufficient for twenty horſes, ſeven cows, five calves, and five pigs, for the period of ſeventeen weeks from the middle of May. They were fed in the ſtable and rick-yard, being taken twice in the day to water, and the horſes had neither hay nor corn.” And in calculating the value of the crop, it is remarked that the horſes could not have been kept equally well for leſs than eight-pence a day; but as the uſual price at which they are taken in at, in that diſtrict, is two ſhillings and ſixpence the week, it may be better to take that as the principle of calculation.

20 Horſes,	17 weeks,	at 2*s.* 6*d.* per week	42*l.*	10*s.*	0*d.*
7 Cows,	- ditto,	at 2*s.* 6*d.* per week	14	17	6
5 Calves,	- ditto,	at 1*s.* 6*d.* per week	6	7	6
5 Pigs,	- ditto.		0	0	0
			£63	15	0
		Or, per acre,	9	2	1

And, “the quantity of dung raiſed by the above ſtock, is ſuppoſed to be from four to five hundred loads, which is eſtimated at 2*s.* 6*d.* per load.” But “the expence in labour for cutting and conveying the food to the ſtock, is not charged; which renders the experiment in ſome meaſure incomplete. The benefit of the practice is, however, fully eſtabliſhed.” And the great ſuperiority and utility of this practice are exhibited in a ſtill more ſtriking point of view, by contraſting this with the conſumption of the ſame ſort of crop in the field, by an equal number of the ſame kinds of ſtock; as, in the time five acres had been uſed in the former method, thirty had been conſumed in the latter, and the horſe part of the ſtock left in much worſe condition. And it is added, that, “beſides the ſuperiority of the practice of ſoiling this ſort of crop in the economy of food, it has the important advantage, as has been ſeen, of affording much larger ſupplies of manure, eſpecially where the ſtalls and fold-yards are kept occaſionally well bedded and cleaned up, as the converſion of the materials proceeds, which muſt be greatly expedited from the vaſt increaſe in the urinary, as well as other diſcharges that muſt of neceſſity take place in this ſort of feeding.

The principal difference between feeding clovers off, on the land, and conſuming them in their green ſtate, in this manner, is ſuppoſed by Mr. Kent to be this; “the quick growth of the graſs, after mowing, ſhades the ground, and prevents the ſun from exhaling the moiſture of the land, ſo much as it would if fed bare; conſequently it continues to ſpring with more vigour; and the moment one crop is off another begins to ſhoot up. Whereas, when cattle feed it, they frequently deſtroy as much as they eat, and, beſides, bruiſe the necks of the roots with their feet, which prevents the clover from ſpringing ſo freely as it does after a clean cut by the ſcythe. In hot weather, which is the common ſeaſon for feeding clover, the flies too are generally ſo troubleſome to the cattle, that they are continually running from hedge to hedge to bruſh them off; by which it is inconceivable what injury they do to the crop. But when they are fed in ſtalls and yards they are more in the ſhade; they thrive better, and, at the ſame time, conſume the whole of what is given them without waſte.” The author of “Practical Agriculture,” however, remarks on this, that “though much of the ſucceſs attending this practice without doubt depends on theſe circumſtances, yet that the upper parts of the roots are leſs penetrated by moiſture, and fewer of the plants of courſe deſtroyed." He adds, that "by proper attention to this crop a very uſeful and abundant green food, for different ſorts of live ſtock, may be provided at an early period of the ſpring, eſpecially when the winters are not very ſevere." And it is adviſed by Mr. Middleton, "on the poorer ſort of ſoils to have both the firſt and ſecond crops of this plant to be eaten green upon the land by ſheep and bullocks, being mown and given them to feed upon." In this way the cattle thrive better from their filling themſelves ſooner, and having more reſt; and there is no waſte. But in order to derive the greateſt poſſible advantage from the ſoiling with this or other crops, convenient covers, ſheds, or other ſuitable houſes are neceſſary to be provided. See SOILING.

It is remarked, in addition, however, "that the practice of feeding down or paſturing clover crops with live ſtock, though it may be advantageous in many caſes, eſpecially where ſheep-huſbandry forms a principal object, always requires to be conducted with care and attention, both in reſpect to the plants and the animals that are to feed upon them." As from the tender nature of the clover plant it ſhould ſeldom be eaten on the land by the heavier ſorts of cattle, becauſe, from the greedy manner in which they feed, many of the plants are pulled up, and others, as has been ſeen, greatly injured or deſtroyed by being bruiſed in their treading, eſpecially as they protrude their young ſhoots. Horſes are particularly objected to on this account by Mr. Parkinſon. The moſt appropriate ſort of ſtock is obviouſly that of ſheep; but where the ſoils are of the drier kind, the lighter ſorts of ſtock of other deſcriptions may be occaſionally admitted, ſuch as calves, foals, and young beaſts. And, as pigs are fond of the clover plant, and thrive well upon it, they may ſometimes be admitted with advantage. In the practice of lamb-ſuckling, it is an uſeful application of the young clovers to turn the ewes upon them, as they afford a ſort of paſturage, which has much effect in increaſing the flow of milk. They may, likewiſe, in the opinion of the author of the "Report of Middleſex," be applied to the fattening of ſheep in April and May; and be fed by the ſheep intended for turnips, in the autumn, till they are ready, with much profit and advantage. No ſort of ſtock ſhould, however, be kept upon crops of clover where the land is ſoft, wet, or poachy. Mr. Marſhall ſays, that, in ſome of the ſouthern diſtricts, where it is the cuſtom to eat down the young clovers by ſheep, it is uſual to chooſe a dry ſeaſon for the purpoſe, the ſtock being removed in caſe the land becomes ſoft and wet. When this ſort of ſtock is employed, it may be the moſt ſafe practice not to permit the animals to continue too long upon the land; as by eating the plants too cloſely they may ſuſtain much miſchief. It is contended by ſome, that treading the ſoil lightly where the lands are dry, may be of great utility to the clover plants, by forcing the earth to the roots, and in that way protecting and rendering them more capable of reſiſting the effects of froſt in the winter ſeaſon. It has likewiſe been ſuggeſted, that "the eating off the weak lateral ſhoots that were thrown out while under the ſhade of the grain crops, may be ſerviceable by increaſing the ſtrength of the plants, and enabling them to withſtand the froſts, as well as to ſhoot more ſtrongly in the ſpring." It may, therefore, be concluded that the moſt beneficial method, where the paſturing of this crop, either in the ſpring or autumn, is had recourſe to, is not to ſuffer the lands to be fed upon when in a moiſt ſtate, or to be too hard ſtocked, or with the heavier ſort of animals, at any time while they remain upon it.

In the feeding down this ſort of crops, as has been already ſeen, there is not only danger of injuring the plants, but the animals that conſume them. Without proper management, cattle and other animals, on being turned upon them, often ſuffer great inconvenience, and are in danger of being deſtroyed by the vaſt diſtenſion of their ſtomachs which takes place. In this ſituation, the animals are, in the language of the farmer, ſaid to be *blown* or *hoven*. The nature of the diſeaſe does not ſeem to be much inveſtigated; but it probably ariſes in conſequence of the large quantity of green ſucculent herbage being greedily devoured without due maſtication, by which it undergoes an uncommon degree of fermentation in the ſtomach; and from this ſudden decompoſition, an unuſual quantity of gaſeous fluid, or *flatus*, is at once ſet at liberty, which ultimately overcomes the contractile power of the digeſtive organ, and the animal is deſtroyed. The ſuppoſition is rendered more probable from the circumſtance of the affection being leſs apt to take place when the clovers or other ſimilar herbage are fed upon in a dry ſtate, as the ſtock in theſe caſes are not able to conſume them in ſo expeditious a manner, or in ſo large a proportion. It is added, that on theſe principles the practice of not ſuffering the cattle, or other ſorts of ſtock, to feed upon them when they are wet, and there is a full bite, would ſeem to be perfectly correct. The advice of not turning the animals upon the crops before the ſun diſſipated the dew and moiſture depoſited in the night, is likewiſe judicious, and ought to be attended to, as well as that of keeping them in motion as much as poſſible when firſt turned in. With ſheep the ſame precautions may be neceſſary, if they be put upon them with the other ſtock in their full growth; but when they are turned in after they have in ſome degree been fed down, there will be little danger of their being injured. Where the clovers are eaten off, as after-graſs, in their ſoft, foggy, and young ſtate of growth, there is, however, great danger of the ſtock being hurt in this way, unleſs theſe circumſtances be attended to and carefully guarded againſt. See HOVEN.

It is obſerved to be the practice with ſome "when the land is intended for the purpoſe of early paſturage, and in ſome caſes where the object is hay, to ſow rye, rib, and other ſimilar graſſes with the clover. In the firſt intention the practice may be beneficial, as the rye graſs riſes early, and may contribute to afford a more full and better herbage for the ſtock at ſuch periods, eſpecially on the better ſorts of ſoil; but with the latter view it ſhould perhaps ſeldom be made uſe of, as the clover will in general produce a ſufficiently abundant crop of itſelf; and from other ſorts of plants being mixed with it, on account of their drying in an unequal manner, it may ſuſtain injury as hay. It is probably, for ſome reaſon of this ſort, that ſuch clover-hay as is mixed with other graſſes is leſs ſaleable, and of conſiderably leſs value in the London markets, than that which conſiſts ſolely of clover. Some cultivators, however, ſuppoſe, that by blending rye-graſs with clover in a ſmall proportion, a ſtrength and body is given to the crop." And it has been ſuggeſted as an improvement where rye graſs is mixed with clover, to ſow the latter a week or two before the other, as from the clover plants having a tender, weak ſtem in their early growth, they may in that way be prevented from being injured by thoſe of the rye-graſs claſping round and ſhading them. But when the crop is deſigned for cutting green for the purpoſe of ſoiling animals, it would ſeem to be the beſt method not to ſow any other ſort of graſs with it, as no advantage can be gained in that way, while there may be danger of the crops being injured by it.

It is obvious, that "the chief diſadvantage of this almoſt invaluable plant, is that of the ſhortneſs of its abiding or continuing in the lands, eſpecially in thoſe of the lighter and more free kinds, as hinted above. It is aſſerted by ſome, not to laſt longer than two years, except on grounds that are perfectly freſh; and, in ſome caſes, where it has been often repeated, not more than one. According to Mr. Marſhall, in ſome of the ſouthern counties, it is, however, found more durable on the calcareous ſoils, eſpecially where not frequently repeated on the ſame land, from its being better able to contend with weeds in its natural ſtate of growth. Theſe facts ſhow the neceſſity of keeping it as far diſtant as poſſible in the courſes of cropping, eſpecially on all the more light friable ſorts of ſoil, and the ſuperior advantages of cultivating it on thoſe of the calcareous kinds." And it is ſuggeſted as probable, that "its duration may be conſiderably prolonged, by preventing the plants from ſhooting up to ſeed ſtems as much as poſſible, either by keeping them cut by the ſcythe, or by the feeding them down by ſtock in a moderate degree, as in theſe ways they will be prevented from being ſo ſoon exhauſted in their roots, as happens in many other ſorts of plants, as ſoon as they have perfected their ſeeds.

It is obſerved in the "Hertford Survey on Agriculture," that the beſt farmers about Ware mow the firſt growth, and always feed the ſecond: they conſider it as good management to mow the firſt, as it is, in their eſtimation, bad to mow the ſecond. However, he ſaw ſeveral ſecond crops in full bloſſom between Walkern and Stevenage, of a luxuriance that ſpoke no bad management: nor is it a point at all to be aſcertained. The practice of various other diſtricts is in favour of mowing both. And Mr. Whittington has no doubt upon this point, thinking that better wheat will be after two mowings than after one. About Hatfield, and all that vicinity, they have cultivated clover ſo long and ſo repeatedly, that the ſoil is, as the farmers ſay, ſick of the plant. It matters not how fine a crop may be in autumn, it dies even ſo late as in that month. Mr. Keate had a proof of the benefit of not ſowing it in one or two courſes conſecutively. Having part of a field for five or ſix years under lucerne, when it was broken up, barley and clover were ſown over the part which had been under lucerne, and alſo on a contiguous piece, where the clover huſbandry had not been interrupted on the latter, the clover in 1801 failed and was ploughed up, but where the lucerne had grown, the clover was, as the writer ſaw, extremely fine, thick, and regular. This ſhows, he thinks, that other graſſes may be ſubſtituted, and yet the land refreſhed and prepared for future clover without a failure. The great price which hay has yielded of late years, has been an injury to the land; the farmers have been unwilling to vary the courſe, or to plough up a bad plant; and very foul fields are the conſequence. Others finding clover crops apt to fail ſow trefoil alſo. And this variation of trefoil is excellent management in his opinion.

It is added, that Mr. Clarke of Sandridgbury has had no clover fail till laſt year, (1800.) If he intends feeding, he mixes trefoil, otherwiſe he ſows clover alone. He mows ſome twice for hay; ſome once, and then feeds ſheep on the land. His beſt wheat is after two mowings, one for hay, and the ſecond for feed; this he attributes to the great fall of the leaf, and to the plants covering the ſoil from the ſun ſo well and ſo long. And Mr. Biggs, near St. Alban's, grows better wheat after mowing than after feeding; and better after two mowings than one, and this general ſuperiority has, in his opinion, amounted to four or five buſhels an acre. And many others reap better wheat after mowing than after feeding the clover. And ſome think, that the reaſon is "the clover's being fed too cloſe: were it kept to a conſiderable growth before it were turned in, ſo that all ſhould not be eaten, but enough trod down to cover the land from the ſun, then feeding would give the beſt wheat." And in Norfolk, it is remarked, by the author of the report of that diſtrict, that thirty years ago they had for ſome time found their clover crop failing, from its recurring too often; this cauſed the variation of ſubſtituting trefoil for one round, and the clover being ſown but once in nine years, the evil was removed. And he now found the ſame account every where in the ſouth of the country, that the land (whatever the ſoil), was what they call ſick of clover. Formerly it was ſown every fourth or fifth year; but now if it returns ſo often it fails for acres together; they therefore ſow clover in one round, and then ſubſtitute white clover and trefoil, adding a little ray graſs, but as little as they can help. Whether the wheat is as good after theſe ſeeds as after clover, is rather an unſettled point. From Mr. Burton, a moſt intelligent obſerver upon this queſtion, the writer found that he himſelf got as good wheat after white Dutch as after red clover, but that he believed the true change for the ſoil would be to ſow no ſeeds at all; and he ſhowed him a large field of red clover, part of which was very regular and good, and part inferior, the former was in a courſe where no ſeeds had been ſown, and the latter where Dutch and trefoil were introduced: a ſtrong confirmation of his remark. Mr. Fowel uſes ſix pecks of ray, ſix pounds of clover or trefoil, and four of white clover for two years.

And the land round Hingham is tired of producing this crop, and cauſes the variation of ſowing ray, trefoil, and white clover.

It is alſo obſerved, that in Happing-hundred, they admit at Catfield, that "if clover recurs too often the land will not yield it, but their method is not an alternate ſubſtitution of other ſeed, or baulking the land for a round, but to take a ſix courſe ſhift inſtead of a five, and mixing white clover and trefoil and ray, by which two precautions they ſucceed well.

Theſe ſtatements from different parts of the county clearly ſhow the neceſſity of caution in repeating crops of clover on moſt ſorts of ſoil.

It may be obſerved, that ſince red clover has been cultivated in England, great improvements have been made in heavy clay-lands, which before produced little except ryegraſs and coarſe bents, but being ſown with red clover, have produced more than ſix times the quantity of fodder they formerly did, whereby farmers have been enabled to feed a much greater ſtock of cattle than they could do before with the ſame extent of ground, which has, at the ſame time, enriched the ſoil, and prepared it for corn; and hence it is now common, where the land is kept in tillage, to lay down their ground with clover, after having had two crops of corn, whereby there is a conſtant rotation of wheat, barley, clover, or turnips on the ſame land.

And Mr. Donaldſon conſiders the general introduction of clover and other cultivated graſſes, as one of the greateſt improvements in modern huſbandry. The commencement of improvements in the different ſpecies of live ſtock, in the modes of cultivation, and in the ſuperior quality, as well as quantity, of the crops of grain, may all, he thinks, be dated from the period when the ſowing of graſs-ſeeds was firſt introduced into the different diſtricts of the kingdom.

One acre of red or broad clover will go as far in feeding horſes or black cattle as three or four of natural graſs. And when it is cut occaſionally, and given to them freſh, it will probably go ſtill much farther, as no part of it is loſt by being trodden down.

The red clover is a biennial, perennial plant, whoſe roots decay after they have produced ſeeds; but by eating it down, or mowing it, when it begins to flower, it cauſes the roots to ſend out new ſhoots, whereby the plant is continued longer than it would naturally do.

CLOVER, *Middle*, or *Cow-red* CLOVER (*Trifolium medium*), is a plant of the clover kind, which riſes with a branchy ſtem, and has a ſtrong, deep, ſtriking root. It is perennial, flowering in July. Its ſtalks are much more branchy and flexuous than in the common clover.

It is a plant that grows naturally in high lands of a chalky quality, and in ſuch gravelly ſoils as have a ſubſtratum of clay. It is a ſort of crop that is ſown in thoſe improved diſtricts, where the land is to continue in a ſtate of reſt for ſeveral years, being put in with the white clover. It is found to continue longer in the land, or to be more *abiding* than the common clover, and at the ſame time almoſt equally productive, eſpecially on the poor calcareous deſcriptions of land.

CLOVER, *White*, another plant of the clover kind, (*trifolium repens*) which has a fibrous root and creeping ſtem, never riſing nearly ſo high as the common or cow-clover. It is perennial, flowering from May to September. It has its name, probably, from its bearing a white flower. It is likewiſe ſometimes denominated *Dutch clover*, from its having been principally imported from Holland. According to Mr. Amos, in the more fertile and moiſt ſoils, it becomes more branchy in the ſtalks. He conſiders it as the ſweeteſt graſs for all ſorts of ſtock yet known, which makes the cloſeſt ſward, and is very productive of foliage. Hence it is, he thinks, moſt peculiarly adapted to laying down land to paſture. It flouriſhes moſt upon rich, dry, warm ſoils; but it will accommodate itſelf to moſt kinds. It is ſeldom ſown alone, unleſs it be to raiſe the ſeed, nor ſhould it ever be mown for hay. In laying down rich ſoils, which are intended to remain in paſture for many years, this ſeed ſhould predominate in the compoſition or mixture that is made uſe of for the purpoſe.

It grows naturally in moſt of the paſtures in England, and is generally known among the country people by the name of *white honey-ſuckle*. This is an abiding plant, whoſe branches trail upon the ground, and ſend out roots from every joint, ſo that it thickens and makes the cloſeſt ſward of any of the ſown graſſes; and it is, as has been ſaid, the ſweeteſt feed for all ſorts of cattle yet known; therefore, when land is deſigned to be laid down for paſture, with an intention to continue ſo, it ſhould, as juſt obſerved, be ſown with a pretty full or large proportion of the ſeeds of this plant. There is an advantage in paſturing white clover, that does not ſtrike farmers in general, which is, that each joint of the plant furniſhes a freſh root, and of courſe a freſh plant, whenever ſuch joint comes in cloſe contact with the ſoil, and conſequently the more it is trodden, the thicker it will get upon the ground. The uſual allowance of this ſort of ſeed is eight pounds to one acre of land; but it ſhould never be ſown with corn; for, if there is a crop of corn, the graſs will be ſo weak under it, as to be ſcarce worth ſtanding; but ſuch is the opinion of farmers in general, that they cannot be prevailed on to alter their old cuſtom of laying down their grounds with a crop of corn, though they ſhould loſe twice the value of their corn by the poorneſs of the graſs, which, in ſuch caſes, will never come to a good ſward, and one whole ſeaſon is alſo loſt; for if this ſeed be ſown in the ſpring without corn, there will be a crop of hay to mow by the middle or latter end of July, and a much better after-feed for cattle the following autumn and winter, than graſs which is ſown with corn will produce the ſecond year. The ſeed of this ſort of clover may alſo be ſown in autumn, in the manner directed for the common red clover; and this autumnal ſowing, if the ſeeds grow kindly, will afford a good early crop of hay the following ſpring; and if, after the hay is taken off the land, the ground be well rolled, it will cauſe the clover to mat cloſe under the ground, and become a thick cloſe ſward.

It has been greatly depended upon by moſt cultivators, in bringing lands into a ſtate of ſward, and is ſaid to be an extremely uſeful plant on the more rich and dry, ſandy and loamy ſoils, as well as in the clayey and peaty deſcriptions of land, where they have been well drained from moiſture; but on the more wet and poorer ſorts of loamy and clayey lands, it is not by any means ſo proper or uſeful, as it is not laſting, but gives place to plants of the aquatic kind, as well as others of an indifferent deſcription. It is a plant ſuppoſed by ſome not to afford ſo ſweet an herbage as broad clover, or many others, but in our trials it has, however, always been eagerly fed upon both by ſheep and neat cattle; and where cloſely fed down, there can be little doubt of its great utility. According to Mr. Goring, as ſtated in the communications to the Board of Agriculture, that which comes up naturally by the application of manure is much more hardy than that which is ſown, as well as more laſting in the ſoil. And it has been juſtly remarked as a proof of good land, that it runs quickly, of its own accord, to this plant. It may be introduced with moſt ſorts of ſeeds, and contributes greatly to the ſucceſs of the cultivator in the improvement of his graſs lands.

White clover ſeed is annually imported from Flanders, by way of Holland; but it is not more a native of that country, Mr. Donaldſon ſays, than of this, as it is very common in moiſt paſtures, in every county in the kingdom; but the ſeeds were never collected for ſowing in this country till of late years; nor are there many perſons here, even now, who make a practice of ſaving this ſeed; though it may be done if the ſame method as is practiſed for the red clover be taken with this ſort; it therefore might be advantageous to farmers who are deſirous of improving their land, to ſow carefully an acre or two of this white clover for ſeed, which will ſave them the expence of buying for ſome years, when the price is high; and there will be a ſure market for any quantity they may have to ſpare.

By Mr. Young it is ſtated as a very profitable article of cultivation, which has of late years been particularly attended to in the counties of Suffolk and Eſſex, by raiſing it alone for ſeed. The firſt growth, contrary to the caſe with red clover, is ſeeded. Some take a ſpring-feeding firſt. The returns depend, of courſe, on the price, which varies much, but it has proved a very profitable article, yielding from 7*l.* to 15*l.* an acre. And it is found that wheat ſucceeds well after it in moſt caſes.

CLOVER-*Hop*, another plant of the white clover kind (*trifolium procumbens*), which has a wide-ſpreading, ſlightly branched, procumbent ſtem, or ſtalk, and a thickiſh, ſhort, fibrous root. It is a ſort of clover that bears a yellow flower, on which account it is called by ſome *yellow meadow trefoil*. It grows naturally among the graſs in the upland paſtures of this country; but the ſeeds are frequently ſold in the ſhops, and are by many mixed with the other ſorts of clover and graſs-ſeeds, for laying down ground to paſture. This plant grows with upright, branching ſtalks, about a foot high, garniſhed with trifoliate leaves, whoſe lobes are oblong and heart-ſhaped, but reſerved, the narrow point joining the foot-ſtalks. The flowers, which are yellow, grow from the ſides of the ſtalk, upon long foot-ſtalks, collected into oval, imbricated heads, having naked impalements lying over each other like ſcales, ſomewhat like the flowers of hops, from whence the plant had the name of hop-clover, which grows naturally in this country. There is another variety which is a much ſmaller plant than this, and generally known by the name of none-ſuch, or yellow hop-trefoil. See None-*ſuch*.

This ſort of clover is ſtrongly recommended by the following circumſtances: 1ſt. Its not only growing but flouriſhing on the moſt barren ſands, and therefore being a very proper graſs to cultivate on ſuch unfertile ſoils, where any other graſs that is worth notice will ſcarcely grow at all. 2. Its not being apt to ſwell cattle as the red clover does. 3. Its continuing long in good ground, and bearing a very good ſeed, or crop; and, by its flouriſhing both on ſands and clays which have not been ploughed for many years, its being likely to continue long on any ſoil.

In Norfolk, this plant is called *red ſuckling*, and is cultivated about Norwich for the profit of the ſeed, and yields a large quantity, but is ſaid not to have any merit comparable to clover or to trefoil.

Clover-*Lay*, or *Ley*, a term which ſignifies the land from which clover has been taken, mown, or paſtured. It is a remark of Mr. Banniſter, that, "where clover-lays have been ſuffered to continue in that ſtate longer than one year, it is a very hazardous experiment to ſow the ground when broken up with wheat or oats, as from the length of time in which the ſurface has been covered with a turf, the worm becomes engendered therein, which often deſtroys the crops of corn; therefore, the ſafeſt way of procedure in the breaking up of theſe old clover-leys, is either to make a fallow of them, or to put them in with peas or other pulſe." From what has been remarked above, it is evident that theſe ſorts of lays require to be managed with conſiderable attention.

Clover *Reaping-machine*, is an implement conſtructed for the purpoſe of reaping and collecting the heads of ſuch clover-crops as have been let remain for ſeed. Various contrivances of this ſort have been ſuggeſted by writers on huſbandry, but there is probably none that anſwers the purpoſe in a perfect manner.

It has been ſuggeſted by Mr. Marſhall, in the "Rural Economy of the Southern Counties," that, "as the great difficulty in the ſecuring of the clover for the purpoſe of ſeed, is that of getting the herbage ſufficiently dry, in the dewy and damp ſeaſon at which the ſeed becomes ripe, that light bags, formed of thin cloth or fine wire, might be uſeful for collecting, catching, and retaining the heads, which moſtly riſe above the herbage, by being fixed upon the handles of the ſcythes as they are ſwept off by them, being emptied as there may be neceſſity, as, in this way, the herbage by being left upon the ground, would be of three times the value of the muſty ſtraw afforded by ſeed-clover, either for the purpoſe of being eaten off, or turned down as a manure. Beſides, the heads, by being well dried in wet weather in the houſe, and in dry ſeaſons in the open air, the ſeed would, it is ſuppoſed, not only be preſerved with more certainty, but in a much better ſtate in reſpect to the ſample, and of courſe, in moſt ſeaſons, be of much greater value."

Clover *Threſhing-machine*, in *Rural Economy*, an implement contrived for the purpoſe of cutting off and collecting the heads of ſuch crops of clover as have been let remain in order to afford ſeed.

Various machines of this ſort have been invented at different times, but probably without being perfectly adapted to the buſineſs. Long ago an account was given, in "Bradley's Syſtem of Huſbandry and Gardening," of a machine employed for this purpoſe in Flanders, where this ſort of crop was introduced and cultivated at a much earlier period than in this country, and which he has deſcribed in the following manner. "He has ſeen," he ſays, "two or three ways of threſhing out clover-ſeeds by engines in that country, after the heads of the ſeeds are thraſhed off by common flails. The engine which he beſt remembers has a hopper at the upper end of a trough, ſo that the heads of the ſeed fall conſtantly from the hopper into the trough. The trough is about ſix feet long, and about two feet and a half over, and lies ſlopewiſe from the hopper, which is at the higher end, ſo as to drop at the other end about a foot. The bottom of this trough within-ſide is made rough by chiſſels, and upon it is a board made to draw backwards and forwards, which is cut in a rough manner like the inſide of the bottom of the trough. When the ſeeds fall into the trough at the upper end, the broad board, in its motion, draws them through the trough, and thereby breaks or opens the ſeed-veſſels, ſo that the chaff and the ſeeds run out of the lower end ready for winnowing. This motion is maintained by a water wheel and crank, and anſwers the purpoſe it is deſigned for very well. He has alſo ſeen an engine of this kind where the bottom of the trough was a hurdle, more finely wrought than the common hurdles; and the ſliding part, which he calls the broad board, was a hurdle of the ſame make. In this he found, that moſt of the pure ſeed fell through the lower hurdle, and little more than chaff was diſcharged by the lower end of the trough, and conſequently muſt give leſs trouble in the winnowing or cleaning from the chaff. He has alſo ſeen another kind of mill, or engine, for this purpoſe, which ſomewhat reſembles the mills which tanners uſe in grinding bark. In the former, he ſhould have mentioned, that there is commonly a weight laid upon the upper hurdle, or board, the better to break the heads of ſeed that paſs between that and the bottom of the trough. And from the great ſimplicity of this machine, the author of the "Preſent State of Huſbandry in Great Britain" thinks it is ſurpriſing that ſome ſuch has not been long ſince erected for the purpoſe in England, where ſuch great quantities of clover-ſeeds are annually ſaved. Were threſhing-mills generally erected in this kingdom, it is highly probable," he ſays, "they might in time be made not only to thraſh off the heads of the clover from the ſtalks, but, by means of ſome ſuch machinery as above deſcribed, be made alſo to ſeparate the ſeeds from the huſks of the clover crops."

CLOUET, **Pieter**, in *Biography*, an engraver of ſome repute, native of Antwerp, who, after he had learned the firſt principles of his art, went to Rome, where he reſided many years, ſtudying under Spierre and Bloemart: having completed his ſtudies he went to Paris, where he lived ſome time, and from thence retired to the place of his birth, and there died aged 62 years. His prints, though ſomewhat deficient in harmony and effect of Chiaro-ſcuro, occaſioned by the too equal diſtribution of the lights and ſhadows, are engraved in a firm and bold manner, ſomething reſembling that of Pontius. He engraved many prints from Rubens, which are much eſteemed. Amongſt the beſt may be reckoned the Death of St. Anthony, a large upright plate; the Deſcent from the Croſs, the ſame; a Converſation, where ſeveral lovers are repreſented in a garden, a large plate length-ways, and a landſcape with a cottage, where the ſnow is repreſented falling; this, which is a large plate length-ways, makes one of a ſet of ſix: the other five were engraved by S. Bolſwert. Strutt. Heinecken.

Clouet, **Albert**, nephew of the preceding artiſt, was born at Antwerp, and like his uncle, went to Italy to perfect himſelf in his art. He ſtudied ſome time under Cornelius Bloemart at Rome, and engraved ſeveral of the prints from the gallery of Pietro da Cortona, in the palace Pitti at Florence, with a near reſemblance to the ſtyle of his maſter. Beſides a great number of other portraits, he engraved thoſe introduced in the lives of the painters by Bellori. The dates on his prints, cited by Heinecken, are from 1641 to 1675. Strutt. Heinecken.

CLOUGH, or *Draught*, in *Commerce*, an allowance of two pounds in every hundred weight for the turn of the ſcale; that the commodity may hold out weight when ſold out by retail.

Clough, or *Clogh*, in *Geography*, a ſmall poſt-town of the county of Down, Ireland, which has a fair for mountain ſheep. There is a caſtle built in a Daniſh fort, which is very unuſual, and which, from being too ſmall for the reſidence of a reſpectable family, muſt have been built merely for defence, for which its ſituation is excellent. It is 69 miles N. from Dublin. Survey of Down.

There are other villages called *Clogh*, and ſome places to which this word is a prefix, its ſignification in the Iriſh language being *a ſtone*.

Clough, or *Clyſe*, is the ſame with paddle, ſhuttle, &c. being a kind of ſluice or pen-ſtock, uſed for retaining or letting go the waters of canals, ponds, mill-dams, &c.

Clough-*arches*, or *Paddle holes*, in the conſtruction of *canals*, denote the crooked arches, which convey the water from the upper pound into the chamber of the lock, when it is to be filled, and when the cloughs or paddles are drawn up. See *Plate* V. *Canals*, *fig.* 36 and 37.

CLOVIO, Don Giulio, in *Biography*, ſo juſtly celebrated for his aſtoniſhing miniatures and illuminations in miſſals and other religious books, was born in Sclavonia in the year 1498. He was originally educated for the church, and took orders, but was afterwards ſuffered to relinquiſh the ſacerdotal habit by a diſpenſation from the pope. Soon after the age of eighteen, his love of painting prompted him to travel to Rome, where he was taken into the ſervice of the cardinal Grimani, by whom he was, for the ſpace of three years, employed in making careful pen-drawings from the fineſt medals.

He afterwards became the ſcholar of Giulio Romano, and made conſiderable advancement in oil-painting; but his maſter, perceiving the extraordinary talent which he evinced for miniature, ſucceeded in perſuading him to apply himſelf entirely to that branch of the art; and it may with juſtice be ſaid, that we owe to the ſagacity of Giulio Romano, and the unexampled aſſiduity of Clovio, the moſt exquiſite and delicately finiſhed performances of that kind in the known world; ſince he not only far ſurpaſſed all who went before him, but to this day ſtands unrivalled, by all thoſe who have ſince attempted to walk in his footſteps. In addition to the inſtruction which our artiſt received from the favourite ſcholar of Raffaele, he derived great benefit from the works of Buonaroti, many of which he copied in a moſt beautiful and finiſhed manner; and he afterwards reaped great advantage from the friendſhip and experience of Girolamo da' Libri, a miniature painter of great note at Verona: the reſult of all theſe ſtudies was a ſtyle of drawing, partaking of the purity of the Roman, and the grandeur of the Florentine ſchool; united, not unfrequently, to the rich colouring of Titian or the ambient hue of Coreggio.

Amongſt the ſurprizing labours of Don Giulio Clovio, deſcribed by Vaſari, that writer particularly dwells upon an *ufficio della madonna*, painted for the Cardinal Farneſe. In this work many portraits were introduced, and the figures, though in ſome caſes no longer than ſo many ants, were repreſented with as much diſtinctneſs in all their parts, as if they had been drawn the ſize of life.

A beautiful miſſal, illuminated by Clovio, formerly belonging to Alexander Champernoun, eſq. is now in the poſſeſſion of the Townley family. Several prints from the works of this maſter, are cited by Heinecken. He died aged 80, in the year 1578. Vaſari. Lanzi, Storia Pittorica.

CLOVIS I., the firſt Chriſtian king of France, ſucceeded his father Childeric I. in the year 481, when he was but 14 years of age. He was not long in freeing his country from a formidable domination, and in putting an end to the empire of the Romans in Gaul. In 486 he defeated Syagrius, the Roman general, at Soiſſons, which he afterwards made the ſeat of his royalty. Syagrius fled to Thoulouſe, claiming the protection of Alaric, king of the Viſigoths, by whom, however, he was finally given up to Clovis. The king, for ſome time, amuſed him with promiſes of enlargement, and thereby obtained new conqueſts; but at length cauſed him to be beheaded privately. The power of the Romans being thus deſtroyed, the French found themſelves maſters of all the provinces ſituated between the Rhine and the Loire. At this period the rights of kings were of a very limited nature, which ill accorded with the haughty ſpirit of Clovis; he felt that it was neceſſary to ſubvert the powers of the ſoldiers, in order to eſtabliſh and augment his own. An opportunity for this purpoſe ſoon preſented itſelf. A rich vaſe was taken from a church at Rheims, which the biſhop anxiouſly deſired might be reſtored. Clovis was inclined to grant his wiſhes, and at the diviſion of the ſpoil claimed the vaſe as his own. "Hold," exclaimed a ſoldier, with his battle-axe raiſed, "thou ſhalt have no other than the ſhare which may fall to thy lot." Clovis, at the time, diſſembled his anger, but he ſhortly after took occaſion to charge the man with ſome trifling offence, and telling him to recollect the vaſe, ſtruck off his head with a ſingle blow. This act of authority, dictated only by the mean and ſavage ſpirit of revenge, impreſſed his army with reverence for his authority, and eſtabliſhed a ſort of boundary between the rights of kings and thoſe of the people. In 493, Clovis married Clotilda, daughter of Childeric, formerly king of Burgundy. She was a zealous Chriſtian, and took every means in her power to convert the king. For three years ſhe ſtrove in vain, when, ſeeing himſelf in danger of a defeat, he invoked the God of the Chriſtians, vowing an adherence to him, if by his aſſiſtance he might be enabled to conquer his enemies. He rallied his troops, gained a complete victory, and was, with 3,000 of his ſubjects, immediately baptized by the biſhop, for whom he had formerly endeavoured to ſave the vaſe. France became now a Chriſtian country, and this revolution, from paganiſm to Chriſtianity, ſeems to have been effected with no more difficulty or diſturbance, than any common regulations of the ſtate. "Indeed," ſays a good writer, "when a fierce and barbarous people received the Chriſtianity of that age, they rather made its genius bend to their diſpoſition, than formed themſelves upon its precepts; and a compliance with ſuperſtitious rights and ceremonies, with ſubmiſſion to eccleſiaſtical authority, and profuſe liberality to religious foundations, conſtituted the whole of their new obligations." The true genius and ſpirit of the Chriſtian religion were little underſtood in that day. Clovis himſelf, when affected by a detail of Chriſt's ſufferings, exclaimed "Oh that I had been there I would have revenged his injuries." The king ſoon attained the high honour of being reckoned the only catholic king in Europe, all the other princes being Arians, and the emperor Anaſtaſius was regarded as not perfectly orthodox. Clovis meditated the moſt extenſive plans, and was deſirous of uniting under his domination all the territory which extends from Langres to Geneva, and from the Pyrenées to the banks of the Loire. He waged a ſucceſsful war againſt his wife's uncle, Gondebaud, from whom he exacted a heavy tribute, on pretence that Alaric, whoſe dominions he had long coveted, was guilty of hereſy; he fell a victim to the ambition of Clovis. His career was, however, checked by his brother-in-law, Theodoric, king of the Oſtrogoths, who defeated him at Arles. Clovis, rendered deſperate by this miſcarriage, fell on, and deſtroyed all that he encountered in his retreat. To facilitate his ambitious projects, he prevailed on Clodoric to aſſaſſinate his own father, Sigebert, and then had the parricide put to death, that he might have fewer obſtacles, with which to contend in invading his territories. Having taken by ſurprize a chief of one of the little ſtates, by which his own dominions were ſurrounded, he cauſed his head to be ſhaved, becauſe he had the title of king, which he wiſhed to belong excluſively to himſelf. Such was the ancient mode of declaring a prince incapable of wearing a crown. The ſon of the inſulted chief obſerved to his dejected parent, "that the branches would one day ſhoot out again, ſince the trunk had not been divided." Clovis enraged at the ſpeech ordered both father and ſon to be beheaded. Having extended his conqueſts from the mouth of the Rhine to Thoulouſe, Clovis took up his reſidence in Paris, which he made the ſeat of his empire, and which remained for fourteen centuries the metropolis of the French monarchy. He then adopted the policy of overthrowing the little independent ſtates and royalties of Gaul, and bringing them all under his own authority, and in purſuing this plan he ſcrupled not to employ treachery and aſſaſſination. To expiate his crimes he founded ſeveral monaſteries, and built a great number of churches, at the inſtigation of his clergy, who perſuaded him that, by ſuch acts of royal munificence, he would ſecure the pardon of his ſins. Clovis died in 511, at the age of forty-five years, in the thirtieth year of his reign, and was buried in the church of St. Peter and St. Paul, which is now called St. Genevieve. He left four ſons, for each of whom he had prepared a kingdom. Clovis was author of the Salic law, which excludes the wife from any ſhare of inheritance. It likewiſe gave riſe to the excluſion of females from the ſucceſſion to the throne of France. See SALIC *Law.* Hiſt. Univer. Du Freſnoy.

CLOVIS II. king of France, ſucceeded his father, Dagobert, in the kingdoms of Neuſtria and Burgundy in 638, while he was a very young child. He is mentioned in this work on account of ſome traits of humanity which are attributed to him; of theſe the moſt remarkable was, that of ſtripping the gold and ſilver plates which ornamented the coffins of St. Denis and his companions, in order to purchaſe corn for the poor in a time of ſcarcity. This action has been repreſented by ſome monkiſh writers as the cauſe of an inſanity, with which, it is ſaid, he was afflicted, and to which they impute the ſtupidity of his deſcendants. Clovis married a beautiful young girl, who had been purchaſed of ſome Engliſh merchants by the mayor of the palace, and preſented to the ſovereign; by her he had three ſons, none of whom emerged from obſcurity. Of Clovis III. nothing is recorded meriting our notice.

CLOUS *d'Artillerie et de Travaux militaires,* nails for artillery and military works. Theſe are of different kinds, lengths, thickneſſes, forms, and denominations, and are particularly deſcribed in this work, under the ſeveral names or appellations they bear.

CLOUT, in *Agriculture,* is an iron plate put on the end of the axle-tree of a cart, or other carriage, to prevent its wearing.

CLOUT-*Nails.* See NAIL.

CLOUTED CREAM, in *Rural Economy,* ſuch cream as is raiſed by means of the milk being heated.

CLOUTS, in *Gunnery,* are thin plates of iron nailed on that part of the axle-tree of a gun-carriage, which comes through the nave, and through which the linſpin goes. See ARTILLERY-*carriages.*

CLOWADOK, in *Geography,* a river of South Wales, which runs into the Ython, at Llanbadern in Radnorſhire.

CLOWES, WILLIAM, in *Biography,* an eminent ſurgeon of the fifteenth century, received his education under George Keble, whoſe ſkill in the art he ſtrongly commends. He was for ſome time ſurgeon in the navy, as he ſays he was on board her majeſty's ſhip the Aide, in the year 1570, when the emperor's daughter married the king of Spain. He ſome time afterwards ſettled in London, and was made ſurgeon to Chriſt's and Bartholomew's hoſpitals. He appears to have been in high eſtimation, and to have had a conſiderable ſhare of practice, as he ſpeaks of cures performed by him on perſons at Town-Malling, in Kent, and other towns and villages in the vicinity of London. In 1586 he was ordered to go to the Low-Countries, to the aſſiſtance of the army under the earl of Leiceſter. On his return he was appointed ſurgeon to the queen. From various paſſages in his publications, we find that a ſtrict friendſhip ſubſiſted between him and Baniſter, who was no leſs famous for his profeſſional abilities. We learn alſo, from the ſame ſource, that he had ſerved under the earl of Warwick, and had been a retainer to lord Abergavenny. At what time he died is not known. The lateſt date in his works is in 1596, at which time he appears to have been in full practice. As an author he is deſerving of conſiderable credit. His works are in Engliſh, and he ſtrongly defends the practice of writing in our vernacular language; at the ſame time, from his frequent quotations from Galen and Celſus, he ſhews he had a competent ſhare of learning. His firſt publication is entitled, "A Brief and Neceſſary Treatiſe touching the Cure of the Diſeaſe, now uſually called Lues Venerea," printed in 1585, reprinted in 1596, and again in 1637. He ſpeaks of the increaſed frequency of the diſeaſe, and ſays, that in the ſpace of five years he had cured more than a thouſand patients infected with it, at Bartholomew's hoſpital. He uſed mercurial frictions, and occaſionally turbith mineral, mercurius diaphoreticus, which he highly commends. He alſo gives formulæ for purging potions, diet drinks, fumigations, ointments, plaſters, cauſtics, &c. His next publication, which appeared firſt in 1588, and which has obtained for him the greateſt credit, was an approved practice for all young chirurgeons, concerning burnings with gun-powder, and wounds made with gun-ſhot, ſword, halberd, pike, lance, &c. the reſult of much practice and obſervation, while employed as an army ſurgeon, ſtrengthened by obſervations from the moſt approved writers, and containing all that was then known on the ſubjects treated of. In the treatment of gun-ſhot wounds, and of punctures of the nerves, he profeſſes to uſe emollient and ſoothing applications, though they would hardly be eſteemed ſo at this time; they were, however, an improvement on what he had been accuſtomed to ſee in the early part of his practice. He relates the caſe of a perſon whoſe ſkull was fractured, in which he uſed the trepan ſucceſsfully, and of a compound fracture of the leg, which he cured without amputating the limb. In ſhort he may be juſtly ranked among the reſtorers and improvers of ſurgery. To the ſecond edition of this work, publiſhed in 1591, he added a tranſlation of a treatiſe on the venereal diſeaſe, by John Alucenar, a Spaniſh phyſician, and ſome aphoriſms relative to ſurgery, in Engliſh and Latin. The firſt of the pieces was delivered to him, he ſays, by a friend; the latter he found among ſome old books of ſurgery. Clowes was a rational practitioner, and appears to have had an enlarged, intelligent, mind. He every where laughs at quacks and impoſtors, particularly at thoſe juglers who pretended to charm away diſeaſes, and tells a merry ſtory of one old beldam, who was put on her trial for uſing witchcraft in the cure of diſeaſes. The judges, who ſaw the ignorance, as well as the malice of the proſecutors, told the dame, if ſhe would divulge her charm ſhe ſhould be ſet at liberty. This ſhe readily did, to the no ſmall diverſion of the court, when ſhe informed them, that it conſiſted in repeating the following words, after receiving the ſtipulated pay, a loaf of bread and a penny:

My loaf in my lap,
My penny in my purſe,
Thou art never the better,
And I am never the worſe.

But we have little reaſon to laugh at the credulity of our anceſtors, while we ſuffer ourſelves to be impoſed upon by ſtories of the efficacy of tractors, and other equally inſignificant and contemptible pieces of juglery and impoſture. Aikin's Biograph. Memoirs.

CLOWEY, in *Geography*, a lake of North America, N. lat. 62° 20′. W. long. 106° 15′.

CLOWNS' All-Heal, in *Botany*. See Stachys *Sylvatica*.

Clowns' *Wound root*. See Stachys.

CLOYE, in *Geography*, a town of France, in the department of the Eure and Loire, and principal place of a canton in the diſtrict of Chateaudun; the place contains 1520, and the canton 10,751 inhabitants; and the territory includes 245 kilometres, and 15 communes.

CLOYED. The ſeamen, when any thing is got into the touch-hole of a great gun, ſo that they cannot with a priming-iron make way for the powder to be put in to prime it, ſay, *the touch-hole is cloyed*; wherefore, when guns are nailed, &c. they ſay they are *cloyed*.

CLOYNE, in *Geography*, a ſmall town of the county of Cork, Ireland, remarkable only for being the ſee of a biſhop. The cathedral is a fine old building, and within a ſhort diſtance of it there is a well preſerved round tower. The biſhopric lies entirely within the county of Cork, extending eaſt and weſt near 50 Iriſh miles in length, by a breadth of 23. It contains 137 pariſhes, which have been reduced to 69 benefices, though they contain 539,700 Iriſh acres. The patronage of the biſhop is conſiderable; and the wardenſhip of the church of Youghel, and a union of pariſhes near Cloyne being united to the biſhopric, this ſee is uſually reckoned amongſt the beſt. The celebrated Berkley was one of its biſhops. Cloyne is within a ſhort diſtance of the ſea, about 14 miles eaſt from Cork.

CLUACA, in *Ancient Geography*, a town of Aſia, in Media, according to Ptolemy.

CLUACARIA, or Clucar, a town of Africa.

CLUACINA, in *Mythology*, an epithet of Venus, derived, as ſome ſay, from *Cluo*, to hear, liſten, or agree; or, according to others, ſignifying to fight. Her image was erected in the place where peace was concluded between the Romans and Sabines.

CLUALE, in *Geography*, a town of America, in Georgia; 15 miles S. of Oakfuſkee.

CLUANA, a maritime town of Italy, in the Picenum, ſituated at the mouth of a river. Pliny.

CLUB *a battalion, to*, a low, vulgar, military phraſe, implying both the confuſion which a body of men gets into by falſe directions given to its different component parts and a temporary inability, on the part of the commanding officer, to reſtore them to their natural front in line or column. Officers, who are inexperienced, and but indifferent tacticians in the ſubordinate parts, may frequently commit this error. The confuſion, however, ſometimes happens through an erroneous movement of a diviſion or company, even when the word of command has been correctly given. An officer ſhould know how to unravel the ſeveral parts immediately. But if he is puzzled, he ſhould cauſe the *diſperſe* to be ſounded for the troops to repair in looſe and deſultory order to ſome rallying point, and there to re-aſſemble in their natural line of formation. A general, however, may be a perfect judge of poſitions, and underſtand thoroughly the principles of attack and defence without having minutely ſtudied or particularly attended to the drill and the mere mechanical arrangements of inferior movements; whereas one, whoſe attention is chiefly directed to ſuch objects, is ſeldom or ever fit to be entruſted with the command of an army on actual ſervice, or in the field, where but few of the manœuvres uſually taught and attended to are either uſeful or can be advantageouſly put in practice. And it ought always to be remembered by thoſe, who write or ſpeak on the attack and defence of this country, though none of them ſeem to have ſo much as once adverted to the fact, that neither the Pruſſian nor German tactics can be made uſe of with advantage in either attacking or defending it. At the ſame time it muſt be acknowledged, that a general ſhould attend to the minutiæ as well as to the ſublimer parts of his profeſſion, allowing, however, to each their juſt and proportionate claim to his attention.

Club *antennæ*, in *Natural Hiſtory*, a name given by naturaliſts to ſuch of the horns or antennæ of butterflies as repreſent a *club*, being larger at the extremities than at the origin.

Club-*foot*, or *club-footed*, a diſtortion ſo called. See Foot, *Diſtortion of the.*

Club-*haul*, in *Sea-Language*, denotes a method of tacking a ſhip, when it is expected ſhe will miſs ſtays upon a lee-ſhore.

Club-*Moſs*, in *Botany*. See Lycopodium.

Club-*Ruſh*. See Scirpus.

CLUDRUS, or Cludros, in *Ancient Geography*, a river of Aſia Minor, in Caria, according to Pliny, who ſays that the town of Eumenia was ſituated on its banks.

CLUE *of a Sail*. See Clew.

CLUGNY, in *Geography*, an iſland in the Southern Indian Ocean, diſcovered by Kerguelen, near Kerguelen's land.

CLUIS Dessous, a town of France, in the department of the Indre, two leagues N.W. of Aigurande.

Cluis *Deſſus*, a town of France, in the department of the Indre, and diſtrict of Chateauroux, 10 miles E. of Argenton.

CLUMP, in *Ornamental Gardening*, a detached portion of ground, dug up on lawns, or other parts of pleaſure-grounds, ſo as to be conſiderably raiſed in the middle for the purpoſe of receiving different ſorts of trees, ſhrubs, flower and other plants of the ornamental kind, in order to ſhow them more fully, and produce a better effect. They differ from borders in being perfectly detached and ſeparate, as well as in being much more raiſed in the operation of digging them over. This ſort of ornamental compartment is not, however, at preſent ſo much in uſe as formerly, except in very ſmall deſigns. But in extenſive grounds, where there is much mown graſs or lawn, when occaſionally introduced, they have a good effect. It has been obſerved by the author of "Ornamental Planting," that "detached maſſes of wood, as well as groups and ſingle trees, give a kind of animation to a ſcene;

a ſcene; and this may be a reaſon why Brown was ſo laviſh of them: but that a crowd of clumps, as a profuſion of ſingle trees, muſt ever disfigure the ſcene they appear in."

In the forming of compartments of this nature, great care ſhould be taken to have them properly proportioned to the nature of the ſituation and extent of ground, as nothing can be more offenſive or diſguſting than clumps diſproportionately large. The diſtribution of them in the ground ſhould likewiſe be well attended to, in order that they may produce the moſt certain and ſtriking variety and effect: this is much aſſiſted by their being duly but irregularly intermixed with the other ornaments of the ſcite on which they are introduced.

In the buſineſs of planting them, the trees and large growing ſhrubs ſhould be conſtantly placed towards the back parts or middles, while the ſmaller ſhrubs and flower plants occupy the fore parts, being all properly intermixed according to their habits and methods, as well as times of flowering; as, by a judicious management in this reſpect, they produce a much better variety and effect, and continue much longer in beauty.

All the finer ſorts of flowering trees, ſhrubs, and other plants, are here proper, as well as a ſlight mixture of thoſe of the more common kinds.

The annual management of clumps is merely that of digging them over once or twice, trimming, and removing all the old ſtems and decayed parts of the plants and ſhrubs, raking them over neatly in the early ſpring ſeaſon, and putting in ſuch annual ſeeds as may be thought proper. See Bosquet.

Clumps, in *Agriculture*, are portions of land planted with different ſorts of trees in a cloſe manner, for the purpoſe of affording ſhelter and protection to the ground or live ſtock kept upon it.

CLUN, in *Geography*, a river of England, which runs into the Temde, 5 miles W. from Ludlow, in Shropſhire.

CLUNCH. By this name miners and well-diggers, &c. denominate a variety of ſtoney matters which they meet with in digging. In the clay which is met with below the ſand ſtratum, which crops in Leighton, Woburn, Ampthill, Sandy, and other pariſhes in Bedfordſhire, two remarkable layers of whitiſh ſtone called clunch are met with, near the part of the clay abounding with large perforated gryphites: theſe clunches are not much harder than chalk, and contain within them very beautiful and large ſpecimens of cornua ammonis, of ſmall bivalve ſhells called anomia or pundibs, and ſmall pieces of rotten wood, in a ſoft or almoſt pulpy ſtate: what is remarkable, and may tend to throw ſome light upon the bitumenization of wood in the ſtrata, is, that ſome ſpecimens of this ſoft wood taken out of the clunch being immerſed in a phial of water, were, after ſome months, ſhrunk very greatly, particularly in thickneſs, and were found hard, and their fracture to be ſmooth and ſhining like the bitumenized wood which is found in other ſtrata, particularly in the purbeck potters, or white pipe-clay ſtratum.

CLUNDERT, or Klundert, a ſtrong town of Holland, formerly called "Neuwervaert," ſeated on a river or canal, which runs from the Merwe, and forms the tract on which this town and Williamſtadt ſtand into an iſland. It was taken by the French in March 1793, and ſoon after evacuated; 10 miles W.N.W. of Breda. N. lat. 51° 39′. E. long. 4° 28′.

CLUNG, in *Rural Economy*, ſignifies cloſed up, or ſtopped; ſpoken of hens, when they do not lay. It is alſo applied to wood or any other thing that is ſhrivelled or ſhrunk up, when it is ſaid to be clung. Aſh timber is ſometimes ſo much clung, that it cannot be ſplit into hoops or other ſimilar forms. And in this ſtate it is improper for the uſe of coopers.

CLUNIA, in *Ancient Geography*, a town of Hither Spain, S.W. of Numantia, which became a Roman colony and "conventus." Suetonius in his Life of Galba (c. 8.) informs us, that this prince governed Hiſpania Tarragonenſis for eight years, and that during this period Vindex revolted againſt Nero, and invited Galba to unite with him in reſcuing the empire from tyranny. It was in this town that a prieſt of Jupiter, admoniſhed in a dream, found in the ſanctuary of a temple a prediction, delivered 200 years before, which announced that a man ſprung from Spain would poſſeſs the empire of the world. This prediction, and the revolt of Vindex, determined Galba to ſeize the empire, under the modeſt title of lieutenant of the ſenate and of the Roman people. It was, moreover, at Clunia, that Galba, after receiving intelligence of the defeat and death of Vindex, received information, that the ſoldiers, ſenate, and Roman people had given him the title of emperor. This prince, in acknowledgment of theſe favourable occurrences, celebrated Clunia on his medals, by the name of Sulpicia, under which appellation it was honoured by Galba. On one medal the emperor is repreſented ſeated and receiving the victory preſented by the goddeſs of the city. This place is now denominated *Corunna* or *Corunna del Conde*.

CLUNIUM, a town of the eaſtern part of the iſland of Corſica, according to Ptolemy

CLUNY, or Clugni, in *Geography*, a town of France, in the department of the Saône and Loire, and chief place of a canton in the diſtrict of Mâcon, ſituated between two mountains on the Rhone. The church is ſuppoſed to be one of the largeſt in France, and the town includes three pariſhes. The place contains 3814, and the canton 15,567 inhabitants: the territory comprehends 262½ kiliometres and 23 communes; 3½ leagues N.W. of Mâcon, and ſeven S. of Chalons-ſur-Saône. In this place was a celebrated abbey of Benedictine monks, being the head or chief of a congregation denominated from them. It was founded by William, duke of Berry and Aquitain; or, as others ſay, by the abbot Berno, ſupported by that duke, in the year 910; but owed its diſtinguiſhed reputation to Odo, who, upon the death of Berno, was created abbot of Clugni in 927. This zealous eccleſiaſtic not only obliged the monks to live in a rigorous obſervance of their rules, but alſo added to their diſcipline a new ſet of rites and ceremonies, which, notwithſtanding the air of ſanctity that attended them, were in reality inſignificant and trifling, and yet at the ſame time ſevere and burthenſome. This new rule of diſcipline was productive of glory to its author, and, in a ſhort time, was adopted in all the European convents; for moſt of the ancient monaſteries, which had been founded in France, Germany, Italy, Britain, and Spain, received the rule of the monks of Clugni, to which alſo the convents, newly eſtabliſhed, were ſubjected by their founders. Thus it was, that the order of Clugni attained to that high degree of eminence and authority, opulence, and dignity, which it exhibited to the Chriſtian world, in the following century. Moſheim obſerves, (E. H. vol. ii. p. 413,) that the "order of Clugni," was not, as ſome have repreſented it, a new ſet of monks, ſuch as were the Carthuſian, Dominican, and Franciſcan orders; but ſignified only, *firſt*, that new inſtitution, or rule of diſcipline, which Odo had preſcribed to the Benedictine monks, who were ſettled at Clugni, and, afterwards, that prodigious multitude of monaſteries throughout Europe, which received the rule eſtabliſhed at Clugni, and were formed by aſſociation into a ſort of community, of which the abbot of

Clugni was the chief. Towards the cloſe of the 12th century a jealouſy aroſe between the Ciſtercians and the monks of Clugni, which, after ſeveral diſſenſions, produced at length an open rupture, and declared war between theſe two opulent and powerful monaſteries. The monks of Clugni accuſed the Ciſtercians of affecting an extravagant auſterity in their manners and diſcipline; while the Ciſtercians, on the other hand, charged them, and on very juſt grounds, with having degenerated from their former ſanctity and regularity of conduct. St. Bernard, the oracle and protector of the Ciſtercians, wrote, in the year 1127, an apology for his own conduct in relation to the diviſion that ſubſiſted between the two convents, and inveighed with a juſt, though decent, ſeverity againſt the vices that had corrupted the monks of Clugni. He accuſes them of luxury and intemperance at their table, of ſuperfluity and magnificence in their dreſs, their bed-chambers, their furniture, equipage, and buildings. He points out the pride and vanity of the abbots, who appeared more like the governors of provinces than the ſpiritual fathers of humble and holy communities, whoſe original profeſſion it was to be crucified and dead to the intereſts and pleaſures, the pomps and vanities, of the preſent world. He declares, with a pious concern, that he knew ſeveral abbots, each of whom had more than 60 horſes in his ſtable, and ſuch a prodigious variety of wines in his cellar, that it was ſcarcely poſſible to taſte the half of them at a ſingle entertainment. This charge was anſwered with uncommon moderation and candour, by Peter Mauricius, abbot of Clugni; and hence it occaſioned a controverſy in form, which ſpread from day to day its baneful influence, and excited diſturbances in ſeveral parts of Europe. It was, however, followed with a much more vehement and bitter conteſt concerning an exemption from the payment of tythes, granted among other privileges and immunities to the Ciſtercians, A. D. 1132, by Innocent II. This keen diſpute was, in ſome meaſure, terminated in the year 1155. Moſheim, E. H. vol. iii. p. 67.

This order of monks was brought into England by William, earl of Warren, ſon-in-law to William the Conqueror, who built a houſe for them at Lewes in Suſſex, about the year 1077. There were twenty-ſeven priories and cells of this order in England, which were governed by foreigners, afterwards made denizens.

CLUPEA, in *Ancient Geography*. See Clypea.

Clupea, in *Ichthyology*, a genus of abdominal fiſhes. The character of the genus conſiſts in the head being compreſſed; mouth compreſſed and rough within; jaws unequal, the upper with ſerrated myſtaces; tongue ſhort, rough, with inverted teeth; eyes moderate, round, and marginal; gills ſetaceous; the gill-covers of either three or four plates; and the gill-membrane eight-rayed; body compreſſed, elongated, and covered with ſcales of moderate ſize; lateral line ſtraight, near the back, and running in a parallel direction to it; belly carinated and generally ſerrated; ventral fins uſually nine-rayed; tail forked.

Species.

Thrissa. Anal fin with twenty-eight rays; laſt ray of the dorſal fin long and ſetaceous.

This fiſh is about twelve or fourteen inches in length; the back bluiſh-green, with rows of browniſh ſpots; the ſides of the head green, and of the body ſilvery white. It inhabits the ſhores of America and India, and is conſidered poiſonous.

Seticornis. Lateral bones of the upper jaw ſetaceous; anal fin with thirty-two rays. A native of the Pacific Ocean. The body is of a lanceolate form, with the back bluiſh, and the belly ſilvery; the ſcales ſmooth, deciduous, ſomewhat of a rhombic form and obliquely imbricated.

Cyprinoides. Belly obtuſe. Length leſs than twelve inches. The body is of an oblong form and ſilvery colour, with the back bluiſh, and the ſcales diſpoſed in ten longitudinal ſeries. A tropical fiſh. *Camaripugaucu* of Ray.

Tropica. Tail cuneated, or wedge-formed.

Inhabits the coaſts of Aſcenſion iſland; the body is white, compreſſed, broad, and ſerrated.

Sinensis. Outer ray of the gill-membrane truncated behind. A ſpecies which inhabits the coaſt of China; in its general figure, this fiſh is broader than the common herring, but in other reſpects reſembles it.

Mystus. Body enſiform; anal fin joined to the tail. Linn. A native of the Indian ſeas.

Atherinoides. Lateral line ſilvery. Gmel. This kind inhabits Surinam. The lower jaw is ſhorter than the other.

Haumela. Body lanceolate, naked, and deſtitute of ventral, anal, or caudal fins: dorſal fin extending the whole length of the back; tail linear.

This and the following ſpecies are deſcribed by Forſkal as natives of the red ſea; they ſeem both very doubtful.

Dorab. Ventral fins minute; upper lip two-horned, with extended teeth; lower longer, the teeth ſtrong and erect.

Villosa. Lateral line prominent and rough. Müller. A native of the north ſea,

Tuberculata. Lower jaw longer: on the ſnout a wart-like protuberance, and a red ſpot at the upper commiſſures of the jaws. La Cepede.

A ſmall ſpecies obſerved by Commerſon, in the Indian ſeas, and ſaid to be an excellent fiſh for the table.

Fasciata. Above, marked with ſemi-current duſky bands; below, with rounded ſpots. La Cepede. Inhabits the Indian ſeas, and was found by Commerſon.

Macrocephala. Above bluiſh, with the head elongated; upper jaw longeſt: fins red. La Cepede.

Deſcribed from a drawing, made by father Plumier, of a fiſh taken in the American ſeas.

Alosa. Sides marked with a longitudinal ſeries of ſpots; ſnout bifid.

This is the common ſhad, a fiſh which inhabits the Mediterranean and northern ſeas: it is of the marine kind, but at particular ſeaſons aſcends rivers for the purpoſe of depoſiting its ſpawn, and which it is obſerved to lay in the deepeſt part of the river. Towards autumn this fiſh returns again to the ſea. Uſual length from eighteen inches to two feet.

The young of this ſpecies has been very recently aſcertained by us to be no other than the little fiſh known commonly by the name of white bait. The hiſtory of that heretofore ambiguous fiſh has excited the curioſity of ſo many naturaliſts, that we cannot refrain repeating, in this place, a few obſervations that have lately fallen from us on the ſame ſubject, in the "Natural Hiſtory of Britiſh Fiſhes."—We have there obſerved that when the true character of the white bait becomes more generally underſtood, and the veracity of thoſe remarks we ſhall offer in the ſequel is ſufficiently confirmed, by the obſervations of other naturaliſts, it will perhaps appear that it has remained with us to remove the myſterious veil that has hitherto enveloped the hiſtory of this little fiſh in obſcurity. To what peculiar circumſtances we are to attribute the errors that have prevailed among writers, reſpecting this fiſh, we cannot eaſily imagine: unleſs, as we muſt ſuſpect, they never had an opportunity of examining it; but that they have actually been deceived, we are perfectly ſatisfied. This aſſertion is not advanced on ſlight ſurmiſes, for ſome pains have been taken by us to inveſtigate the hiſtory of this heretofore ambiguous fiſh: we have examined it repeatedly, and have now before us a variety of ſpecimens, elucidatory of the different tranſitions of its growth, from a diminutive ſize to the full length of three or four inches. Every one of theſe bears the moſt ſtriking ſemblance of the parent fiſh, and affords an incontrovertible evidence, that the white bait is really the fry of the common ſhad. We ſhall premiſe our enquiry by introducing the obſervations of Mr. Pennant concerning it, in the reſult of which he labours to prove, that the white bait is not the young ſhad, or even fiſh of the clupea, but one of the cyprinus genus, approaching near to the bleak, and ſhall conclude with ſtating our reaſons for diſſenting from an opinion ſo long eſtabliſhed, and ſo uniformly adopted by later writers.

"During the month of July (ſays Mr. Pennant) there appear in the river Thames, near Blackwall and Greenwich, innumerable multitudes of ſmall fiſh, which are known to the Londoners by the name of *white bait.* They are eſteemed very delicious when fried with fine flour, and occaſion, during the ſeaſon, a vaſt reſort of the lower order of epicures to the taverns contiguous to the places where they are taken at.

"There are various conjectures about this ſpecies, but all terminate in a ſuppoſition that they are the fry of ſome fiſh, but few agree to which kind they owe their origin. Some attribute them to the ſhad, others to the ſprat, the ſmelt, and the bleak. That they neither belong to the ſhad, nor the ſprat, is evident from the number of branchioſtegous rays, which in thoſe are eight, in this only three. That they are not the young of ſmelts is as clear, becauſe they want the *pinna adipoſa,* or rayleſs fin; and that they are not the offſpring of the bleak is extremely probable, ſince we never heard of the white bait being found in any other river, notwithſtanding the bleak is very common in ſeveral of the Britiſh ſtreams; but, as the white bait bears a greater ſimilarity to this fiſh than any other we have mentioned, we give it a place as an appendage to the bleak, rather than form a diſtinct article of a fiſh, which it is impoſſible to claſs with certainty. It is evident that it is not of the carp or cyprinus genus; it has only three branchioſtegous rays, and only one dorſal fin; and, in reſpect to the form of the body, it is compreſſed like that of the bleak. Its uſual length is two inches; the under jaw is longeſt; the irides ſilvery, the pupil black; the dorſal fin is placed nearer to the head than the tail, and conſiſts of about fourteen rays; the ſide line is ſtraight; the tail forked, the tips black. The head, ſides, and belly are ſilvery; the back tinged with green." Brit. Zool.

Dr. Shaw, in his "General Zoology," deſcribes the white bait as a ſpecies of the carp or cyprinus genus. It is obſerved, by this writer, that "this ſmall fiſh, which is extremely plentiful, at particular ſeaſons, in the river Thames, is ſuppoſed to be the young of ſome ſpecies of cyprinus, though it is not agreed to what ſpecies it ſhould moſt properly be referred." The white bait is introduced by Dr. Turton as a variety of the bleak, *cyprinus alburnus.* He deſcribes it as having the lateral line ſtraight. The general deſcription is to the following effect. "Pupil black; iris ſilvery; lower jaws longer; head, ſides, and belly ſilvery; back tinged with green; dorſal fin nearer the head than the tail, and with about fourteen rays; tail forked, the tips black." It will be proper to add, that no mention is made of this fiſh in the Gmelinian *Syſtema Naturæ,* and that Dr. Turton has inſerted it, to all appearance, on the authority of Mr. Pennant.

Our obſervations commenced with ſtating the white bait to be the genuine offspring of the ſhad, and conſequently of the clupea inſtead of cyprinus genus, as the preceding authors conſider it. This we ſhall have little difficulty in determining. To ſpeak with indeciſion on a point that admits of not the ſlighteſt doubt, would be ſuperfluous; when we deliver an opinion merely, it is becoming to expreſs it with diffidence; but ſurely diffidence and indeciſion are miſapplied to matters beyond the poſſibility of doubt, and ſuch is the fact preciſely with regard to white bait. Every circumſtance conſidered, we cannot avoid concluding that much of the prevailing errors reſpecting the white bait has originated from the incautious obſervations of Mr. Pennant on this ſubject; that this author never ſaw the white bait, and that ſucceeding naturaliſts, too implicitly relying upon his obſervations, have been inadvertently precipitated into thoſe errors, which the moſt caſual examination of the fiſh in queſtion would have enabled them to detect. If, however, contrary to this ſuggeſtion, Mr. Pennant ever did examine the fiſh, his ſpecimens muſt have been either in a moſt imperfect ſtate, or his inveſtigation of it unpardonably negligent. His figure conveys no juſt idea of the fiſh, and his critical animadverſions are laboriouſly intricate and defective. He tell us, for example, that the white bait "neither belongs to the ſhad nor the ſprat, as is evident from the number of branchioſtegous rays, which in thoſe are eight, in this (the white bait) only three." This remark is incorrect; the branchioſtegous rays were uniformly eight in number in at leaſt fifty ſpecimens we examined, with the view of aſcertaining the fact exactly. The number of thoſe rays determines at once that it cannot be of the cyprinus genus, which is diſtinguiſhed by having only three rays inſtead of eight. Mr. Pennant further remarks, that "it is impoſſible to claſs this fiſh with certainty," but in what reſpect this ambiguity conſiſts it is not for us to ſay. The white bait certainly poſſeſſes every criterion of the ſpecies as evidently as the parent, or full-grown fiſh; its outline is the ſame, the fins are alike; it exhibits the ſame ſerrations on the abdomen and cleft on the ſnout; and what is even remarkable in a fiſh of this ſmall ſize, the lateral range of duſky ſpots is perceptible through the beautiful ſilver ſcales, as in the larger fiſh; it exhibits, in a word, the moſt perfect but diminiſhed view of the common ſhad, not a ſolitary character excepted. Vide Donov. Brit. Fiſhes, pl. 98.

HARENGUS. Body without ſpots; lower jaw longer.

The common herring is a fiſh ſo generally known to every common obſerver, that we conceive it unneceſſary to offer an elaborate deſcription of it; the ſpecies is pretty accurately defined by the above character, which is that aſſigned to it by Linnæus in his "Fauna Suecica."

The importance of the herring to the inhabitants of Europe, and thoſe more particularly of the northern countries, is very great. The fiſhery of the herring, as may be naturally conceived, is very great. The Dutch who, in this reſpect, ſet an early example of induſtry to the reſt of Europe, were engaged in this fiſhery ſo long ago as the year 1164, and are ſaid to have carried it on for ſeveral centuries after, with the greateſt perſeverance and ſpirit. The method of pickling the herring, after the Dutch manner, is reported to have been diſcovered by William Beukelen, of Biervlet, near Sluys in Flanders, and his art, in a great meaſure, remains a ſecret to this day. The ſuperior excellence of the herrings pickled in this manner is generally allowed, and ſuch herrings bear a higher price than thoſe preſerved in any other way. The Britiſh pickled herrings are in little eſteem, except in our own country. Some attempts have been lately made to eſtabliſh a ſmall colony of Dutch fiſhermen on the coaſt of Scotland, for the expreſs purpoſe of pickling herrings in the ſame manner as in Holland, but whether the laudable endeavours of thoſe concerned will be ultimately ſucceſsful, time alone can determine; there ſeems to exiſt a general, and, no doubt, very unfounded prepoſſeſſion in the country, that they are ſtill inferior to thoſe pickled in Holland.

Many particulars related by authors, reſpecting the periodical migrations of the herring from the northern regions towards the ſouth of Europe, ſeem to admit of great diſpute; the beſt informed ichthyologiſts of the preſent time are inclined to think thoſe accounts, in moſt inſtances, erroneous. It is ſuppoſed the herring, like the mackrel, remains, during the winter months, at no very great diſtance from the ſhores, which it moſt frequents during the ſpawning ſeaſon; the ſame we have ourſelves obſerved with regard to the ſprat. In winter they inhabit the deepeſt parts of the ſea, or plunge beneath the ſoft mud at the bottom, from whence they riſe at the ſpring ſeaſon, and approach the ſhallows in order to depoſit their ſpawn in proper ſituations. In proof of this, Bloch obſerves, that herrings are found at almoſt all ſeaſons of the year about ſome of the European coaſts, and that the northern migrations, ſuppoſed by Pennant and others, are impracticable in the ſhort period aſſigned by them, as the fiſh, in its ſwifteſt progreſs, is utterly incapable of moving at a rate by any means ſo rapid as the term allowed for thoſe migrations would require. For this, and other reaſons, Bloch is induced to think the long voyages of the herring exiſt only in the minds of its deſcribers.

The herring is ſuppoſed to feed on marine worms, and the ſmall fry of fiſhes in general; its greateſt enemies are the various ſpecies of whales, ſome of which ſubſiſt almoſt entirely on this fiſh.

PILCHARDUS. Noſe turned up; dorſal fin in the centre of gravity; ſcales large and firm.

The pilchard is ſomewhat allied in general appearance to the herring, but is thicker, or of a leſs compreſſed form, the back more elevated, and the ſcales very conſiderably larger in proportion. It is alſo a ſmaller fiſh, rarely exceeding the length of eight inches. Pilchards, according to Dr. Borlaſe, appear uſually in vaſt ſhoals off the Corniſh coaſts, about the middle of July, and diſappear again in the beginning of winter, though a few return again after Chriſtmas. Their winter retreat is ſuppoſed to be the ſame as that of the herring. The pilchard fiſhery is a very productive concern on the coaſt of Cornwall, where thoſe fiſh are cured for exportation. Oil is alſo extracted from them in great abundance.

SPRATTUS. Lower jaw longer than the upper; dorſal fin about ſeventeen-rayed, belly ſerrated.

The ſprat inhabits the north of Europe, appearing at particular ſeaſons in immenſe ſhoals near the coaſts; it uſually ſpawns in autumn.

ENCRASICOLUS. Upper jaw longeſt. Linn.

The general length of the anchovy is from three to four inches, or, at the utmoſt, about four inches and a half; though individual ſpecimens have occurred of a ſtill larger ſize. The prevailing colour is ſilvery, with the back green.

This fiſh is found in great plenty in the Mediterranean, Northern, and Atlantic ſeas, and, like the herring, is ſuppoſed to leave the deep receſſes of the ſea, and in ſpring approach the ſhores, for the purpoſe of depoſiting its ſpawn. The great fiſhery of anchovies is at Gorgona, a ſmall iſle to the weſt of Leghorn. They are taken in vaſt quantities, and prepared for ſale by ſalting and pickling; the bones eaſily diſſolve in boiling. It is ſuppoſed to have been known to the ancient Greeks and Romans, who prepared from it a kind of garum for their table. The anchovy has been obſerved, though very rarely, on the Engliſh coaſt. Vide Donov. Brit. Fiſhes. See ANCHOVY.

CLUSES, in *Geography*, a town in the department of Leman, and chief place of a canton in the diſtrict of Bonneville, ſeated by the ſide of the Arve; the place contains 2102, and the canton 10,330 inhabitants: the territory includes 190 kiliometres and 8 communes.

CLUSIA, in *Botany*, (ſo called in memory of C. Cluſius, or Charles de l'Ecluſe,) Balſam-tree. Linn. Gen. 1154. Schreb. 1584. Juſſ. 256. Vent. 3. 147. (Perepé Encyc.) Claſs and order, *polygamia monœcia*. Nat. Ord. *Guttiferæ*, Juſſ. Vent.

Gen. Ch. *Cal.* Perianth from four to ſixteen-leaved, permanent, leaves concave, imbricated, the exterior ones gradually ſmaller. *Cor.* Petals from four to ſix, large, open, roundiſh, larger than the calyx. *Stam.* Filaments from ſix or eight, to a very great number, ſimple, ſhorter than the corolla. *Piſt.* Germ ovate-oblong; ſtyle none, ſtigma radiate, peltate, flat, obtuſe, permanent. *Peric.* Capſule ſpheroid, large, furrowed, from four to twelve-celled, opening from the ſummit to the baſe into as many valves as there are cells, each terminated by a ray of the ſtigma. *Seeds* numerous, ſmall, covered with a ſucculent pulp, affixed either to a central angular receptacle, or to receptacles adhering on the inſide to the ſummit of the valves.

Eſſ. Ch. Calyx from four to ſixteen-leaved. Petals from four to ſix. Stamens generally very numerous. Stigma ſeſſile, with diverging rays. Capſule from four to twelve-celled, opening longitudinally into as many valves. Seeds ſmall, covered with a ſucculent pulp.

Obſ. All the flowers have ſtamens and a piſtil; but in ſome, the ſtamens are abortive, in ſome the piſtil, and in others they are both perfect. All the ſpecies are trees abounding in a viſcid juice, which becomes red when expoſed to the air, and hardens into a gum or reſin. In the female flowers, a nectary is formed by the coalition of the abortive anthers, including the germ.

Sp. 1. C. *roſea*, Linn. Sp. Pl. 1. Mart. 1. Poir. 1. Plum. Gen. 21. Jacq. Americ. 270. Pict. 231. (Cenchramidea, Pluk. Alm. 92. tab. 157. fig. 2. Cateſb. Car. 2. tab. 99.) "Leaves veinleſs; corollas ſix-petalled." *Trunk* from twenty to thirty feet high; branches ſpreading. *Leaves* oppoſite, quite entire, inverſely egg-ſhaped, firm, coriaceous, even on their upper ſurface, marked underneath with oblique parallel nerves unconnected by veins, round, and ſometimes a little emarginate at the ſummit, narrowed at the baſe, on ſhort petioles. *Flowers* large, roſe-coloured, axillary and terminal; peduncles thick, ſhort, ſometimes ſimple, more frequently two or three-flowered; bractes ſhort, obtuſe, ſcaly; calyx-leaves ſix, coloured, almoſt round, concave, obtuſe, open, ſomewhat imbricated; the two intermediate ones half the ſize of the two interior ones, and twice the ſize of the two exterior ones; petals concave, very open, with a thick ſhort claw; ſtamens very numerous, erect, awl-ſhaped, the length of the germ, and ſurrounding it in two ranks; in the female flowers, without anthers; germ cylindrical, ſhorter than the calyx, furrowed by the impreſſion of the filaments; ſtigma with eight equal rays. *Capſule* greeniſh, large, almoſt round, obtuſe, eight-celled, eight-valved. *Seeds* numerous, covered by a thick, ſoft pulp, attached to a very large central receptacle, the angles of which form the cells. A native of the Weſt Indies, among rocks; and it is alſo paraſitic on the trunks or limbs of other trees, occaſioned by birds ſcattering the viſcid ſeeds, which take root like thoſe of miſſelto, but not finding ſufficient nutriment, the roots ſpread on the ſurface of the tree, till they find a decayed hole, or other lodgment, where there is a ſmall portion of ſoil; the fertility of this being exhauſted, a root is diſcharged out of the hole till it reaches the ground, though at forty feet diſtance; here again it fixes itſelf and becomes a much larger tree. The reſin is uſed to cure ſores in horſes, and inſtead of tallow for boats. 2. C. *alba*, Linn. Sp. Pl. 2. Mart. 2. Poir. 2. Jacq. Amer. p. 271. tab. 166. Plum. Gen. 22. Icon. 87. fig. 1. "Leaves veinleſs; corollas five-petalled." In habit reſembling the preceding ſpecies. *Leaves* alſo ſimilar, except in being a little longer, not emarginate, and ſcarcely petioled. *Flowers* white, without ſcent, ſmaller and leſs elegant; calyx-leaves nine, in three ranks, of different ſizes, as in C. roſea; petals twice as large as the internal calyx-leaves; filaments from five to eight, only half the length of the germ; germ a little ſhorter than the petals; ſtigma five or ſix-rayed. *Capſule* large, of a beautiful ſcarlet colour when ripe, five or ſix-celled, with the ſame number of valves. *Seeds* whitiſh, covered with a reddiſh pulp, attached to a large central receptacle. A native of Martinico. 3. C. *flava*, Linn. Sp. 3. Mart. 3. Poir. 3. Brown. Jam. 236. (Terebinthus; Sloan. Jam. 167. Hiſt. i. p. 91. tab. 200. fig. 1.) "Leaves veinleſs; corollas four-petalled." General habit, leaves and infloreſcence ſimilar to the two preceding. *Flowers* pale yellow; calyx almoſt quadrangular; compoſed of ſixteen leaves in four ranks; the inner ones gradually increaſing in ſize; petals egg-ſhaped, narrowed towards the claws, very thick, two larger than the others; ſtamens very numerous; filaments ſhort, thick, nearly in four ranks round the germ; anthers with two ſeparate lobes; germ very ſmall; ſtigma thick, almoſt capitate, with four lateral appendages, twelve-rayed. *Capſule* twelve-celled, twelve-valved. *Seeds* numerous, attached to a very large, oblong, twelve-furrowed receptacle. It is ſaid to vary in the colour of the flowers and fruit. A native of Jamaica, and of Cayenne, in South America, among rocks at the foot of mountains. 4. C. *retuſa*, Poir. 4. Lam. Ill. tab. 852. "Leaves ſomewhat veined, egg-ſhaped, retuſe; flowers ſix-petalled; fruit ſomewhat globular-compreſſed." *Leaves* ſix or ſeven inches long, and about three broad, oppoſite, petioled, very thick, completely retuſe and round at the ſummit; marked with ſtrong, tranſverſe, parallel nerves, connected by very fine, ſcarcely perceptible, veins. *Flowers* axillary, towards the extremity of the branches, peduncled, often ſolitary; calyx-leaves eight, inverſely egg-ſhaped, in two ranks; the outer ones not half the length of the others; bractes two, about the middle of the peduncles, and two others at the bifurcation, where there is more than one flower; ſhort, egg-ſhaped, very thick, ſmooth, permanent; corolla much larger than the calyx; ſtamens very numerous, anthers ſimple, erect. *Capſule* globular, compreſſed at the two extremities, with at leaſt ſixteen or eighteen cells, and as many valves. A native of America. 5. C. *venoſa*, Linn. Sp. 4. Mart. 4. Poir. 6. Plum. Gen. 21. Ic. 87. fig 2. "Leaves veined." Trunk more than thirty feet high. *Flowers* white; calyx-leaves four, roundiſh; two outer ones a little narrower, acute; petals four, egg-ſhaped, obtuſe, very open, a little longer than the calyx; ſtamens very numerous; filaments ſtraight, a little flattened; anthers erect, oblong; ſtigma five-rayed. Miller's plant, which ſeems to be a variety, has roſe-coloured flowers, produced in long ſpikes at the end of the ſhoots. A native of the Weſt Indies. 6. C. *ſeſſiliflora*, Poir. 5. "Leaves inverſely egg-ſhaped, ſomewhat veined; flowers ſeſſile, cluſtered." *Stem* rugged, greeniſh. *Leaves* oppoſite, coriaceous, thick, ſometimes emarginate, quite entire, narrowed at the baſe; petioles only two or three lines long, compreſſed, thick. *Flowers* ſmall, axillary. A native of Madagaſcar, deſcribed from an imperfect ſpecimen in the herbarium of La Marck, in which the parts of fructification could not be diſtinguiſhed. 7. C. *ſeſſilis*, Mart. 6. Forſt. Fl. Auſt. n. 391. "Leaves oppoſite, inverſely egg-ſhaped and elliptic, quite entire, veined; flowers axillary, ſolitary, nearly ſeſſile, four-petalled." A native of New Caledonia. 8. C *pedicellata*, Mart. 6. Forſt. Flor. Auſtral. n. 390. "Leaves oppoſite, inverſely egg-ſhaped, quite entire, veined; cymes axillary; flowers four-petalled. A native of Tongatabu.

Propagation and Culture. Theſe plants are moſt advantageouſly imported in tubs from their native climates. They muſt be conſtantly kept in the ſtove, and ſparingly watered, eſpecially in winter. They may alſo be propagated by cuttings, which muſt be laid to dry for a fortnight or three weeks. The beſt time for planting them is in June or July, when the pots ſhould be plunged into a hot-bed of tanner's bark. In winter they may be placed upon ſtands in the dry ſtove; but if they are plunged into the tan-bed in ſummer, their leaves will be larger and more beautiful.

C. *foliis venoſis*, Fabric.—*Minor*, Rumph. See DECUMARIA *barbara*.

CLUSINA PALUS, in *Ancient Geography*, the name of a long marſh, formed by the waters of the Clanis, near Cluſium.

CLUSINI FONTES, fountains of Italy, in Etruria, placed by the ancients near Cluſium. They are now called "Bagni de S. Cantiano."

CLUSINI, a people of Italy, in Etruria; the *Cluſini Novi* are placed by Pliny towards the ſources of the Tiber, and he calls their town *Cluſium Novum*; the *Cluſini Veteres* are placed by the ſame author on a mountain, and he calls their town *Vetus Cluſium*.

CLUSIUM, now *Chiuſi*, a town of Italy, at a ſmall diſtance to the weſt of Perugia, on the right bank of the Clanis. Its ancient name was "Camers." Its origin is traced to about the time of the ſiege of Troy; and ſome attribute its foundation to Cluſius, ſon of Tyrrhenus, and others to Telemachus. In the time of the Romans it was conſiderable; and Porſenna held his court and was buried in this place. Pliny ſpeaks of his tomb, and of a monument erected in honour of him, called the "Labyrinth." The Gauls beſieged this place, but marched towards Rome without taking it. This place is now, on account of the inſalubrity of the air, almoſt forſaken.

CLUSIUS, more properly DE L'ECLUSE, CHARLES, in *Biography*, a very eminent botaniſt, born at Arras, in the French Netherlands, February 19, 1526. He received the firſt rudiments of polite literature, with the knowledge of ſeveral modern languages, at Ghent; and afterwards beſtowed ſome time upon the Greek and Latin claſſics at Louvain, where he likewiſe applied himſelf to the ſtudy of juriſprudence. He alſo took a degree in medicine; but it does not appear that he purſued either of theſe ſtudies as a ſource of emolument. Having always had an ardent deſire to viſit foreign countries, he went to Germany at the age of 23, where he imbibed a taſte for general ſcience, eſpecially geography and botany. He travelled into the ſouth of France, but was called home by his father on account of the civil wars, about 1563. He afterwards found means to viſit that kingdom again, as well as Spain, and great part of Portugal, chiefly with a view to the botany of thoſe countries, which he has amply illuſtrated. He viſited England at three ſeveral times. In all theſe journies he formed valuable acquaintances among the learned in his favourite ſcience, who ſubſequently communicated their various diſcoveries to enrich his publications; his liberal, candid, and amiable diſpoſition preſerving him from all envy and rivalſhip. He not only collected and deſcribed a number of new plants, but made drawings of ſeveral with his own hand. In the year 1573, Cluſius was invited to Vienna by the emperor Maximilian II., with whom, as well as with his ſon, afterwards the emperor Rodolphus II., he was in great favour, and was honoured by the former with the rank of nobility. He had always a great deſire to viſit Italy; but having three times been diverted from his purpoſe by various accidents, he concluded it was not the will of Providence that he ſhould ever ſee that country, and gave up the deſign. In 1593, the 68th year of his age, Cluſius was choſen profeſſor of botany at Leyden, where he reſided in great reputation till his death, which happened on the 4th of April 1609, in the 84th year of his age. He was honoured with a public funeral in St. Mary's church, Leyden, when a Latin oration in his praiſe was delivered by the rector of the univerſity. He died unmarried. With reſpect to bodily health, Cluſius was unfortunate beyond the uſual lot of humanity. In his youth he was afflicted with dangerous fevers, and afterwards with a dropſy. He broke his right arm and leg by a fall from his horſe in Spain, and diſlocated, as well as fractured, his left ankle at Vienna. In his 63d year he diſlocated his right thigh, which, being at firſt neglected, could never afterwards be reduced, and he became totally unable to walk. Calculous diſorders, in conſequence of his ſedentary life, accompanied with colic and a hernia, cloſe the catalogue of his afflictions. Yet his cheerful temper, and ardour for ſcience, never forſook him, nor did any man ever enjoy more reſpect and eſteem from thoſe who knew him.

Cluſius may be ſaid to have held the botanical ſceptre for a long courſe of years till his death. Although not, like his great contemporary, Conrad Geſner, a ſyſtematic genius, he was one of the beſt practical botaniſts. He diſcriminated plants very happily, and his hiſtories of them are rendered intereſting by innumerable remarks and anecdotes, which carry his readers along with him wherever he goes, to ſhare his pleaſures without his toils. When ſeated in his botanical chair at Leyden, his authority was reſpected on all hands, and all diſcoveries were laid at his feet. Our gardens are indebted to him for the cherry-laurel and horſe-cheſnut, now ſo common and ſo ornamental, which he received, among many other plants, from the imperial ambaſſador at the Porte, in 1576. All the reſt of the cargo periſhed, but Cluſius beſtowed the greateſt poſſible attention to preſerve and increaſe theſe; for, unlike many ſelfiſh collectors, he delighted to diſperſe his treaſures among thoſe who took pleaſure in their acquiſition, and it is but juſt that his memory ſhould be perpetuated along with thoſe two beautiful trees, with which all botaniſts of taſte ought for ever to aſſociate his name, thus giving him a monument more laſting than braſs or marble.

The principal publications of Cluſius are the following:

1. "Rariorum aliquot Stirpium per Hiſpanias obſervatarum Hiſtoria," Antwerp, 1576, octavo, with above 220 wooden cuts, admirably executed. In ſeveral parts of this work, he conſiders the fructification as of primary importance for determining the genera of plants, a doctrine which had but recently been firſt advanced by Conrad Geſner, and Cæſalpinus.

2. "Rariorum aliquot Stirpium per Pannoniam, Auſtriam, et vicinas quaſdam Provincias obſervatarum Hiſtoria," Antwerp, 1583, octavo, with above 350 wooden cuts, ſomewhat leſs elegant, as Haller obſerves, than thoſe of the former work, but ſufficiently good and original, as is the letter-preſs of both. The former is a treaſure of the vegetable productions of the ſouth of Europe, as the latter is of Alpine ones. Both are commodious and highly agreeable pocket-companions for the travelling botaniſt.

3. The foregoing were re-publiſhed, with the title of "Rariorum Plantarum Hiſtoria," in folio, at Antwerp, in 1601, with ſome additions of garden plants, an ample treatiſe on *fungi*, with cuts, ſome of Cluſius's correſpondence, and Pona's account of mount Baldus. This is the edition in common uſe, and moſt generally quoted.

4. "Exoticorum Libri decem," Antwerp, 1605, folio, with numerous cuts of animals, exotic fruits, and gums. The obſervations of Garcias ab Orta, Acoſta, Monardez, and Bellon, form the baſis of this work, to which Cluſius has added many illuſtrations. An appendix of his own on rare plants is ſubjoined, in which is the firſt figure of the horſe-cheſnut in flower.

5. "Curæ Poſteriores," Antwerp, 1611, folio. This poſthumous work is generally bound with the laſt. It conſiſts of a few excellent figures and deſcriptions of rare plants. The funeral oration of Cluſius, with various poetical tributes to his memory, are commonly annexed to this volume, and among them a ſhort account of his life from "Boiſſard's Portraits of Illuſtrious Men."

To this liſt may be added various tranſlations and editions of other writers on Botany, or Materia Medica. A manuſcript of Cluſius on *fungi* is ſaid to exiſt in the library at Leyden. Boiſſard. Haller's Bibl. Botan. Cluſius's works. S.

Clusius, or *Cluſio*, in *Ancient Geography*, now *La Chieſe*, a river of Italy, in Ciſalpine Gaul; which bounded the country of the people denominated "Cenomani," according to Pliny.

CLUSTER, in *Agriculture*, a bunch or number of things of the ſame kind growing or joined together.

Cluster-*Sowing*, that method of ſowing grain, in which a number of corns are placed in the ground together, or in cluſters. See Sowing *of grain*.

Clusters, a word provincially uſed, to imply the bunches or clumps in turnip crops, &c.

Cluster *of Stars*, in *Aſtronomy*. See Nebula and Star.

Cluster-*polype*. See Polype.

CLUTIA, in *Botany*. See Cluytia.

Clutia *androgyna*; Linn. Mant. See Andrachne *fruticoſa*.

CLUVERIUS, or Cluvier, Philip, in *Biography*, a celebrated geographer, born at Dantzic in 1580. The earlier parts of his education he received under the eye of his father, who ſent him to Leyden to finiſh his ſtudies. Here he was intended to purſue the civil law, but ſhowing a decided diſpoſition for geographical ſtudies, he was adviſed by Joſeph Scaliger to devote himſelf chiefly to the advancement of that branch of knowledge. With this view he reſolved to examine for himſelf the Low Countries; but in his way to Brabant, he was robbed, and obliged to return to Leyden. His father abandoned him to want, becauſe he refuſed to purſue the courſe which he had marked out for him in the law; the young man, therefore, had recourſe to the military life, and ſerved in Bohemia two years. He was afterwards impriſoned, on account of a publication relating to ſtate affairs. Upon recovering his liberty he reſumed his geographical purſuits, and travelled into England, France, Germany, and Italy, for the purpoſe of making accurate obſervations of the countries which he meant to deſcribe. He was every where received by literary and learned men, with all the reſpect due to his talents. He ſpoke with fluency ten languages, *viz.* the Greek, Latin, German, French, Engliſh, Dutch, Italian, Hungarian, Poliſh, and Bohemian. On his return to Leyden he taught with reputation, and died at the early age of 43 years. His principal works are, 1. "De Tribus Rheni Alveis;" 2. "Germania Antiqua;" 3. "Italia Antiqua, Sicilia, Sardinia, et Corſica;" 4. "Introductio in Univerſam Geographiam." Moreri.

CLUVESYECK, in *Geography*, a town of Germany, in the duchy of Holſtein; 5 miles E.N.E. of Rendſburg.

CLUVIA, in *Ancient Geography*, a place of Italy, in the country of the Samnites, garriſoned by the Romans.

CLUYTIA, in *Botany*, (named by Boerhaave, in memory of Angerius Clutius, or, in his native language, Antgers Cluyt, profeſſor of botany at Leyden. The name of the genus has uſually been ſpelt Clutius; but profeſſor Martyn has judiciouſly altered it to Cluytia, to make it more diſtinct, in pronunciation, from Cluſia.) Linn. Gen. 1140. Schreb. 1526. Gært. 623. Juſſ. 387. Vent. 3. 489. (Clutelle; Encyc.) Claſs and order, *dioecia gynandria*. Nat. Ord. *Tricoccæ*, Linn. *Euphorbiæ*, Juſſ. *Tithymaloideæ*, Vent.

Gen. Ch. *Male. Cal.* Perianth five-cleft or five-leaved; leaves concave, ſpreading. *Cor.* Petals five, ſpreading very much, about the length of the calyx and alternating with its diviſions; claws flat; ſcales (called by Linnæus exterior nectaries) five, ſmall, trifid, ſpreading, oppoſite to the diviſions of the calyx, placed in a circle within the petals, and about the length of the claws; glands (called by Linnæus interior nectaries) five, ſmall, mellifluous at the tip, placed between the ſcales, oppoſite to the petals. *Stam.* five, ſituated on the upper part of the ſtyle, remote from the corolla, ſpreading horizontally; filaments ſhort; anthers roundiſh, verſatile. *Piſt.* Germ none; ſtyle cylindrical, truncated, very long, bearing the ſtamens. *Female. Cal.* and *Cor.* as in the male, permanent; ſcales or exterior nectaries five, didymous, of the ſame ſize and ſituation as in the male; interior nectaries none. *Piſt.* Germ roundiſh; ſtyles three, bifid, reflexed, the length of the corolla; ſtigmas obtuſe. *Peric.* Capſule globular, ſix-furrowed, ſcabrous, three-celled, *Seeds*, one in each cell, roundiſh, even-ſurfaced, with an appendage at the tip.

Eſſ. Ch. Calyx five-leaved or five-cleft. Corolla five-petalled. Styles, in the female flowers, three. Capſule three-celled. Seeds ſolitary.

Sp. 1. C. *daphnoides.* Lam 1. (Chamœlea; Burm. Afr. 120. tab. 44. fig. 2.) "Leaves nearly linear, narrowed towards the baſe, obtuſe at the tip; younger ones tomentous on both ſides; flowers ſolitary, erect." A ſhrub about two feet high, much branched; branches cylindrical, ſtiff; ſmaller ones leafy, cottony near the ſummit, tubercled below. *Leaves* almoſt ſeſſile, near together, without any regular order, thickiſh, reſembling thoſe of Daphne Cneorum, but ſmaller and leſs ſmooth. *Flowers* axillary, peduncled, generally ſolitary; males ſmaller than the females and leſs erect. A native of Africa, communicated by Sonnerat. 2. C. *alaternioides.* Linn. Sp. Pl. 1. Mart. 1. Lam. 2. (Tithymalus; Pluk. Alm. 369. tab. 290. Chamœlia; Burm. Afr. 116. tab. 43. fig. 1. Alaternoides; Comm. Hort. 2. p. 3. tab. 2.) "Leaves nearly ſeſſile, linear-lanceolate; flowers ſolitary, erect." Linn. "Leaves linear-lanceolate, mucronate, quite ſmooth, cartilaginous and ſcabrous at the margin." Lam. A ſhrub, about two feet high; Lam. (Six or eight; Miller.) *Stems* leafy, almoſt their whole length; branches numerous, on their upper part, commonly ſimple, angular. *Leaves* ſcattered. *Flowers* greeniſh-white, ſmall, axillary, ſolitary, peduncled; males ſmaller, a little pendulous. A native of Africa. 3. C. *polygonoides.* Linn. Sp. Pl. 2. Mart. 2. Lam. 3. (Chamœlea; Burm. Afr. 118. tab. 43. fig. 3.) "Leaves lanceolate; flowers axillary, very numerous." *Leaves* alternate, gradually narrowed to the ſummit, acute, ſmooth, quite entire. *Flowers* ſmall, uſually two together, pendulous. A native of the Cape of Good Hope. 4. C. *pulchella*, Linn. Sp. Pl. 3. Mart. 3. Lam. 4. Gært. tab. 107. Lam. tab. 835. (Frutex Æthiopicus; Comm. Hort. 1. p. 177. tab. 91.) "Leaves egg-ſhaped, quite entire; flowers lateral." A ſhrub, three or four feet high. *Stem* upright, branched at its ſummit, forming a handſome head; branches ſmooth, with a greeniſh bark. *Leaves* an inch broad, alternate, petioled, ſoft, finely dotted underneath. *Flowers* greeniſh-white, axillary, commonly ſeveral together; male ones ſmaller, on peduncles only three lines long; female, on peduncles longer than the petioles. Lam. *Capſule* pedicelled or ſeſſile, globular, ſcabrous, with elevated points, three-furrowed, tricoccous; cocci of the ſubſtance of paper, gibbous on one ſide, angular on the other, ſemi-bivalved, the back of the valves ſeparating ſpontaneouſly from the partitions; partitions membranous, permanent on the axis of the fruit, dark cheſtnut-coloured, ſhining, ſlightly ſerrated on the edges. *Receptacle* central; filiform, covered by the partitions which form ſix membranous roundiſh wings about the axis. *Seeds* dark cheſtnut-coloured, egg-ſhaped, ſmooth, ſhining, with a two-lobed white umbicular gland immediately below the tip on the inſide. A native of Africa. 5. C. *lanceolata*, Mart. 10. Vahl. Symb. 2. 101. Forſkal. Ægypt. 170. "Leaves elliptic-lanceolate; flowers lateral, tomentous." Nearly allied to the preceding, but differs in having the branches purple, and aſh-coloured, villous at the top. *Leaves* broad-lanceolate, two inches long or more, without dots underneath, few above, and viſible only with a magnifier. *Male-flowers* numerous, aggregate, axillary, on very ſhort peduncles; female ones commonly ſolitary, peduncled; calyxes villous-tomentous. *Capſules* not dotted. A native of Ægypt. 6. C. *hirta*, Linn. jun. Supp. 432. Mart. 4. Lam. 9. Vahl. Symb. 2. 101. "Leaves wedge-ſhaped, ſmooth; flowers lateral, glomerate, hirſute." A ſhrub. *Branches* cylindrical, ſmooth, tubercled with the remains of fallen leaves, uſually ſcattered, but ſometimes three together. *Leaves* petioled, reticularly veined. *Flowers* nearly ſeſſile; calyx rough with ſhort hairs; petals oblong, minute, ſmooth; ſtyle trifid, involved in aſh-coloured hairs. Found by Thunberg at the Cape of Good Hope. 7. C. *tomentoſa*, Linn. Mant. 299. Mart. 5. Lam. 5. "Leaves elliptical, tomentous on both ſides." A ſhrub, three feet high, much branched, upright, tubercled with the remains of fallen leaves. *Branches* cylindrical, pubeſcent. *Leaves* the ſize of thoſe of thyme, ſeſſile, rather acute. *Flowers* white, ſeſſile, lateral ſolitary, longer than the leaves; calyx five-toothed, cottony on the outſide; petals oval, the length of the calyx; ſtigma bearded. A native of ſandy ſhores at the Cape of Good Hope. 8. C. *retuſa*, Linn. Sp. Pl. 4. Mart. 6. "Leaves oval, retuſe: flowers racemed, axillary." *Leaves* on ſhort petioles, alternate, the ſize of thoſe of beech, reflexed at the edge, with prominent tranſverſe nerves underneath. *Flowers* very ſmall; racemes axillary, quite ſimple near the ends of the branches; partial peduncles three or four, alternate, filiform; calyx-leaves acute; petals three-toothed; nectaries none, except a ring ſurrounding the receptacle; in the middle a column with five horizontal filaments, and verſatile anthers. A native of the Eaſt Indies. 9. C. *ſquamata*, Lam. 6. (Scherunam-cottam. Rheed. Mal. 2. p. 23. tab. 16. Good. Rai. hiſt. 1623. Corni ſive ſorbi ſpecies; Bont. Jav. 103.) "Leaves elliptical, ſmooth above, pubeſcent and nerved underneath; flowers axillary, ſeſſile, ſquamoſe at the baſe." A ſhrub, ten or fifteen feet high; upper branches ſlender, almoſt filiform, leafy, pubeſcent towards the ſummit. *Leaves* alternate, on ſhort petioles, entire; furniſhed underneath with lateral, oblique, parallel nerves, which are croſſed by other ſmaller ones. *Flowers* axillary, not-racemed, but ſeſſile, and often cluſtered two or three together, ſupported by a ſmall ſomewhat ſpungy knot, which is formed by the ſcales. *Capſules* egg-ſhaped, ſmooth, with three or four cells. A native of the Eaſt Indies, found by Sonnerat and Commerſon. La Marck doubts whether it be not the retuſa of Linnæus; but the deſcriptions are ſo inconſiſtent, that we have thought it beſt to keep them diſtinct, though the ſynonyms, quoted by Linnæus, probably belong to La Marck's plant. 10. C. *eluteria*, Linn. Sp. Pl. 5. Mart. 7. Lam. 8. Woodv. Med. Bot. Supp. Pl. 211. (Eluteria, Hort. Clif. 486. Croton; Brown, Jam. 347. n. 4.? Ricinus. Pluk. alm. tab. 220. fig. 5.) Seba Theſ. 1. tab. 35. fig. 3. "Leaves cordate-lanceolate." A ſmall tree, ſeveral feet high, with numerous branches; bark of the branches brown and ſmooth; that of the trunk externally more white and rough. *Leaves* alternate, on long petioles, obtuſe, bright green above, paler underneath. *Flowers* both of the male and female plants in ſpikes, whitiſh, with all the characters of the other ſpecies; but it is neceſſary to obſerve that Dr. Woodville does not notice the number of ſtamens, which according to Linnæus are ten, and render the real genus of the plant uncertain. There is much confuſion with reſpect to it and croton caſcarilla of Linnæus; the latter of which, a native of the Spaniſh main, has been ſuppoſed by many to afford the medicinal bark, called caſcarilla. But Dr. Woodville poſitively aſſerts, that this drug is the produce only of cluytia eluteria, and is brought to Europe ſolely from the Bahama iſlands. This deſcription and figure are taken from a ſpecimen in the herbarium of Sir Joſeph Banks. In the ſame plate he has figured a branch ſent from Jamaica by Dr. Wright, under the name of croton clutheria, which, in his account of medicinal plants of Jamaica, he ſays, is the ſame as the caſcarilla, or elutheria; but it appears from Dr. Wright's ſpecimens in the herbarium of the preſident of the Royal Society, that his plant is dioicous and truly a cluytia, differing from that of the Bahama iſlands in having broader and more obtuſe leaves. According to Lewis, the cortex caſcarillæ is imported into Europe from the Bahama iſlands, particularly from that which is called elutheria, in curled pieces, or rolled up into ſhort quills about an inch in width; exhibiting, when broken, a ſmooth, cloſe, blackiſh-brown ſurface. Freed from its outer whitiſh coat, which is inſipid and inodorous, it has a light agreeable ſmell, and a moderately bitter taſte, accompanied with a conſiderable aromatic warmth. Its virtues are partially extracted by water, and totally by rectified ſpirit. Diſtilled with water it yields a greeniſh eſſential oil, of a very pungent taſte, and of a fragrant penetrating ſmell, more grateful than that of caſcarilla itſelf. See CASCARILLA. 11. C. *ſtipularis*, Linn. Mant. 127. Mart. 8. Lam. 7. "Leaves oval, tomentous underneath," *Branches* zigzag, tomentous. *Leaves* rather large, quite entire, on ſhort petioles; ſtipules egg-ſhaped, acute, the length of the petioles. *Flowers* dark purple, axillary, ſeſſile, not longer than the ſtipules; calyx one-leafed, campanulate at the baſe, with five acute diviſions, permanent; petals roundiſh, very ſhort, alternately with the diviſions of the calyx; ſtyle columnar, trifid, ſtamens five, fertile and horizontal. A native of the Eaſt Indies. 12. C. *acuminata*, Linn. Supp. 432. Mart. 9. Lam. 10. "Herbaceous; leaves egg-ſhaped, ſmooth, obtuſe, with a point; flowers axillary, ſolitary." A native of the Cape of Good Hope. It reſembles andrachne telephoides.

Propagation and Culture. C. alaternoides and C. pulchella, are eaſily propagated by cuttings during any of the ſummer months. The pots ſhould be plunged into a very moderate hot-bed, till the cuttings have taken root. The plants ſhould afterwards be put ſeparately into ſmall pots, and kept in the open air, in a ſheltered ſituation, till October or later, if the weather prove mild. In winter they require only the ſhelter of the green-houſe, without artificial heat; but ſhould occaſionally be allowed free air, they will otherwiſe grow mouldy and periſh. C. eluteria may alſo be propagated by cuttings during the ſummer, which ſhould be kept in a dry place for a few days before they are planted. It will live through the winter in an airy glaſs-caſe, but muſt be ſparingly watered. In ſummer it requires only to be ſcreened from heavy rain.

CLWYDD, *Vale of*, in *Geography*, a ſingularly beautiful and fertile vale in North Wales, which extends northward from the termination of the Berouin hills, near Llangollen, by Ruthyn and Denbigh, to the ſea beyond St. Aſaph. The breadth of this vale is about three miles, and the length near thirty, and through almoſt the whole of it the two little rivers of the Clwydd and the Elwy run parallel to each other. It is ſeparated by a ridge of mountains from the dreary waſtes which encompaſs it; there is neither mountain nor rock to be ſeen in any part of it, after you turn your back upon Rudland; the hills on one ſide of it riſe very gradually by gentle aſcents: moſt of them are cultivated quite to their ſummits, others half-way up; and when the tops are not encloſed, they are a fine graſſy down, and ſhaded and enlivened with wood. This vale abounds with rich encloſures, farm-houſes, gentlemen's ſeats, pleaſant villages; and its three towns, Ruthyn, Denbigh, and St. Aſaph, ſtand in fine ſituations, about the diſtance of ſix miles from one another.

CLYDE, a large river in Scotland, inferior only to the Tay. The parent ſtream originates from Clydeſlaw, in the pariſh of Crawford, one of thoſe ſtupendous hills that ſeparate the diſtrict of Annandale from Lanarkſhire, near the ſources of the Annan and the Tweed. After paſſing through, and thus dividing the county of Lanark, almoſt 55 miles, the Clyde enters the Frith of Clyde oppoſite to the diſtrict of Carval and the iſland of Bute, in Argyleſhire. It is navigable for ſmall craft only as far as Glaſgow, and 6 miles below that city at Dalmure-burnfoot, the great canal from the Forth joins the Clyde. See CANAL. Part of Lanarkſhire receives the name of Clydeſdale, or Stathclyde, from this river, which it renders more fertile than any other portion of Scotland, and extremely romantic, through its numerous caſcades. Twenty miles from Clydeſlaw, the valley contracts, the banks become ſteep, and the gradual declinations on each ſide of the rivers are adorned with many handſome ſeats, the reſidences of gentlemen who have highly cultivated their lands, and planted the beſt deſcriptions of fruit-trees, which yield abundantly; and their rich meadows are covered with excellent flocks. Bonniton fall, or *linn*, derived from the Gaelic word "leum," *leap*, or *fall*, is ſo termed from an elegant manſion named Bonniton-houſe, ſituated near it; a ſhort and romantic walk on a projecting rock, exhibits the fall of the river over a precipice 12 feet in height, into a hollow den, as Mr. Lockhart expreſſes it in the ſtatiſtical account of Scotland, producing a pleaſing contraſt of foam and miſt, with the placid ſurface above, where the Clyde emerges from beautiful groupes of foreſt-trees. After this deſcent, the ſtream ruſhes with angry impetuoſity over a bed of rocks, bounded on either ſide with crags reſembling ancient walls, from which wild birds fly in rapid ſucceſſion; half a mile below, is the Corra-linn, (derived from an eſtate and caſtle on one of the banks). The ſcenery of this neighbourhood is extremely grand, but the caſcade, as viewed from ſeats placed in various parts of the walks, grouped with tremendous rocks, the caſtle, a corn-mill on a rock below, and rendered more ſublime by the roar of the water ruſhing into an abyſs, is truly aſtoniſhing. Sir James Carmichael, of Bonniton, erected a pavilion on the ſummit of a bank, in 1708, which affords a full view of the linn, and a mirror placed in the uppermoſt room, exhibits the cataract by reflection, as if it were on the point of overwhelming the ſpectator. The deſcent of the Clyde is ſaid to be 84 feet, but there are three inconſiderable breaks in the fall. The miſt from this prodigious body of water aſcends to a very great height, and a perpetual rainbow glides, during the ſhining of the ſun, from place to place, as the air acts on particles of the fluid. A third linn has obtained the name of Dundaff, or Black-caſtle leap, probably from its vicinity to ſome fortreſs now forgot, which ſeems to be corroborated by the tradition, that denominates a rock the patriot Wallace's *chair*, or place of concealment from the Engliſh. Trouts frequently leap up this fall, which is about three feet high. New Lanark, a village, and four cotton-mills, are ſituated near Dundaff linn. Stonybyres linn, receives its name from Stonebyres, an eſtate in the poſſeſſion of Daniel Vere, eſq. This cataract, which is 80 feet in height, and 2 miles below Corra linn, terminates the progreſs of the ſalmon towards the ſource of the Clyde, but their attempts to aſcend it during the ſpawning ſeaſon, are inceſſant; nor is the horſe-muſcle, or pearl-oyſter, though plentiful below the linn, ever found above it. The banks and precipices termed "Cartlane-craigs," are ſaid to be nearly 400 feet higher than its level; and at the bottom flows the Mouſs, a remarkable ſtream, which penetrates the hill of Cartlane, and the ſolid rock, in preference to a more convenient courſe on its very borders. The Clyde, having paſſed Lanark, proceeds to Hamilton and Glaſgow, receiving ſeveral tributary ſtreams, particularly the Avon, and the north and ſouth Calders; beſides which, the Leven enters it at Dumbarton, and the Carl near Renfrew; by theſe means the Clyde expands to the breadth of 2 miles oppoſite Newport, Glaſgow, but the Channel alone is navigable by veſſels of conſiderable burthen; below Greenock it enters the Frith of Clyde. Mr. Lightfoot, who explored the borders of this beautiful river, diſcovered ſome uncommon plants, which he has deſcribed in his "Flora Scotica," but the only mineral found in the neighbourhood, is ſpatum ponderoſum, veins of which interſect the rocks. There are ſeveral ſmall bridges on the Clyde, and one of magnificent deſign at Glaſgow.

There is a light-houſe for the benefit of this navigation, on Little Cambray iſland, oppoſite to the ſouth end of the Iſle of Bute. The tide flows in this river to ſome diſtance above Paiſley. The Ayr rail-way communicates with this river near the town of Ayr. An act paſſed 46 Geo. III. for making and maintaining water-works for ſupplying the town of Glaſgow with water from this river. In 1800, 46 Geo. III. an act paſſed for the Glaſgow and Saltcoats canal, to connect with this river at Androſſan harbour. Mr. Thomas Telford, the engineer, is employed on both theſe works.

CLYDE and FORTH *Canal.* See *Forth* and *Clyde* in our article CANAL.

CLYDON, from κλυζω, *I cauſe to fluctuate*; in *Medical Writers*, is uſed for the fluctuation of food taken into the ſtomach, ariſing from the laxity or weakneſs of its fibres, and of the abdominal muſcles.

CLYMANT, a term uſed by ſome heralds to expreſs a goat ſtanding on his hind legs.

CLYMENE, in *Fabulous Hiſtory*, the name of ſeveral females, the principal of whom were the following; *viz.* a daughter of Oceanus and Tethys, and mother, by Iapetus, of Atlas, Prometheus, &c.:—a nereid, and mother, by Jupiter, of Mnemoſyne:—daughter of Oceanus, and mother, by Apollo, of Phaeton, &c.:—the mother of Homer, &c. &c.

CLYMENEIDES, an appellation of the ſiſters of Phaeton, derived from the name of their mother.

CLYMENUM, in *Botany*, hiſpanicum, ſiliqua articulata, et ſiliqua plana, Tourn. See LATHYRUS *articulatus*, and LATHYRUS *clymenum*.

CLYMENUM *bithynicum, ſiliqua ſingulari*, Boerh. See VICIA *bithynica*.

CLYMENUS, in *Mythology*, a ſurname of Pluto.

CLY-MORE, a great two-handed ſword, formerly uſed by the Highlanders. It was double-edged, and about two inches broad, or about one fifth of an inch broader than the ancient Roman gladius. The length of the blade of the cly-more was about 3 feet 7 inches; and that of the handle about 14 inches. It had a plain tranſverſe guard of about a foot; and the weight of it was about ſix pounds and a half. Theſe ſwords are ſuppoſed by ſome to have been the original weapons of the Engliſh, from the circumſtance of the figure of a ſoldier's being found with one of them among the ruins of London, after the great fire in 1666. Such a ſword muſt have been a very bad and inconvenient weapon, calculated only for giving a falling ſtroke, and that, too, at ſome diſtance, and muſt have been uſeleſs againſt a large ſhield; and ſuch a ſword as the Roman gladius, which was two-edged and ſharp-pointed, peculiarly fitted for ſtabbing, and not above fifteen inches long in the blade.

CLYNDEE *Collieries*, in Langevelach pariſh, near Swanſea in Glamorganſhire, in South Wales, are works, belonging to Lockwood and Co., and famous for the under-ground canal, which conducts to them, being a branch from the Swanſea canal, in Morriſtown, about 3 miles above Swanſea. This canal proceeds about 1000 yards in a north-weſt direction into the hill, along a tunnel 8½ feet high and 5 feet wide, for 4-ton boats; from over this canal-tunnel, a branch of under-ground rail-road, of half a mile long, proceeds along the Clyndee vein of coals, with numerous ſhorter branches of rail-road, to the preſent workings of coals. The communication between the canal and rail-road is made, by means of a perpendicular pit or ſhaft about 20 fathoms deep, through which the coals are let down in baſkets of about 7 cwt. each, to be tipped or emptied into the boats below. The mode in which the deſcent of theſe baſkets is regulated, is curious and ſingular: the rope, which connects the deſcending full baſket and the aſcending empty baſket, winds over a horizontal roller, which connects by means of a toothed wheel with the upright ſhaft of a regulator, conſiſting of boards or arms which lave in the water of a round ciſtern or well, about 8 feet diameter, provided and conſtantly ſupplied with water to the requiſite height, by means of pipes and cocks which bring in or let out water, whenever the coal-baſkets are intended to deſcend ſlower or faſter. This ſimple and effectual mode of regulating, or rather of deſtroying, power in machinery, was contrived by Mr. William Robert, a carpenter in the employ of Lockwood and Co. and was erected in the year 1793; notwithſtanding which, Mr. Anthony George Echardt, in a patent dated 31ſt of January 1795, included this as his invention, and propoſes to apply it for regulating mills, to be worked by men, walking on the outſide or top, nearly of large cylindrical wheels.

CLYOQUOT, in *Geography*, a ſound or bay on the N.W. coaſt of America, weſterly from Berkley's ſound.

CLYPEA, or CLUPEA, a town of Africa, in the preſent kingdom of Tunis, the *Aſpis* of the Grecians, is built upon a ſmall promontory, the Taphitis of Strabo, which being in the figure of a ſhield or hemiſphere gave occaſion to the name. It is five leagues S.E. from the promontory of Mercury or Cape Bon. It is called by Livy, Mela, and Pliny, *Clupea*; by Polybius, Appian, and Agathemerus, *Aſpis*; but by Solinus and the Itinerary, *Clypea*. According to Silius Italicus and Solinus, it was built by the Sicilians; and they add, that its founders called it Aſpis. Strabo repreſents Clupea and Aſpis as one city; but Ptolemy erroneouſly diſtinguiſhes them, and places the cape of Mercurii promontorium between them. This was the firſt place which the Romans took in Africa, in the firſt Punic war. It was formerly an epiſcopal ſee. Nothing now remains of this ancient city, for the caſtle is a modern ſtructure: and what they now call *Clybea* is a collection of miſerable huts or cottages, about the diſtance of a mile from the ſpot where the old city ſtood.

CLYPEARIA, in *Botany*, alba; Rumph. Burm. See ADENANTHERA *falcata*.

CLYPEOLA, (diminutive of Clypeus, a ſhield, ſo called from the ſhape of the ſilicle.) Linn. gen. 807. Schreb. 1082. Willd. 1231. Gært. 819. Juſſ. 240. Vent. 3. 107. (Jonthlaſpi; Tourn. 99.) Claſs and order, *tetradynamia ſiliculoſa*. Nat. Ord. *Siliquoſæ*, Linn.

Gen. Ch. *Cal.* Perianth four-leaved; leaves ovate-oblong, permanent; Linn. (caducous; Lam.) *Cor.* Petals four, oblong, entire. *Stam.* Filaments ſix, ſhorter than the corolla; anthers ſimple. *Piſt.* Germ roundiſh, compreſſed; ſtyle ſimple, ſtigma obtuſe. *Peric.* orbicular, flat, compreſſed, very ſlightly emarginate, erect, deciduous, two-valved. *Seeds* orbicular, ſolitary.

Eſſ. Ch. Silicle emarginate, orbicular, compreſſed, flat, deciduous.

Sp. 1. C. *jonthlaſpi*, Linn. Sp. Pl. 1. Mart. 1. Lam. 1. Willd. 1. Gært. tab. 141. Lam. Ill. tab. 560. fig. 1. (Thlaſp. clypeatum, ſerpylli folio; Bauh. Pin. 107.—Jonthlaſpi: Col. Ecphr. 1. p. 281. tab. 284. Tourn. 210.) Annual treacle muſtard, or buckler muſtard. "Annual; ſilicles orbicular, one-celled, one-ſeeded." *Stems* about five or ſix inches high, ſlender, weak, almoſt ſimple, cloathed with ſhort whitiſh hairs. *Leaves* linear-ſpatula-ſhaped, ſmall, alternate; ſeſſile, glaucous, with minute ſtars of hairs on the ſurface. *Flowers* yellow, ſmall, the ſize of the calyx; in a ſmall terminal ſpike. *Silicle* pubeſcent, ſurrounded by a paler and finely ciliated edge, not opening ſpontaneouſly, but eaſily diviſible into two very thin membranous valves. *Receptacle* none, except a capillary umbilical cord, ſpringing from the margin of one valve, and extending to the centre of the cell. *Seed* elliptic, compreſſed, ſmooth, of a tawny colour. Gært. A native of the ſouth of France, Spain, and Italy. Villars doubts whether it be different from alyſſum minimum of Linnæus. Its filaments have a tooth above the baſe, as in moſt of the alyſſums. Willdenow has made this appendage, the leading eſſential character of that genus, but has, notwithſtanding, admitted maritimum and ſome other ſpecies, which he himſelf acknowledges to have perfectly ſimple filaments. 2. C. *tomentoſa*, Linn. Mant. 92. Mart. 2. (Alyſſum orientale. Ard. Spec. 2. p. 32. tab. 15. fig. 1. Lam. 9. Willd. 11.) Hoary treacle muſtard. "Perennial; ſiliques orbicular, two-celled; one ſeed in each cell." *Root* woody, branched ſtems ſhrubby, diffuſe; leaves hirſutely hoary; lower ones three inches long, half an inch broad, ovate-oblong, ſinuated; ſtem ones alternate, ſeſſile, linear-lanceolate, entire, or finely toothed. *Flowers* yellow, longer than the calyx, terminal and axillary, at firſt in a kind of umbel, but afterwards panicled. *Silicles* inverſely heart-ſhaped, alternate, peduncled. Firſt obſerved in the Levant by Tournefort; cultivated at Venice in 1755 by Arduini, from ſeeds ſent by Leonard Seller. 3. C. *maritima*, Linn. Sp. 2. Mart. 3. (Alyſſum maritimum; Lam. 8. Willd. 2. A. halimifolium; Hort. Kew. 2. 381; Bot. Mag. 101. Thlaſpi; alyſſon dictum maritimum; Bauh. Pin. 107.) Sea treacle muſtard or clowns muſtard. "Perennial; ſilicles two-celled, egg-ſhaped; one ſeed in each cell." *Stems* ſhrubby, much branched, diffuſe, evergreen. *Leaves* linear-lanceolate, quite entire. *Flowers* white, darker in the middle, reſembling thoſe of water-creſſes, with an agreeable honey-like ſmell, calyx deciduous; petals inverſely egg-ſhaped; filaments dark purple, toothleſs; anthers yellow. A native of the coaſt of the Mediterranean. In England, where it is uſually ſown in the rich borders of the garden, it grows ſo luxuriantly, that the ſtems, becoming juicy and tender, are generally deſtroyed by our froſts. It thus becomes an annual from peculiarity of circumſtance. Tournefort, Arduini, La Marck, Gærtner, Juſſieu, Ventenat, and Willdenow, all agree in referring the laſt two ſpecies to alyſſum, on account of their two-celled ſilicle, which Gærtner makes an eſſential character of alyſſum; a circumſtance which we cannot but think fully ſufficient to conſtitute a generic diſtinction; but as they have not been taken up in our firſt volume, we found it neceſſary to introduce them here.

CLYPEOLA *alliacea*, Arduin. Lam. See PELTARIA *alliacea*.

CLYPEOLA *alyſſoides*, Crantz. See ALYSSUM *calycinum*.

CLYPEOLA *annua ſiliculis bilocularibus diſpermis*, Sauv. See ALYSSUM *campeſtre*.

CLYPEOLA *didyma*, Crantz. See BISCUTELLA *lævigata*.

CLYPEOLA *montana*, Crantz. See ALYSSUM *montanum*.

CLYPEOLA *ſiliculis bilocularibus tetraſpermis*, Hort. Clif. See ALYSSUM *calycinum*.

CLYPEUS, or CLYPEUM, *Buckler*; a piece of defenſive armour, which the ancients uſed to carry upon the arm, to ſecure them from the blows of their enemies.

The figure of it was either round, oval, or ſexangular: in the middle was a boſs of iron, or of ſome other metal, with a ſharp point. See SHIELD.

CLYSMA, in *Ancient Geography*, a town and fortreſs of Egypt, ſituated at the bottom of the gulph of Heroopolis, according to Ptolemy, who, as well as the table of Peutinger, diſtinguiſhes this town from Arſinoe. Euſebius ſays expreſsly, that at Clyſma the Iſraelites paſſed the Red Sea. F. Calmet ſays, that this place, in modern times, is called *Colſum*.

CLYSSUS, a term uſed by the old writers in *Chemiſtry* and *Alchemy*, is defined, by Macquer, to be the vapours that ariſe from the detonation of nitre with any inflammable ſubſtance, &c. The clyſſus of nitre is the vapours from nitre and charcoal; the clyſſus of ſulphur, thoſe from ſulphur and nitre, &c. The term is now obſolete.

CLYSTER, or GLYSTER, in *Medicine*, Enema. A clyſter is a liquid medicine applied by injection up the rectum, and is a very ancient, and, in many caſes, a very important form of medicine, though leſs frequently employed in this than in many other countries, where medicine is practiſed as a ſcience.

Clyſters are applied either by a large ſyringe which holds from one to two or more pints of liquid; or, in private practice, generally by means of a ſmall ivory pipe faſtened to, and opening into the middle of, a hog's bladder. To uſe it, firſt ſtop, with a ſmall cork, the end of the pipe which opens into the bladder, then pour into the bladder the liquid intended to be thrown up, and tie it tight that none may ſpill out. Then lay the patient on his belly, and introduce the pipe (previouſly oiled) for an inch or two into the rectum, draw out the cork, which may be eaſily done through the folds of the bladder, and, by preſſing gradually on the bladder, all the liquid will readily paſs up into the rectum. A perſon may readily perform this office for himſelf when uſed to it. The direction in which the pipe is to be introduced is parallel to the ſacrum, being that of the courſe of the lower part of the rectum to the anus.

Clyſters are uſed for ſeveral purpoſes. Moſt commonly they are purgative, and moſt of the liquid cathartics taken by the mouth are alſo ſerviceable as clyſters, obſerving that conſiderably larger doſes may be ſafely uſed by injection. A pint of decoction of chamomile flowers with Glauber's ſalt, or thin gruel and ſalt, electuary of ſenna and milk, or caſtor oil made into an emulſion with egg, are very uſeful mild cathartics, which may be employed in this way, and many others might be enumerated. It is of advantage to employ ſome emollient ſubſtance, combined with the purgative, to defend the inteſtine in ſome meaſure againſt the acrimony of the medicine. Thus, if the electuary of ſenna is uſed, it may be conveniently rubbed up with a little oil, and the whole will then mix uniformly with milk or any other liquid.

When clyſters are employed as purgatives, it muſt be remembered that they cannot paſs higher up than the valve of the colon, and conſequently that they can only act directly upon the large inteſtines. Therefore, they can ſeldom entirely ſupply the place of purgatives by the mouth, which paſs through and excite the whole inteſtinal canal; but they prove moſt uſeful auxiliaries, particularly in thoſe caſes of inteſtinal diſorder that are attended with much vomiting and irritability, where, beſides emptying the lower bowels, they act as topical fomentations, and very often induce eaſe and ſleep when other methods fail. In ſuch caſes, therefore, they ſhould be in pretty large quantity, not very ſtimulating, and as warm as the patient can bear them.

Glyſters are alſo of ſingular ſervice in checking that extreme and painful irritation of the rectum, that attends long continued diarrhœa and dyſentery. In theſe diſorders the great ſuffering of the patient is the inceſſant teneſmus, and diſcharge of bloody mucus from the inteſtine, with extreme pain and irritation. This is often wonderfully relieved by a glyſter made of thin ſtarch, or linſeed tea, or any other mild mucilage, mixed with a few drops of laudanum. The quantity of liquid injected in this caſe ſhould be but ſmall, that it may not ſtimulate the inteſtine merely by its bulk, but the doſe of any opiate, given by glyſter, may in general be three or four times the quantity which, under ſimilar circumſtances of age, conſtitution, &c., would be given by the mouth.

We may mention a few other ſpecific purpoſes for which glyſters have been employed with advantage.

As vermifuges they have a peculiar and local uſe, where the worms are lodged in the lower inteſtines, particularly as very highly ſtimulating medicines are often required to diſlodge theſe troubleſome animals, which, if given by the mouth, might produce a good deal of inconvenience and irritation.

Tobacco infuſion is given by way of glyſter in ſtrangulated hernia, to bring on that extreme ſtate of faintneſs and relaxation which is moſt favourable to the reduction of the hernia.

In uterine or inteſtinal hæmorrhage, reſtringent clyſters, and particularly iced water, are ſometimes of powerful uſe in checking theſe alarming accidents.

Aſafœtida infuſion, and other antiſpaſmodics, were formerly often injected in hyſteria, and other complaints for which this claſs of remedies is employed, but this is little uſed at preſent.

Turpentine mixed with a watery liquid, by the intermede of egg, is often given by clyſter, and in this way it powerfully acts both on the bowels and kidnies, giving that peculiar ſmell to the urine which attends the internal uſe of this remedy.

Laſtly, nutritive ſubſtances are ſometimes given in this way, when, from conſtriction or wounds in the œſophagus, nothing can be taken into the ſtomach. This is, doubtleſs, a very imperfect method of ſupplying the wants of nature, as comparatively only a ſmall quantity of the abſorbents open into the lower inteſtines, but caſes have occurred in which life has been ſupported by this means for many days. The ſubſtances to be injected in theſe caſes, are any of the animal or vegetable liquids and infuſions which are known to afford the moſt nutriment, ſuch as ſtrong broths, milk, jellies, and the like.

CLYSTRUS, in *Ancient Geography*, a town of Aſia, ſituated near the ſea, in a diſtrict of mountainous Cilicia, according to Ptolemy.

CLYTÆ, a people of Macedonia, who furniſhed excellent nitre. Pliny.

CLYTEMNESTRA, in *Fabulous Hiſtory*, the daughter of Jupiter, or of Tyndarus, king of Sparta, by Leda, and wife of Agamemnon. While this prince was at the ſiege of Troy, ſhe had an intrigue with Ægiſthus, whom ſhe engaged to murder Agamemnon on his return. His ſon Oreſtes, however, avenged the death of his father, by killing Ægiſthus, together with his mother Clytemneſtra. See AGAMEMNON and ORESTES.

CLYTHENESS, in *Geography*, a cape of Scotland, in the German Ocean, on the ſouth-eaſt coaſt of the county of Caithneſs. N. lat. 58° 14′. E. long. 0° 10′.

CLYTIA, or CLYTIE, in *Fabulous Hiſtory*, daughter of Oceanus and Tethys, was beloved by Apollo; but afterwards deſerted by him, in conſequence of an amour with Leucothoe, her ſiſter. Clytia diſcovered the ſecret to her rival's father; and on this account Apollo treated her with contempt and abandoned her; ſo that ſhe languiſhed, and, by continually gazing on the ſun, was changed into a ſunflower, which ſtill turns towards the ſun, in token of her love.

CLYTIUS, one of the giants ſlain in the war againſt Jupiter, by Hecate; or, according to Apollodorus, by Vulcan.

CLYTORIS, a beautiful virgin of Theſſaly, deflowered by Jupiter, who, for this purpoſe, aſſumed the form of an ant.

CLYTUS, one of the Centaurs.

CNACADION, in *Ancient Geography*, the name given by Pauſanias to one of the three mountains, between which was ſituated the town of Las. This mountain was in Laconia.

CNACALON, or CNACALUS, a mountain of the Peloponneſus, in Arcadia. Diana had a temple on this mountain, and was worſhipped in it under the appellation of "Cnacaleſia." Pauſanias.

CNAUSON, a town of the Peloponneſus, in Arcadia, which, according to Pauſanias (l. viii. c. 27.), was one of the colonies founded under the auſpices of Epaminondas.

CNECEUS, ſuppoſed to be the *Cnacion* of Plutarch, a river of the Peloponneſus, in Laconia.

CNEMIS, a town of Greece, upon the ſea-coaſt in the Locride, according to Pliny. It is called *Cnemides* by Mela, Ptolemy, and Strabo; the latter of whom ſays, that it was a fortified place, and ſituated oppoſite to the promontory Cænæa, in the iſle of Eubœa.—Alſo, a mountain of the Locride, oppoſite to the ſame iſland, from which the Locrii Epicnemides, who inhabited its vicinity, derived their appellations.

CNEMODACTYLÆUS, in *Anatomy*, a muſcle, otherwiſe called EXTENSOR *tertii internodii digitorum*.

CNEŌRUM, in *Botany*, (Κνεωρον; Hippoc. Theophraſt. Cneorum; Plin. Derivation unknown.) Linn. Gen. 48. Schreb. 65. Willd. 81. Juſſ. 369. Vent 3. 443. (Chamælea; Tourn. 421. Gært. 441. Cameleé; Encyc.) Claſs and order, *triandria monogynia*. Nat. Ord. *Tricoccæ*, Linn. *Terebintaceæ*, Juſſ. Vent.

Gen. Ch. *Cal.* very ſmall, three-toothed, permanent. *Cor.* Petals three, oblong, erect, three times the ſize of the calyx, equal, deciduous. *Stam.* Filaments three, awl-ſhaped, ſhorter than the corolla; anthers ſmall. *Piſt.* Germ. ſuperior, obtuſe, triangular; ſtyle erect, the length of the ſtamens; ſtigma trifid, ſpreading. *Peric.* Berry dry, hard, globularly three-lobed, tricoccous; cocci two-celled, two-ſeeded, (three-berried drupe; Gært.) *Seeds* ſolitary, conduplicate.

Eſſ. Ch. Calyx three-toothed. Petals three, equal. Berry dry, tricoccous.

Sp. C. *tricoccum*, Linn. Sp. Pl. Mart. Lam. Willd. Gært. tab. 70. Lam. Ill. tab. 27. (Chamælea tricoccos; Bauh. Pin. 462. Cam. Epit. 973.) Widow wail, or ſpurge olive. A ſmall ever-green ſhrub, about two feet and a half high; branches compact, well garniſhed with leaves, cylindrical, ſmooth, greeniſh. *Leaves* alternate, ſeſſile, elongated, entire, narrowed at the baſe, a little enlarged towards the ſummit, ſmooth, rather thick, with a ſtrong vein or rib along the middle. *Flowers* pale yellow, ſmall, axillary, on ſhort peduncles, often ſolitary, ſometimes two or three together. Lam. *Fruit* tricoccous, or conſiſting of three ſmall-berried drupes, gibbous on one ſide, angular on the other, joined at a common axis, dark brown when ripe; fleſh thin, green; ſhell bony, thick, nearly globular, wrinkled, marked on the inner ſide with a furrow and umbilical hole, two-celled, without valves; one of the cells placed behind the other, both of them at the ſeat of the radicle, divided by a very ſlender partition, ſo that the upper part of the ſhell appears four-celled. *Receptacle common* filiform, terminated by the ſtyle; *proper* conſiſting of ſmall umbilical cords reaching from the axis of the fruit to the ſeeds. *Seeds* one in each cell, very ſmall, egg-ſhaped, doubled together like a worm, white, with a brown caruncle at the inſertion of the umbilicus. Gært. A native of the ſouth of Europe in dry, rocky ſoils.

CNEORUM. See CONVOLVULUS, and DAPHNE.

Propagation and Culture. This ornamental little ſhrub is hardy enough to bear the cold of our winters, provided it be not rendered too luxuriant by being planted in a very rich ſoil. Its ſeeds ſhould be ſown in autumn, ſoon after they are ripe, in a bed of common earth, and covered half an inch deep. In the autumn following the plants may be removed where they are to remain. They flower in March, and produce a freſh ſucceſſion through the whole of the ſummer. The leaves and fruit are acrid, cauſtic, and violently purgative.

CNEPH, in *Mythology*, denoting *good*, by way of eminence, an appellation under which the ancient Egyptians, particularly in the vicinity of Thebes, honoured the beneficence of the Creator, as they adored his power under the name of *Phtha*, and his wiſdom under that of *Neith*. "The prieſts of Egypt," ſays Euſebius, (Evang. Præp. l. 3.) "call Cneph the architect of the univerſe." Strabo mentions his temple, built in the iſle of Elephantis. The ſymbol of this god, or attribute of the divinity, was a ſerpent, called by the Phœnicians the "Good Genius." To this purpoſe Euſebius obſerves, that "the ſerpent in the middle of a circle, which it touches in the two oppoſite points of its circumference, indicates the Good Genius." For this object they choſe a particular ſort of ſerpent, of which Herodotus (l. ii.) gives the following deſcription. "There are found, in the environs of Thebes, ſacred ſerpents which are not venomous. They have two horns on the top of the head. When they die, they are buried in the temple of Jupiter. The name of Cneph, or Good Genius, was beſtowed on them, as well as on the divinity they repreſented; and the veneration of the people extended no farther than to the image. The temple of Cneph may be regarded as the moſt ancient in the country; and its exiſtence has been alleged, in connection with thoſe of Phtha and Neith, as an evidence that among the Egyptians the worſhip of the Creator, which was one of the dogmas of their religion, preceded every other. Cneph was ſometimes repreſented in the ſhape of a man of a dark-blue complexion, holding a girdle and a ſceptre, with a royal plume on his head, and thruſting forth an egg out of his mouth, whence another God proceeded whom they named Phtha, denominated by the Greeks Vulcan. Theſe hieroglyphics have been thus explained; the intelligent being denoted by them is hidden and inviſible, the giver of life, and the univerſal ſovereign; and his being moved in an intellectual ſpiritual manner, is ſignified by the feathers on his head, and the egg, proceeding from his mouth, is interpreted to be the world.

CNESTIS, in *Botany*, (Κνηϛις, Gr. from Κναω, or Κνεω, ſcalpo; ſo called on account of the prickly capſules which wound the ſkin when rubbed againſt them.) Willd. 911. Juſſ. 374. Vent. 3. 452. (Gratelier; Lam. Encyc.)

Claſs and order, *decandria pentagynia*. Nat. Ord. *Terebintaceæ*, Juſſ. Vent.

Gen. Ch. *Cal.* deeply five-cleft; ſegments oval or oblong, villous on the outſide, coloured within, caducous. *Cor.* Petals five, inſerted into the receptacle, ſometimes ſhorter, ſometimes longer than the calyx, alternating with its diviſions. *Stam.* Filaments ten, attached to the receptacle, a little longer than the petals; anthers round, didymous. *Piſt.* Germs five, ſuperior, egg-ſhaped, very villous; ſtyle ſhort; ſtigma truncated, obſcurely two-lobed. *Peric.* Capſules five, diſtinct, one or more frequently abortive, narrowed towards the baſe, villous, one-valved, opening longitudinally on one ſide like thoſe of ſterculia or apocynum, a little curved. *Seeds* one in each capſule.

Eſſ. Ch. Calyx five-cleft. Petals five. Capſules five, one-ſeeded.

Sp. 1. C. *glabra*, Lam. Encyc. 1. Ill. Pl. 387. Willd. 1. "Leaflets egg-ſhaped, petioled, ſmooth on both ſides; racemes faſcicled, ſhort, ſlender." A tree. *Leaves* ſcattered, ſituated near the ends of the branches, pinnated with an odd one. Common petioles from five to ſeven inches long, cylindrical, ſmooth; leaflets from nine to fifteen, two inches long or more, entire, coriaceous, on very ſhort petioles.

Flowers red or purple, ſmall; racemes numerous, ſcarcely two inches long, cottony, lateral and terminal, corollas open, ſcarcely longer than the calyx. *Capſules* club-ſhaped, curved, ſix or ſeven lines long, ruſſet, covered with an abundant prickly pubeſcence, which wounds the ſkin. A native of the iſles of France and Bourbon. 2. C. *polyphylla*. Lam. 2. Willd. 2. "Leaflets ovate-oblong, ſomewhat villous, on very ſhort petioles; racemes tomentous; capſules very obtuſe." A tree, with the habit of the preceding. *Branches* ſomewhat cottony towards the ſummit. *Leaflets* about ſeventeen, ſometimes ſlightly acuminate, nearly ſmooth above, nerved, and a little villous underneath. *Flowers* rather larger than thoſe of the preceding ſpecies; racemes three inches long or more, a little faſcicled, cottony, axillary, and terminal; petals narrowiſh, longer than the calyx. *Capſules* reſembling thoſe of the preceding, but quite obtuſe. A native of Madagaſcar. 3. C. *corniculata*, Lam. 3. Mart. 3. (Spondioides pruriens; Smeathman, Herb.) "Leaflets oblong-acuminate; middle nerve villous; capſules oblong, acute, horn-ſhaped, tomentous, prurient." *Branches* woody, cylindrical, brown, ſlightly pubeſcent near the ſummit. *Leaves* more diſtant than in the preceding; leaflets about nine, an inch and a half long, entire. *Capſules* four or five, near an inch and a half long. Diſcovered by Smeathman, at Sierra-Leona. 4. C. *trifolia*, Lam. 4. Willd. 4. (Spondioides villoſa; Smeathman, Herb.) "Leaves ternate; leaflets egg-ſhaped, acuminate, even-ſurfaced above, panicle terminal." *Branches* woody, cylindrical, cottony. *Leaves* alternate, ſometimes almoſt oppoſite; petioles three inches long, cylindrical, cottony, leaflets entire, nerved and reticularly veined underneath, ſlightly tomentous; ſtipules ſmall, ſetaceous or filiform. *Flowers* in a looſe terminal panicle; peduncles cottony; bractes ſmall, filiform. *Capſules* club-ſhaped, half an inch long, rather acute at their ſummit, curved, cottony. Found in Africa by Smeathman.

CNICUS, *eriſithales*, *ferox*, *ſpinoſiſſimus*, *centauroides*, *uniflorus*, *cernuus*. Linn. See Carduus, n. 70. 86, 87. 92, 93. 95. —— *acarn.* Linn. See Carthamus *caneſcens*. —— *oleraceus*, *pygmæus*, Linn. See Serratula.

Cnicus *aculeatus purpureus humilior*, Tourn. See Atractylis *humilis*.

Cnicus *ſylveſtris ſpinoſior*, Bauh. Pin. See Carlina *vulgaris*.

Cnicus *cæruleus aſperior*, Bauh. Pin. See Carthamus *cæruleus*.

Cnicus —— *humilis montis lupi*, Herm. See Carthamus *carduncellus*.

Cnicus *creticus*, *atractylidis folio et facie*, Tourn. See Carthamus *creticus*.

Cnicus *dentatus*, Forſk. See Carthamus *dentatus*.

Cnicus *hiſpanicus arboreſcens*, *fœtidiſſimus*, Tourn. See Carthamus *arboreſcens*.

Cnicus *ſativus*, *ſive officinarum*, Bauh. Pin. —— *vulgaris*, Cluſ. See Carthamus *tinctorius*.

Cnicus *caule diffuſo*, *foliis dentato ſinuatus*, Hort. Cliff. See Centaurea *benedicta*.

CNIDINIUM, in *Ancient Geography*, a ſtrong place of Aſia Minor, in Ionia, placed by Diodorus Siculus in the vicinity of the town of Epheſus.

CNIDUS, a town of Aſia Minor, in Caria, in the province called, Doris, at the extremity of a promontory, anciently denominated Triopium, now Cape Crio, having on the north the Ceramic, or Ceraunian bay, and on the ſouth the Rhodian ſea. This ancient city was much celebrated. Venus, its tutelary deity, was worſhipped in this place; and hence ſhe has been called the Cnidian Venus. Her ſtatue, which was reckoned one of the moſt beautiful productions of Praxiteles, was placed here in a temple, which was open on all ſides, ſo that the ſtatue might be every where ſeen; and in whatever point of view it was examined, it excited equal admiration. No drapery veiled its charms; and its beauty was ſo ſingular and extraordinary, that it inflamed with a violent paſſion another Pygmalion, who, in the dark, endeavoured to animate a cold and inſenſible repreſentation of a moſt faſcinating woman, and there left traces of a mad profanation. (Pliny, H. N. l. xxxvi. c. 5.) Nicomedes, king of Bithynia, offered to pay the debts of this city, which were immenſe, in order to obtain this maſter-piece of art; but the Cnidians could not be prevailed upon to part with it. Pliny, who relates the fact, praiſes them for their refuſal to ſurrender an object which immortalized their city, as well as their paſſion for the fine arts. In this place were other ſtatues, which, deſtitute of the perfection and ſeducing graces of the Venus of Praxiteles, contributed no leſs to the public glory and proſperity, by the crowd of ſtrangers who came hither to admire them. Heaps of ruins at this day occupy the place of one of the moſt ſplendid cities of ancient Greece; and the curious are prohibited from digging among them, in order to diſcover fragments of its ancient ſplendour. Independently of a taſte for the arts, the Cnidians had alſo a genius for great enterpriſes. They had reſolved to cut through the baſe of the large promontory which formed their domain, and to convert their peninſula into an iſland. Thus, their ſmall craft would have avoided the long circuit of Cape Triopium, as well as the dangers of the tempeſtuous ſea which breaks upon it; and their country, more inſulated, would have been leſs expoſed to attacks and ſurpriſes from the enemy. But an oracle ſuſpended labours which were likely to conduce to the ſafety and proſperity of the ſtate. It was found that the meaning of the two hexameter verſes, pronounced by the Pythian at Delphi, ſignified that the inhabitants of Cnidus were to leave their iſthmus ſuch as it was; becauſe, if Jupiter had willed it to be an iſland, he would have ſaved them the trouble of making it ſo; an abſurd anſwer, calculated only to divert from the execution of grand projects, and worthy of perſonages who, on myſterious tripods, and in an obſcure language, boaſted of being the interpreters of the gods. The ſhores of Cnidus furniſh now, as in former times, a great abundance of fiſhes, juſtifying the appellation of "Piſcoſam Cnidon," given it by Ovid. The wines of Cnidus were anciently very famous. Theophraſtus (l. vii. c. 4.) ſpeaks of Cnidian onions as of a particular ſpecies; they were very mild, and did not occaſion tears.

CNIZOMENÆ, a people of Aſia, placed by Diodorus Siculus in the vicinity of the Arabian gulf.

CNOPITZ, in *Geography*, a river of Carinthia, which runs into the Drave, about 6 miles S. W. of Saxenburg.

CNOSSUS, in *Ancient Geography*, a town ſituated on the northern coaſt of the iſland of Crete, towards the eaſt, and at a ſmall diſtance from the ſea. According to Strabo (l. x.) it was formerly called Cœratus, or Ceretos, from the name of the river which watered it. This was famous for the reſidence and court of Minos, and as the abode of the moſt wealthy, as well as the moſt powerful and warlike, people of the whole iſland. Strabo ſays, that in extent it was 30 ſtadia. A ſmall village, Cnoſſou, would ſerve to point out the ſcite of the ancient town, if it were not diſcoverable in the rubbiſh which covers it, and a great part of which has ſupplied materials for the building of modern Candia. The port of Cnoſſus was denominated Heracleum.

CNOTHONDORF, in *Geography*, a town of Hungary, 18 miles W. of Tokay.

CNUPHIS, or Chnumis, in *Ancient Geography*, a city of Egypt, S. of Thebes, and on the ſame ſide of the river, ſo called from a god of that name, worſhipped by the inhabitants. See Cneph.

CO, a town of Egypt, and the capital of the Cynopolite nome.

COA, in *Botany*, *ſcandens, fructu trigemino*, Plum. See Hippocratea *volubilis*.

Coa, in *Ancient Geography*, a town of Arabia Felix, near the ſea, and almoſt oppoſite to the iſland of Dioſcorides, according to Ptolemy. It is mentioned in the books of Chronicles and Kings, on occaſion of the horſes with which Solomon was ſupplied by it.—Alſo, a river of Aſia, which had its ſource, according to Ptolemy, in Mount Imaus, and joining the river Suaſte, diſcharged itſelf into the Indus.

Coa, in *Geography*, a river of Portugal, which runs into the Duero; 12 miles S. of St. Joanno de Peſqueira.

COACERVATUM Vacuum. See Vacuum.

COACH, a vehicle for commodious travelling, ſuſpended on leathers, and moved on wheels.

In England, and throughout Europe, the coaches are drawn by horſes, except in Spain, where they uſe mules. In a part of the Eaſt, eſpecially the dominions of the great Mogul, their coaches are drawn by oxen. In Denmark they ſometimes yoke rein-deer in their coaches; though this is rather for curioſity than uſe.

The coachman is ordinarily placed on a ſeat raiſed before the body of the coach. But the Spaniſh policy has diſplaced him in that country by a royal ordonnance; on occaſion of the duke d'Olivares, who found that a very important ſecret, whereon he had conferred in his coach, had been overheard, and revealed by his coachman; ſince that time the place of the Spaniſh coachman is the ſame with that of the French ſtage-coachman, and our poſtillion, *viz.* on the firſt horſe on the left.

If we derive the origin of the modern word *coach*, or *coche*, from *caroche*, or *caroſſe*, and theſe from *caroccio*, we find that this term was known in the 14th century, and was probably invented not merely to deſignate a military machine ſo called, but was adopted from one already in uſe, ſignifying a larger kind of car or waggon. Muratori, in his "Diſſertation on the Military Syſtem of the rude ages in Italy," (vol. i. p. 360.) obſerves, that the inventor of the caroche, introduced after the year 1000, was Eribert, archbiſhop of Milan, in the 11th century, who directed that a ſtandard of the following kind ſhould precede his men as they marched to battle. A tall beam, like the maſt of a ſhip, fixed in a ſtrong waggon, is raiſed on high, bearing on the top a golden ball, with two very white ſtreamers depending from it. In the middle, the holy croſs, painted with the image of our Saviour, with its arms widely ſpread, overlooked the ſurrounding troops, ſo that, whatever ſhould be the event of the combat, they might be comforted with this ſign. This is the undoubted origin of the military caroche, in imitation of which other more powerful cities afterwards formed them with a little variation, in order to ſerve the purpoſes of war. The caroche was uſed not only by the Milaneſe, but alſo by the Bologneſe, Paduans, Veroneſe, Breſcians, Cremoneſe, Placentines, Parmeſans, &c.; and it appears, that in the 13th century the uſe of the caroche was regarded as ſingularly honourable, and of great avail in conquering the enemy. To loſe it was accounted an irreparable diſgrace, as it was the higheſt glory to take that of the adverſary. From Italy the uſe of theſe caroches paſſed into Germany, Flanders, Hungary, and other countries, as Du Cange has remarked; but in the 14th century, when another mode of fighting was introduced, and they were found to be rather an incumbrance than an advantage, they ceaſed to be employed. But to return from this digreſſion to the hiſtory of coaches, more properly ſo called.

Some have thought, from the etymology of the word *coach*, to determine the country in which it was invented. But it would be much more eaſy to aſcertain the origin of the term, if we did but know by whom cloſe-carriages were invented. Menage makes it Latin, and by a far-fetched derivation, traces it from "vehiculum." Junius derives it from οχεω, to carry. Wachter ſeeks its origin in the German word "kutten," to cover; and Lye in the Belgic "koetſen;" to lie along, as it properly ſignifies a couch or chair. The Italian derivation has been already mentioned. Others endeavour to prove, that the word *coach* is of Hungarian extraction, and that it had its riſe from a village in the province of Weiſelburg, which is at preſent called "kitſee," but was formerly known by the name of "kotſee," or "cotzi," and that this travelling machine was even there firſt invented. However this be, it is certain that in the 16th century, or even at an earlier period, a kind of covered carriages was known, under the name of Hungarian carriages.

Beckmann, in his "Hiſtory of Inventions" (vol. i. p. 111, &c.) has taken conſiderable pains to prove, that covered carriages, under different forms and denominations, were uſed among the principal nations of antiquity. Accordingly, he ſays, that the *arcera*, mentioned in the 12 tables, was a covered carriage, uſed by ſick and infirm perſons. This was employed at an earlier period than the ſoft *lectica*, and diſuſed after this was introduced. A later invention was the *carpentum* (which ſee); and at a ſtill later period were introduced the *carrucæ*, concerning which ſo little is known, that antiquaries are not certain, whether they had only one wheel, like our wheel-barrows, or, as is more probable, four wheels. (See Carruca.) In proceſs of time covered carriages became more generally appendages of Roman pomp and luxury; but at length the ſpirit of the feudal ſyſtem for ſome time baniſhed the uſe of them. The feudal lords, conceiving it to be of the greateſt importance that their military vaſſals ſhould ſerve them on horſe-back, were averſe from indulging them with elegant carriages, the prevalence of which would render them indolent, and unfit them for military ſervice. Accordingly perſons of every rank, males and females, clergy and laity, rode upon horſes or mules, and ſometimes upon ſhe-aſſes. The miniſter rode to court, the magiſtrates of the imperial cities to council, even in the beginning of the 16th century, and great lords made their public entry on the moſt ſolemn occaſions on horſe-back. In the accounts of the papal ceremonies that occur, we find no mention of a ſtate-coach, or body-coachman, but merely of ſtate-horſes, or ſtate-mules.

It was neceſſary that a horſe for his holineſs ſhould be of a grey colour, not mettleſome, but a quiet tractable nag; that a ſtool with three ſteps ſhould be brought in order to aſſiſt him in mounting; and the emperor and kings, if preſent, held his ſtirrup, and led his horſe, &c. Biſhops alſo made their public entrance on horſes or aſſes richly decorated. At the coronation of the emperor, the electors and principal officers of the empire were ordered to make their entrance on horſes, and to perform their ſervice on horſeback. Moreover, it was formerly neceſſary, that thoſe who received an inveſtiture ſhould make their appearance on horſeback: the vaſſal was obliged to ride with two attendants to his lord's court, where, having diſmounted from his horſe, he received his fief. Covered carriages, however, were known in the principal ſtates of Europe, in the 15th and 16th centuries; but they were at firſt uſed by women of rank, and the men thought it diſgraceful to ride in them. At this period, when the electors and princes did not chuſe to be preſent at the meetings of the ſtates, they excuſed themſelves by informing the emperor that their health would not permit them to ride on horſeback; and it was conſidered as unbecoming for them to ride like women. In the year 1544, when count Wolf of Barby was ſummoned by John Frederic, elector of Saxony, to go to Spires, to attend the convention of the ſtates aſſembled there, he requeſted leave, on account of his ill ſtate of health, to make uſe of a cloſe carriage with four horſes. The uſe of covered carriages was for a long time forbidden even to women. In the year 1545, the wife of a certain duke obtained from him, with great difficulty, permiſſion to uſe a covered carriage in a journey to the baths, with this expreſs ſtipulation, that her attendants ſhould not have the ſame indulgence. It is nevertheleſs certain, that the emperors, kings, and princes, about the end of the 15th century, began to employ covered carriages on journies, and afterwards on public ſolemnities. Indeed, in the account of Don Ambroſe Travaſari's embaſſy, in 1433, we are informed that he made his entry into Mantua in a coach, *(un nobil cocchio tirato du ſpiritoſi deſtrieri.)* In 1474, the emperor, Frederic III, viſited Frankfort in a cloſe carriage; and in the following year he came into the ſame city in a very magnificent covered carriage. In the deſcription of the ſplendid tournament held by Joachim, elector of Brandenburg, at Ruppin in 1509, the electreſs appeared in a carriage all over gilt, accompanied by twelve other coaches, ornamented with crimſon, and another of the ducheſs of Mecklenburg, which was hung with red ſatin. At the coronation of the emperor Maximilian, in 1562, the elector of Cologne had twelve carriages; and in 1594, when the margrave John Sigiſmund did homage at Warſaw, on account of Pruſſia, he had in his train thirty-ſix coaches with ſix horſes each. Count Kevenhiller (cited by Beckmann,) deſcribing the marriage of the emperor Ferdinand II. with a princeſs of Bavaria, ſays, "the bride rode with her ſiſters in a ſplendid carriage ſtudded with gold; her maids of honour in carriages hung with black ſatin; and the reſt of the ladies in neat leather carriages." The ſame author mentions the entrance of cardinal Deitrichſtein into Vienna in 1611, and tells us that forty carriages went out to meet him. At the election of the emperor Matthias, the ambaſſador of Brandenburg had three coaches, which were conſtructed in a coarſe manner, of four boards clumſily put together. When the conſort of that emperor made her public entrance, on her marriage in 1611, ſhe rode in a carriage covered with perfumed leather. Mary, infanta of Spain, conſort of the preceding emperor, Ferdinand III., rode, in Carinthia, in 1631, in a glaſs carriage, in which no more than two perſons could ſit. The wedding-carriage of the firſt wife of the emperor Leopold, who was alſo a Spaniſh princeſs, coſt, together with the harneſs, 38,000 florins. The coaches uſed by that emperor are thus deſcribed; "in the imperial coaches no great magnificence was to be ſeen; they were covered over with red cloth and black nails. The harneſs was black, and in the whole work there was no gold. The pannels were of glaſs, and on this account they were called the imperial glaſs coaches. On feſtivals the harneſs was ornamented with red ſilk fringes. The imperial coaches were diſtinguiſhed only by their having leather traces; but the ladies in the imperial ſuite were obliged to be contented with carriages, the traces of which were made of ropes." At the magnificent court of duke Erneſt Auguſtus, at Hanover, there were in the year 1681, fifty gilt coaches with ſix horſes each. The firſt time that ambaſſadors appeared in coaches, in a public ſolemnity, was at the imperial commiſſion held at Erfurth, in 1613, reſpecting the affair of Juliers.

In the hiſtory of France we find many proofs, that at Paris, in the 14th, 15th, and even the 16th centuries, the French monarchs rode commonly on horſes, the ſervants of the court on mules, and the princeſſes, together with the principal ladies, ſometimes on aſſes. In 1534, queen Eleonora and the princeſſes rode on white horſes, during a ſacred feſtival; and that private perſons, *e. g.* phyſicians, uſed no carriages in the 15th century, has been inferred from the principal entrance to their public ſchool, which was built in 1472, and which was ſo narrow, that a carriage could not paſs through it, though it was one of the wideſt exiſting at that period. In Paris alſo, at all the palaces and public buildings, they had ſteps for mounting on horſeback, ſuch as thoſe which the parliament cauſed to be erected in 1599. However, carriages appear to have been uſed at an early period in France. An ordinance of Philip the Fair, iſſued in 1294, for ſuppreſſing luxury, and in which the wives of the citizens are forbidden to uſe carriages (cars), is ſtill preſerved. Coaches or chariots are ſaid to have been in uſe at the duke of Burgundy's court ſo early as 1445. (See Palaye's "Memoires ſur l'Ancienne Chevalerie.") Under Francis I., or rather about 1550, ſomewhat later, there were at Paris, for the firſt time, only three coaches; one of which belonged to the queen, another to Diana de Poictiers, the miſtreſs of two kings, Francis I. and Henry II., by the latter of whom ſhe was created ducheſs of Valentinois, and the third to René de Laval, lord of Bois-Dauphin, who, being a corpulent unwieldy nobleman, was not able to ride on horſeback. Others ſay, that the three firſt coaches belonged to Catherine de Medicis, Diana ducheſs of Angoulême, the natural daughter of Henry II., who died in 1619, and Chriſtopher de Thou, firſt preſident of the parliament, the latter of whom was troubled with the gout; but his wife came to Paris on horſeback. The other miniſters of ſtate ſoon followed his example. Henry IV. was aſſaſſinated in a coach, but he uſually rode through the ſtreets of Paris on horſeback, and had only one coach for himſelf and his queen. We find, however, two coaches at the public ſolemnity on the arrival of the Spaniſh ambaſſador, Don Peter de Toledo, under the reign of this king. The coaches uſed at this time were not ſuſpended by ſtraps; they had a canopy ſupported by ornamented pillars; and the whole body was ſurrounded by curtains of ſtuff or leather, which might be drawn up. If Henry's coach had been furniſhed with glaſs, it is probable that he would not have been murdered. Baſſompiere, in the reign of Louis XIII., is ſaid to have been the firſt who projected a ſmall coach with glaſſes: and the coach in which Louis XIV. made his public entrance about the middle of the 17th century, appears to have been a ſuſpended carriage. The inventor of this very material improvement, or that of ſuſpending the body of the carriage from elaſtic ſprings, cannot be aſcertained. This is the only information relating to it that occurs, unleſs we allow that the firſt word of the following expreſſion, "branlant et moult riche," which is applied to the carriage preſented to the queen of France, in 1457, by the ambaſſador of Ladiſlaus V., king of Hungary and Bohemia, indicates that the carriage was ſuſpended.

Twiſs, in his "Travels through Spain and Portugal," ſays, that coaches were ſeen for the firſt time in Spain in the year 1546. To this purpoſe it is obſerved by Don Lorenzo Vander Hamin and Leon, in the firſt book of Don John of Auſtria's life, that Charles Pubeſt, a ſervant of Charles V. king and emperor, came in a coach or chariot, a thing rarely ſeen in theſe kingdoms. Whole cities ran out to ſtare at it, for at that time they only made uſe of carts drawn by oxen, and in them were ſeen the moſt conſiderable perſons even of the court. Within a few years, about three ſcore and ten, it was found neceſſary to prohibit coaches by royal proclamation. In Madrid, it is ſaid, there are from four to five thouſand gentlemen's carriages.

Towards the end of the thirteenth century, when Charles of Anjou made his entrance into Naples, the queen of Naples rode in a carriage, called by hiſtorians "caretta," the outſide and inſide of which were covered with ſky-blue velvet, interſperſed with golden lilies. From Naples the luxury of carriages ſpread over all Italy.

England lays claim to a very early uſe of coaches; but whatever may be the denomination under which they are mentioned, it is moſt probable that the ancient vehicles of this kind were merely cars, or a ſuperior ſort of waggons. From the life of St. Erkenwald, in ſir William Dugdale's hiſtory of St. Paul, he appears to have uſed ſomewhat approaching to their conſtruction, or a ſort of chaiſe with wheels, in which he preached when he was old and infirm. This muſt have been as early, at leaſt, as the year 675. Brooke, in his "Catalogue and Succeſſion of Dukes, Earls, &c." ſays, that William de Ferrars, earl of Derby, died of a bruiſe occaſioned by a fall from his coach in 1253. Mr. Dallaway, in his "Inquiry into the Origin of Heraldry," cites a manuſcript regiſter of the abbey of Glouceſter, preſerved in the archives of Queen's college, Oxford, which ſtates the manner of conveying the body of Edward II., from Berkeley caſtle; "Iſte tum abbas ſuo curru, honorificè ornato cum armis ejuſdem eccleſiæ depictis, &c.;" and from which citation he infers that arms were painted at this early period on carriages and domeſtic furniture. From Stowe's ſurvey of London, we learn, that the oldeſt carriages uſed by the ladies in England were known under the now obſolete name of "whirlicotes." When Richard II., towards the cloſe of the 14th century, was obliged to fly from his rebellious ſubjects, he, and all his followers, were on horſeback; but his mother, who was ſick and weak, rode in a carriage. But this became afterwards unfaſhionable; for that monarch's queen, Anne, the daughter of the king of Bohemia, ſhewed the Engliſh ladies how gracefully and conveniently ſhe could ride on a ſide-ſaddle; and, therefore, whirlicotes and chariots were diſuſed, except at coronations and other public ſolemnities. In 1471, after the battle of Tewkeſbury, which decided the fate of king Henry VI. and that of the houſe of Lancaſter, when others fled in different directions, the queen was found in her chariot, almoſt dead with ſorrow. (Hall's Chronicle.) In 1487, on occaſion of a grand celebration of the feaſt of St. George, at Windſor, in the third year of king Henry VII., the queen and the king's mother rode in a chaiſe, covered with a rich cloth of gold, drawn by ſix courſers, harneſſed with the ſame cloth of gold; and 21 ladies, habited in crimſon velvet, rode on white palfreys. (Aſhmole's Order of the Garter.) In the Northumberland houſehold-book, the duke's chapel-ſtuff is ordered to be ſent before by my lord's chariot; which uſe of it, about the year 1512, indicates that it bore little reſemblance to the modern carriage of that name. In the proceſſion of the funeral of Thomas Howard, duke of Norfolk, 1524, the body laid in a chariot was drawn by horſes richly capariſoned; and before it, in its way to Thetford, where he was buried, went three coaches of friars. Holinſhed ſays that queen Elizabeth uſed a chariot at a very early period (1558) of her reign. From theſe and many ſimilar inſtances that might be cited, we may eaſily conjecture what kind of vehicle was the ancient coach. In every period of Engliſh hiſtory chairs and horſe-litters, or hanging-waggons, occur, and they appear to have been the moſt eaſy and commodious machines for conveyance with which our anceſtors were acquainted. Stowe, in his "Summarie of the Engliſh Chronicles," cited by Strutt, in his "Manners and Cuſtoms of the Engliſh," vol. ii., ſtates, that, in 1555, Walter Ripon made a coach for the earl of Rutland, which was the firſt that was ever uſed in England; and, in 1564, the ſame Walter made the firſt hollow turning-coach, with pillars and arches, for her majeſty; and again, in 1584, he made a chariot-throne, with four pillars behind, to bear a canopy with a crown imperial on the top, and before, two lower pillars, on which ſtood a lion and a dragon, the ſupporters of the arms of England. From Stowe's large chronicle we learn, that in the year 1564, Guylliam Boonen, a Dutchman, became the queen's coachman, and that he was the firſt that brought the uſe of coaches into England. Soon after, within the period of 20 years, they became common among the nobility and other perſons of rank. About this time it is ſaid long waggons, conveying paſſengers and commodities, were introduced. Anderſon, in his "Hiſtory of Commerce," ſays that coaches were firſt known in England about the year 1580, and that they were introduced from Germany by Fitz-Allen, earl of Arundel. He adds, from Stowe, that they were in general uſe by the nobility and gentry about the year 1605. But Mr. Strutt informs us, that it was a long time after the invention of coaches before a coach-box was added to the body; "for the coachman joineth a horſe fixed to match a ſaddle-horſe to the coach-tree; then he ſitteth upon the ſaddle; and when there are four horſes he drove thoſe which went before him, guiding them with a rein." In the year 1598, when the Engliſh ambaſſador went to Scotland, he had a coach with him. The duke of Buckingham, the unworthy favourite of two kings, was the firſt perſon who rode with a coach and ſix horſes, in 1619; in ridicule of which novel pomp, the earl of Northumberland put eight horſes to his carriage.

Towards the end of the 16th century, John of Finland, on his return from England, among other articles of luxury, brought with him to Sweden the firſt coach. Before that period, the greateſt lords in Sweden, when they travelled by land, carried their wives with them on horſeback, and the princeſſes travelled in the ſame manner.

In Dâ Roches's "Hiſtory of Denmark," there are two paſſages, in which coaches are mentioned as exiſting in that country in the time of Chriſtian II. about the year 1515; but, perhaps, they merely mean the covered carts which are ſtill uſed in Weſtphalia and its neighbourhood.

It appears that in the capital of Ruſſia there were elegant coaches as early as the beginning of the 17th century. At Amſterdam coaches with wheels were prohibited in the year 1663, in order to ſave the expenſive pavement of the ſtreets, for coaches there, even in ſummer, are placed upon ſledges as thoſe at Peterſburg are in winter. Many attempts have been made to ſuppreſs the uſe of coaches. The feudal nobility and vaſſals on the continent were forbidden the uſe of coaches, under pain of incurring the puniſhment of felony. In 1588, duke Julius of Brunſwick publiſhed an order, prohibiting his vaſſals to ride in carriages; and in 1608, Philip II., duke of Pomerania-Stetten, reminded his vaſſals, that they ought not to make ſo much uſe of carriages as of horſes. Theſe prohibitions, however, have been of no avail; and coaches became common all over Germany.

Louis XIV. of France, made ſeveral ſumptuary laws for reſtraining the exceſſive richneſs of coaches, prohibiting the uſe of gold, ſilver, &c. therein, but they have had the fate to be neglected.

Coaches may be divided into two kinds; thoſe that have iron bows, or necks, and thoſe that have not; both the one and the other have two principal parts, the body, and the train, or carriage. The *body* is that part where the paſſengers are diſpoſed; and the *carriage* is that which ſuſtains the body, and to which the wheels are faſtened, that give motion to the whole machine.

There have been various contrivances among coach-makers to enable coaches, and other four-wheeled carriages, to turn ſhorter than the common coaches, without the fore wheels touching the perch. The moſt common and effective among theſe, is a contrivance called the *crane-neck*, a repreſentation of which is given in *Plate* XIII. *fig.* 1. of *Mechanics*. In the place of the common ſingle perch or pole, which connects the two axletrees together, two iron perches, A, A, are ſubſtituted; they are firmly attached to a ſtout piece of wood, B, by bolts and ſcrews; this piece, which carries the two ſprings, D, D, at its ends, has another, E, halved into it at right angles, that ſupports, at its end, a third beam, F, parallel to the firſt, the uſe of which is to hold iron braces, *b*, *b*, for the ſprings, and to ſtrengthen the perches A, A, which are connected to it by ſcrew-bolts at the place where they croſs each other. The perch-bolt, *a*, round which the fore-axle moves as a centre, when the coach is in the act of turning, paſſes through the interſection of the pieces B and E, and alſo through the axletree G. H is an iron circle concentric with the perch-bolt, firmly fixed to the axletree, on which the ends of the pieces B and E reſt, ſo as to guard againſt the perch-bolt being broken or bent by any ſudden jerk when the carriage is turning. The remainder of the carriage is made in the common way, and the improvement conſiſts in bending the two perches, A, A, upwards, ſo that the fore wheels can turn under them, and might be made to turn quite round, if neceſſary.

Fig. 2, repreſents a contrivance of Mr. Jacob, of Greek-ſtreet, Soho-ſquare, for the ſame purpoſe. A is the perch, as in a common coach, B the piece carrying the ſprings, and F the piece ſupporting their braces, bolted acroſs the perch at right angles; *a* is the perch-bolt, which does not paſs through the axletree itſelf, but through a piece of wood, G, projecting perpendicularly from the middle of the axletree, about half the diameter of the fore-wheels, and is firmly fixed to it by bolts and ſtraps of iron; the axletree, H, is ſtraight on the upper ſide, and has a ſtraight edge of iron ſcrewed on the top of it, on which the end of the perch, A, is ſupported; the under ſide of the perch is alſo faced with iron, where it lies upon the axletree. It is evident, from the drawing, that by removing the perch-bolt to a diſtance from the axletree, by means of the piece G, the axletree may be turned round much nearer into a line with the perch, without either of the wheels touching it, than it could do, if the perch-bolt went through the middle of it, as in the common way. By this contrivance, though it does not poſſeſs all the advantages of the crane-neck, coaches may be made to turn much ſhorter than the common ones, without any increaſe of expence in their conſtruction.

Coaches are diſtinguiſhed, with regard to their ſtructure, into *coaches*, properly ſo called, *chariots*, *calaſhes*, and *berlins*. With regard to the circumſtances of their uſe, &c. we diſtinguiſh *ſtage-coaches*, *hackney-coaches*, &c.

Chariot, or *Half*-Coach, is a kind of coach that has only a ſeat behind, with a ſtool, at moſt, before. When theſe are very gay, richly garniſhed, and have five glaſſes, they are called Calashes.

By 43 Geo. III. c. 161. repealing former acts, the following duties are impoſed on carriages, to take place from April 5, 1804, and they are levied under the proviſions of the 43 Geo. III. c. 99, and by 45 Geo. III. c. 15, &c. *viz.* for one carriage with four wheels, the annual ſum of 11*l.*; for two ſuch carriages, 24*l.* 4*s.*; for three, 39*l.* 12*s.*; for four, 55*l.*; for five, 71*l.* 10*s.*; for ſix, 89*l.* 2*s.*; for ſeven, 107*l.* 16*s.*; for eight, 127*.l.* 3*s.*; for nine 148*l.* 10*s.*; and an additional 16*l.* 10*s.* for every other carriage: and for every additional body, ſucceſſively uſed on the ſame carriage or number of wheels, the further ſum of 15*s.* 6*d.*:—For every carriage with leſs than four wheels (tax-carts excepted) drawn by one horſe, 5*l.* 15*s.* 6*d.*; and drawn by two or more horſes, 8*l.* 1*s.* 8¼*d.*; and for every additional body, ſucceſſively uſed on the ſame carriage or number of wheels, the further ſum of 2*l.* 15*s.*:—For every carriage, kept for the purpoſe of being let to hire, for any period not exceeding 28 days, ſo that the ſtamp-office duty, payable by law on horſes let to hire, ſhall be duly paid and ſatisfied on every ſuch letting by a licenſed perſon, if ſuch carriage have four wheels, as above; if it have leſs than four wheels, the reſpective ſums above mentioned in the caſe of the ſame carriages:—all which duties ſhall be reſpectively paid by the perſon keeping the ſame:—For every carriage kept for the purpoſe of being let to hire, for any period of time leſs than one year, and in ſuch manner, that the ſaid ſtamp-office duty ſhall not be payable to ſuch letting by any ſuch licenſed perſon, if the carriage ſhall have four wheels, the annual ſum above ſtated; and if ſuch carriage have leſs than four wheels, the reſpective ſums above mentioned. Poſt chaiſes are chargeable with eight guineas each. By 43 Geo. III. c. 161, the following new duties are to be paid by coach-makers, and on carriages built for ſale, in lieu of the duties thereby repealed; and alſo the new duties on perſons vending ſuch carriages by auction or commiſſion: *viz.* by every perſon who ſhall carry on the trade of a coach-maker, &c. the annual duty of 5*s.*; by every ſuch coach-maker for every carriage with four wheels, made for ſale, 1*l.*, and for every ſuch carriage with two wheels, 10*s.*:—By every perſon who ſhall ſell any carriage chargeable with duty by this act, by way of auction or commiſſion, the annual duty of 5*s.*; by every ſuch perſon for every ſuch carriage with four wheels, which he ſhall ſell by auction or commiſſion, 1*l*, and for every ſuch carriage with two wheels, ſo ſold, 10*s.* Perſons who have kept any carriages in the year ending on the days appointed for the commencement of the duties in 1804, are to return liſts to the aſſeſſors; and perſons beginning or ceaſing to keep carriages, or to carry on the trade of coach-makers, are to give notice of the ſame. Coach-makers are required to keep accounts of carriages built or ſold by auction or on commiſſion. The aſſeſſors, &c. to whom ſuch accounts are delivered, ſhall certify the ſame to commiſſioners.

The number of coaches made in England in the year 1793, is ſaid to have amounted to 40,000, more than half of which were exported. By the yearly accounts of the net produce of the permanent taxes, it appears that the duty on four-wheeled carriages (excluſive of hackney coaches) amounted in the year 1803 to 184,389*l.* 5*s.* 7½*d.* and in 1804, to 172,013*l.* 5*s.* 5½*d.*; and the duty on two wheeled carriages, to 90,090*l.* 2*s.* 7¾*d.* and 119,866*l.* 11*s.* 5½*d.* reſpectively: and the amount of the duties on both ſorts of carriages was 260,589*l.* 13*s.* 9½*d.* in 1805, 260,088*l.* 4*s.* 7½*d.* in 1806, and 302,349*l.* 3*s.* 2*d.* in 1807 reſpectively. The duties upon hackney coaches and chairs amounted in 1806 to 24,325*l.* 2*s.* and in 1807 to 25,857*l.*

Coaches, *Hackney*, thoſe expoſed to hire in the ſtreets of London, and ſome other great cities, at rates fixed by authority.

Theſe firſt began to ply in the ſtreets of London, or rather waited at inns, in 1625, and were only twenty in number; but they were ſo much increaſed in 1635, that king Charles iſſued an order of council for reſtraining them. In 1637, 1637, he allowed fifty hackney-coachmen, each of whom might keep twelve horſes. In 1652 their number was limited to two hundred, and in 1654 extended to three hundred, for which 600 horſes were employed. In 1661 four hundred were licenſed at 5*l.* annually for each. In 1694 ſeven hundred were allowed, and taxed by the 5 and 6 W. and M. at 4*l.* per annum each.

By 9 Anne, cap. 23, the king may appoint commiſſioners, not exceeding five in number, for regulating hackney-coaches within the bills of mortality; and by this ſtatute eight hundred hackney-coaches were allowed in London and Weſtminſter; but by 11 Geo. III. cap. 24, the number was increaſed to one thouſand; and by 42 Geo. III. c. 78. one hundred more was added, which are to be licenſed by the commiſſioners, and pay a duty of 5*s.* per week (9 Anne. c. 23.) and an additional duty of 5*s.* per week (24 Geo. III. ſeſſ. 2. c. 27.) for each licence to the crown, to be paid monthly: and if any perſon drive or let to hire a hackney-coach without licence, he ſhall forfeit 5*l.* The commiſſioners may appoint inſpectors to ſee that licenſed perſons provide ſafe and clean coaches and ſufficient horſes, and ſuſpend the licence of any perſon whoſe coach or horſes ſhall be found defective (39 and 40 Geo. III. §74.); nor ſhall any horſe be uſed with any hackney-coach under the height of 14 hands (9 Anne. c. 23.). By the ſame ſtatute every coach is to have a diſtinct mark or number on both ſides, which is not to be altered under penalty of 5*l.* No unlicenſed coaches ſhall ply at funerals for hire, or without having a number fixed on the fore-ſtandard, ſhewing it to be licenſed, on pain of 5*l.* 1 Geo. c. 57. 24. Geo. III. ſeſſ. 2. c. 27. By 1 Geo. c. 57. refuſing any perſon to take the number of the coach, or giving a wrong number, incurs the forfeiture of a ſum not exceeding 40*s.* By 11 Geo. III. c. 28. every hackney-coach is to be provided with checque-ſtrings, and plying without them incurs a penalty of 5*s.*; and by 1 Geo. c. 57. drivers of hackney-coaches are to give way to perſons of quality and gentlemen's coaches, under penalty of 10*s.*

By 39 and 40 G. III. c. 47. the fares on hackney coaches allowed by 26 G. III. c. 72. are repealed, and the following fares are to be taken in lieu thereof: namely, between ſix in the morning and twelve at night for every diſtance not exceeding one mile 1 *s.* and for every further diſtance not exceeding half a mile 6 *d.* and increaſing 6 *d.* for every half mile ſuch coach ſhall go farther. ſ. 1.

And as to time, for every coach kept in waiting between ſix in the morning and twelve at night, for not exceeding 40 minutes 1 *s.* and for any further time not exceeding 20 minutes 6 *d.* and ſo on during the whole time ſuch coach ſhall be engaged, computing at the rate of 6 *d.* for every 20 minutes.

And for every coach hired where there is a regular continuation of carriage-way pavement, or at any ſtand beyond ſuch continuation, and taken to, and diſcharged at any place from which the ſame cannot be driven to the neareſt continuation of ſuch carriage-way pavement, or ſuch ſtand, before ſun-ſet, (eſtimating the rate of driving at five miles an hour,) then one half part of the fare hereby allowed for ſuch diſtance as ſuch coach can be ſo driven towards ſuch neareſt pavement before ſun-ſet, ſo as no fraction of any ſum leſs than 6 *d.* ſhall be payable by reaſon of ſuch half rate; and the full rate hereby allowed ſhall be paid for ſuch diſtance as ſhall remain for ſuch coach to be driven at the rate aforeſaid to ſuch pavement after ſun-ſet, or where ſuch coach ſhall have been hired at any ſtanding beyond ſuch pavement, then to ſuch ſtanding or to the neareſt pavement, at the option of the perſon diſcharging ſuch coach.

And every coach hired for a day not exceeding 12 hours, and to end before 12 o'clock at night, and the diſtance not to exceed 20 miles, ſhall be paid 18 *s.* for ſuch day's work, and for any further time or diſtance or if after 12 at night, ſuch further rate for ſuch time or diſtance as is allowed for any further time or diſtance of the like nature by this act: And alſo if any ſuch coach ſhall be taken to and diſcharged at any place exceeding one mile from where there is a regular carriage-way pavement, ſo as that ſuch coach cannot be driven to ſuch pavement within ſuch 12 hours, or before 12 at night; or where the diſtance where ſuch coach ſhall be diſcharged, added to the diſtance ſuch coach ſhall have been driven, ſhall in the whole exceed 20 miles, then ſuch further additional rate as is herein allowed for any further time or diſtance of the like nature.

And for every ſuch coach which ſhall be hired or kept in waiting after twelve at night or before ſix in the morning, or ſhall be diſcharged at any ſuch time and place that it cannot be driven to ſome regular carriage-way pavement before twelve at night, an additional fare for ſuch time or diſtance as aforeſaid, over and above the rate before mentioned, of 6 *d.* upon every 1 *s.* but ſo that ſuch additional rate ſhall not be taken for any ſuch coach hired between ten and twelve o'clock at night, unleſs the rate, according to the time for which ſuch coach ſhall be kept, or the diſtance ſuch coach ſhall be taken, ſhall according to the rates aforeſaid amount to 2 *s.* or upwards, although ſuch coach ſhall not be diſcharged till after twelve at night.

And when the average price of oats computed according to 31 G. III. c. 30. ſhall exceed 25 *s.* per quarter, the commiſſioners for licenſing hackney coaches may allow additional fares to be taken, *viz.* 6 *d.* on every 2 *s.* fare: 1 *s.* on every 4 *s.* fare, and ſo 6 *d.* additional on every additional 2 *s.* provided the coach goes or is kept to the full amount of the fare; and ſuch additional rates may be continued till 30 days after oats are reduced to one guinea per quarter. ſ. 2, 3.

Every licenſed coachman, plying for hire, within the cities of London and Weſtminſter, or the ſuburbs thereof, or elſewhere within the bills of mortality, ſhall be obliged and compellable, on every day of the week, at ſeaſonable times, to go any where within the diſtance of ten miles from either of the ſaid cities. 7 G. III. c. 44. ſ. 12. 12 G. III. c. 49, ſ. 1.

No perſon who ſhall regularly uſe ſuch hackney coach as a ſtage coach to and from any of the towns or places in the neighbourhood of London or Weſtminſter, ſhall be obliged to carry any fare out of the ordinary courſe of his ſtage work or duty; provided that he do, by painting in legible characters, on the door of ſuch coach, or on a board to be affixed on ſuch door, plainly denote and diſtinguiſh the ſame to be a ſtage coach to and from any ſuch town or place. 12 G. III. c. 49. ſ. 2.

If any hackney coachman ſhall refuſe to go at, or exact more for his hire, than according to the above act, or bye-laws; he ſhall forfeit a ſum not exceeding 3 *l.* nor under 10 *s.* 1 G. ſt. 2. c. 57. ſ. 2.

And every hackney coachman where coaches are ſtanding, ſhall be compellable to go with any perſon when deſired, and on refuſal, (unleſs he prove being hired) ſhall be liable to the like penalties as perſons refuſing to carry for hire, by any law now in being. 39 and 40. G. III. c. 48. ſ. 5.

Hackney coachmen exacting more than their fare, ſhall be liable to the penalties, and their fares ſhall be recoverable, as under former acts. ſ. 11.

And if any perſon who ſhall drive a coach, or carry a chair for hire, acting under a perſon licenſed, ſhall be guilty of miſbehaviour, by demanding more than his fare, or giving abuſive language, or other rude behaviour; he ſhall, on conviction on oath, forfeit not exceeding 20 *s.* to the poor; and if he ſhall not be able, or refuſe to pay, he ſhall be committed to Bridewell or ſome other houſe of correction, to be kept to hard labour for ſeven days, and receive the public correction of the houſe before he be diſcharged. 9 An. c. 23. ſ. 44.

And on miſbehaviour of a coachman or chairman by abuſive language, or otherwiſe, the commiſſioners may revoke his licence, or inflict on him a penalty, not exceeding 3 *l.* to the poor; and on non-payment, he ſhall be committed to Bridewell or ſome other houſe of correction, to be kept to hard labour for 30 days. 9 An. c. 23. ſ. 49. 7 Geo. III. c. 44. ſ. 16.

If any perſon ſhall refuſe to pay, or ſhall deface any coach or chair, any juſtice may grant his warrant to bring him before him; and on proof upon oath may award ſatisfaction to the party, and on refuſal to pay, may bind him over to the next ſeſſions, who may determine the ſame. 9 An. c. 23. ſ. 22.

And if any hackney coachman or his renter, ſhall be in arrear for any rent made payable by his licence for any longer time than is expreſſed therein, the ſaid commiſſioners may revoke ſuch licence, and levy the money upon the goods of either the owner or renter, in like manner and form as by any law now in being with reſpect to the owner. 26 G. III. c. 72. ſ. 3.

The rents and penalties to be levied by diſtreſs, by warrant of three commiſſioners; which diſtreſs ſhall be ſold in ten days, returning the overplus, charges of the diſtreſs and of the warrant being firſt deducted (if on ſeven days' notice they pay not the fine without ſuch warrant); and in default of diſtreſs, to be impriſoned till paid; and if any rent ſhall be unpaid for 14 days, the commiſſioners may withdraw the licence. 9 An. c. 23. ſ. 12.

And moreover, the breach of the bye-laws, and of theſe rules and orders, may be puniſhed by any juſtice of the peace, mayor, bailiff, or other magiſtrate, where the offence ſhall be committed, in like manner as by the commiſſioners. 9 An. c. 23. ſ. 17. 1 G. ſt. 2. c. 57. ſ. 7. 4 G. III. c. 36. 7 G. III. c. 44. ſ. 19. 10 G. III. c. 44. ſ. 7.

And every licenſed perſon who ſhall neglect or refuſe (being duly ſummoned for that purpoſe) to appear by himſelf or his renter, ſhall forfeit 10 *s.* to be recovered as the other penalties; and if ſuch licenſed perſon ſhall neglect or refuſe to appear, together with his renter, upon the third ſummons, the complaint may be heard and determined in his abſence. 10 G. III. c. 44. ſ. 6.

And if any owner of a licenſed hackney coach, ſhall refuſe or neglect to appear with his driver before the commiſſioners upon the third ſummons left at his uſual place of abode, the ſaid commiſſioners may revoke ſuch licence, and licence another perſon in his room. 24 G. III. ſeſſ. 2. c. 27. ſ. 37.

And all penalties levied by any juſtice, mayor, bailiff, or other magiſtrate, ſhall by them be tranſmitted to the receiver general of the duties on hackney coaches and chairs, and they ſhall alſo tranſmit a certificate thereof to the commiſſioners, within ten days after levying ſuch penalty, on pain of 10 *l.* half to the king and half to him that ſhall ſue. 10 G. 3. c. 44. ſ. 8.

Hackney coaches were firſt eſtabliſhed at Edinburgh in 1673; and carriages of this kind have been introduced within ſome years, in ſeveral principal cities and towns of England. At Paris, and in ſome other places in the continent, they are known, by the name of "fiacres." This appellation is ſaid by Beckmann to have originated in France, about the year 1650, when one Nicholas Sauvage firſt thought of keeping horſes and carriages for hire; and as he lived in a houſe called the "hôtel S. Fiacre," the coaches, coachmen, and proprietor were called "fiacres." A particular kind of hackney carriage is peculiar to the Pariſians; it is denominated "brouette," or "roulette," and ſometimes by way of deriſion, "vinaigrette;" and was invented by a perſon of the name of Dupin; the body is almoſt like that of our ſedans, but rolls upon two wheels, and is dragged forwards by men. Carriages of this kind came into common uſe in 1671, but they were employed only by the common people. The number of all the coaches at Paris is computed (ſays Beckmann) at about 15,000; and the author of the "Tableau de Paris," reckons the number of the hackney coaches to amount to 1800, and aſſerts that more than 100 foot paſſengers loſe their lives by them every year. Fiacres were introduced at Warſaw, for the firſt time, in 1778. In Copenhagen there are 100 hackney coaches. In Madrid there are from 4 to 5000 gentlemen's carriages; in Vienna 3000, and 200 hackney coaches.

COACHES, *Stage*, are thoſe appointed for the conveyance of travellers from one city or town to another; and theſe, as well as other coaches, chaiſes, &c. with four wheels, pay an annual tax of 8 *l.* 8 *s.*

Perſons keeping ſtage-coaches for the purpoſe of conveying paſſengers by hire, ſhall take out a licence at 5 *s.* annually, and renew it on pain of forfeiting 10 *l.* 25 Geo. III. c. 51. By 30 Geo. III. c. 36. it is enacted, that the drivers of ſtage-coaches, drawn by three or more horſes, are not to admit more than one outſide paſſenger on the box, and four on the roof, under a penalty of 5 *s.* for every perſon above the limited number, to be paid to the toll-taker at every turnpike gate through which ſuch carriage ſhall paſs; the proprietor's name ſhall be put on the carriage; and if the coachman ſhall ſuffer any perſon to drive the ſame, without the conſent of the inſide paſſengers, or quit the box without reaſonable occaſion, or for a longer time than ſuch occaſion may require; or ſhall, by furiouſly driving, negligence, or miſconduct, overturn the carriage, or endanger the perſons or property of the paſſengers, or of the owner of ſuch carriage, he ſhall for every ſuch offence forfeit not exceeding 5 *l.* nor leſs than 40 *s.*; and if the guard fire without cauſe, he ſhall forfeit for every ſuch offence 20 *s.* If the driver cannot be found, the proprietor of ſuch carriage ſhall be liable to the penalty laid upon the driver. The penalties are to be applied, half to the informer, and half to the ſurveyor of the highways in the place where the offence is committed, for the repair of the highways. See POST-*horſes*.

COACH, in *Sea Language*, denotes a chamber or apartment near the ſtern, in a ſhip of war.

COADJUTOR, *Fellow-helper*, is properly uſed for a prelate joined to another, to aſſiſt him in the diſcharge of the functions of his prelature; and even, in virtue thereof, to ſucceed him.

The coadjutor has the ſame privileges with the biſhop himſelf. Coadjutors were formerly appointed by kings, for archbiſhops and biſhops grown old, or abſent, and not able to ſuperintend their dioceſes. But the right of appointing coadjutors, in Romiſh countries, is now reſerved to the pope alone.

Coadjutors are alſo called biſhops *in partibus infidelium*; becauſe it is neceſſary the coadjutor of a biſhop ſhould be a biſhop himſelf; without which he cannot diſcharge the office.

The uſe of coadjutors in the church, is borrowed from the Roman empire. Symmachus ſpeaks of aſſiſtants, or coadjutors, given to magiſtrates, and calls them *adjutores publici officii*. See SUFFRAGAN.

The popes formerly made a ſhameful abuſe of the coadjutories;

jutories; ſome they granted to children, and young people, with this clauſe, *donec ingreſſus fuerit; till they were capable of entering upon the adminiſtration of the office.* Others they granted to perſons not in orders, with this clauſe, *donec acceſſerit;* and others to perſons at a great diſtance, with this clauſe, *cum regreſſus;* but the council of Trent tied down the pope's hands, by adding abundance of reſtrictions on the article of coadjutors.

In nunneries they have coadjutrixes, who are religious, nominated to ſucceed the abbeſs, under pretence of aiding her in the diſcharge of her office.

COADUNATÆ, in *Botany*, the 12th of the natural orders of Linnæus in the Philoſophia Botanica, and the 52d of the Poſthumous Prælections. In the former it contains the following genera; annona, liriodendrum, magnolia, uvaria, michelia, and thea. In the latter xylopia is added, and thea removed to columniferæ. Linnæus has left no explanation of this order.

COAGMENTATION, is uſed, among chemiſts, for the act of melting down a matter, by caſting in certain powders, and afterwards reducing the whole into a concrete or ſolid.

COAGUILLA, or New Estremadura, in *Geography*, a province of New Leon, part of the Spaniſh dominions in North America; the bounds of which are extended by Alcedo to the river Medina, and the extent of which is computed at 200 leagues from N. to S. and 160 from N.W. to N.E. The capital is Monclova, in lat. 27° 30′. This province is a deſert waſte, ſcarcely peopled, except by ſome Miſſions; and its mineral treaſures, if any exiſt, have not been explored.

COAGULATION, in *Chemiſtry.* A liquid is ſaid to coagulate when it becomes ſolid, or nearly ſo, without aſſuming a regular cryſtallized form, and without the loſs of the more fluid part by evaporation, or by any other method. The ſolidification of the white of egg by heat, and the ſpontaneous ſtiffening of blood when drawn from the living vein, are familiar examples of coagulation. We are perfectly ignorant both of the cauſe of coagulation in theſe caſes, and of the nature of the change that takes place in them.

In many caſes a thickening, which is alſo termed coagulation, is produced in liquid ſolutions, by certain additions, which exerciſe a well-defined chemical action. In this caſe coagulation is ſynonymous with incipient and copious precipitation, where the relative bulk of fluid is ſmall; as, for example, where milk is coagulated by rennet, which produces a ſeparation between the curd and whey; but before the ſeparation is complete the whole maſs ſtiffens, or coagulates. This term is alſo applied to a ſudden and copious production of cryſtals, ſo minute or irregular, as hardly to aſſume to the naked eye the cryſtalline form, as when ſtrong ſulphuric acid is poured into a concentrated alkaline ſolution, which immediately converts the whole into a confuſed maſs of ſulphat of potaſh.

COAGULUM, the *coagulum* of the Latins, the ϖιτυα, and the ταμισος of the Greeks, are the ſame with what in Engliſh we call rennet. See Rennet.

COAITA, in *Zoology.* See Simia *paniſcus.*

COAK. See Coke.

Coaks, in *Ship Building*, denote oblong ridges left on the ſurface of different pieces of made-maſts, by cutting away the wood round them, the intermediate part being called the plain.

COAKING, is the uniting of two or more pieces together in the middle, by ſmall tubular pieces, formed from the ſolid of one piece, and ſunk exactly the ſame in the other, the butts of which prevent the pieces from drawing aſunder length-ways. There are different methods of coaking, ſuch as the following:—*Coak and plain,* when a coak is formed, and a plain ſurface follows between that and the next:—*Running coaks*, which are coaks continued through the whole length along the middle, but anſwering the above purpoſe, as the butts of each coak come one-third of their breadth within and without each other alternately:—*Chain-coaks,* which are formed one at the end of the other, on the oppoſite ſides of the middle line. See Tabling.

Coaking, or *Buſhing*, in *Block-making*, denotes letting through the middle of a ſheave a cylindrical piece of metal, with a hole through its centre, to admit the pin or axis on which the ſheave turns; on each ſide of the ſheave a plate is let in, having three or four correſponding holes in each, for rivets to go through, to ſecure and ſtrengthen the whole. The entrance of the holes in the plates is enlarged, that the heads of the rivets and points, when clenched, may have a ſmooth ſurface. When there is only one plate, the rivets have broad heads; the holes in the ſheave are made accordingly, and the points are clenched on the plate. The cylinder and one plate are caſt in one piece.

Coaking, *plank*, is letting in narrow pieces of lignum-vitæ, tranſverſely to each other, one on each ſide of the ſheave; which has likewiſe a ſmall circular braſs plate let in on each ſide, and riveted through, as others.

COAL, in *Mineralogy.* The word coal has been derived by ſome writers from the Hebrew, and by others from the Greek or Latin, but whatever may be its origin, it is deſerving of remark that the ſame found for the ſame object is uſed in the Anglo-Saxon, the Teutonic, the Dutch, the Daniſh, and the Iſlandic languages. Coals are found in ſeveral parts of the continent of Europe, but the principal mines are in this country. They have been diſcovered and wrought in Newfoundland, Cape Breton, Canada, and in ſome of the provinces of New England. China abounds in them, and they are well known in Tartary, and in the iſland of Madagaſcar.

Hiſtory of Coal as an Article of Commerce.

Coals are firſt mentioned as fuel for artificers by Theophraſtus, who deſcribes them as earthy ſubſtances that burn like wood-coals, and are uſed by the ſmiths. The ancient Britons had a primitive name for this foſſil, and Pennant ſays, "that a flint axe, the inſtrument of the aborigines of our iſland, was diſcovered in a certain vein of coal in Monmouthſhire, and in ſuch a ſituation as to render it very acceſſible to the inexperienced natives, who in early times were incapable of purſuing the ſeams to any great depths."

Although coals are ſo abundant in many of the above named places, yet as there are no beds found in the whole extent of Italy, the great line of this fuel ſeems to ſweep round the globe, from the north-eaſt to the ſouth-weſt, viſiting Brabant and France, and avoiding Italy. The ſtrongeſt argument adduced by thoſe who contend that the Romans, while in poſſeſſion of this iſland, were ignorant of the uſe of coal, is, that there is no name for it in the Latin language, the word *carbo* being always uſed for charcoal. Cæſar takes no notice of coal in his deſcription of this iſland; yet there is good evidence to believe that the Romans brought it into uſe. In the Weſt Riding of Yorkſhire are many beds of cinders, heaped up in the fields, in one of which a number of Roman coins were found ſome years ago.

From Horſely it appears, that there was a colliery at Benwell, about four miles weſt of Newcaſtle-upon-Tyne, ſuppoſed to have been actually worked by the Romans, and it is evident from Whitaker, that coals were uſed as fuel in this country by the Saxons. No mention is made of this foſſil during the Daniſh uſurpation, nor for many years after the Norman conqueſt.

The firſt charter for the licence of digging coals, was granted by king Henry III., in the year 1239; it was there denominated ſea-coal; and, in 1281, Newcaſtle was famous for its great trade in this article, but in 1306, the uſe of ſea-coal was prohibited in London, from its ſuppoſed tendency to corrupt the air. Shortly after this, it was the common fuel at the king's palace in London, and, in 1325, a trade was opened between France and England, in which corn was imported, and coals exported. In 1379, a duty of ſixpence per ton was impoſed upon ſhips coming from Newcaſtle with coals. At this period, the inhabitants of the county of Durham had obtained no privilege to load or unload coals on the ſouth ſide of the Tyne; but, in 1384, Richard II., on account of his devotion to Cuthbert, the tutelary ſaint of Durham, granted them licence to export the produce of their mines, without paying any duties to the corporation of Newcaſtle. In the year 1421, it was enacted, that the keels or lighters carrying coals to the ſhips ſhould meaſure exactly twenty chaldrons, to prevent frauds in the duties payable to the king.

Æneas Sylvius, afterwards pope Pius II., viſited this iſland, about the middle of the 15th century, and he remarked, that the poor of Scotland received for alms pieces of ſtone, which they burnt in place of wood, of which at that time the country was deſtitute. About the beginning of the 16th century, the beſt coals were ſold in London at the rate of 4*s.* 1*d.* per chaldron, and at Newcaſtle for about 2*s.* 6*d.*; and in 1563, an act was paſſed in Scotland to prevent the exportation of coals, which had occaſioned a great dearth of fuel in that country. Queen Elizabeth, in the year 1582, obtained a leaſe of a great part of the mines of Durham, for ninety-three years, at the annual rent of 90*l.*, which occaſioned an advance in the price of coals; it was afterwards aſſigned to Thomas Sutton, the founder of the Charter-Houſe in London, who aſſigned it to the corporation of Newcaſtle, for the ſum of 12,000*l.*; and the price of coals was immediately advanced to ſeven ſhillings and eight ſhillings per chaldron. Notwithſtanding the ſeveral advances upon this article, when queen Elizabeth demanded the arrears of two-pence per chaldron, which had been granted to Henry V., but the payment of which had been neglected by the corporation, they petitioned for a remiſſion of the debt on account of their inability; this was granted, and alſo a charter to incorporate a new company, called hoſtmen or coal-engroſſers, for ſelling all coals to the ſhipping; in conſequence of which the corporation impoſed one ſhilling per chaldron additional upon this article. At this period the lord mayor of London complained to the lord-treaſurer, Burleigh, that the free-hoſts in Newcaſtle, to whom the grand-leaſe had been aſſigned, for the uſe of the town, had transferred their right to a few perſons, who engroſſed all the other collieries, and he requeſted that the collieries might be free, and that the price of coals ſhould not exceed ſeven ſhillings per chaldron.

It appears, by an order of the hoſtman's company, dated A.D. 1600, that tram-waggons and waggon-ways had not then been invented, but that the coals were at that time brought down from the pits in wains, holding eight bolls each (all of them meaſured and marked), to the ſtaiths by the ſide of the river. About this period, an engine for drawing the water out of the coal mines was invented in Scotland, by a predeceſſor of the firſt earl of Balcarras, who obtained from James VI. a patent for 21 years. This improvement was not, till ſome time after, adopted in the neighbourhood of Newcaſtle.

In a petition of grievances, preſented by the houſe of commons to king James, in 1610, a complaint occurs of a late impoſition of one ſhilling per chaldron on ſea-coals, riſing in Blyth and Sunderland, not by virtue of any contract or grant, as on the coals of Newcaſtle, but under the mere pretext, aſſumed by the contractors, of his majeſty's royal prerogative. This petition diſplayed ſo ſtrongly the rapacity of that body of men, and the diſtreſs occaſioned by it to the inhabitants of London, that the prayer of the petition was immediately complied with. It was during the ſame reign, that an information was exhibited in the ſtar-chamber, by the attorney-general, againſt the mayor and burgeſſes of Newcaſtle, by the name of hoſtmen, for that they, having the preemption of coals for the inheritors in Northumberland, and the county of Durham, by their charter of the 42d of Elizabeth, forced ſhips to take bad coals, amongſt which was a quantity of ſlate; in conſequence of this they were all fined, ſome of them in penalties of one hundred pounds each, and committed to the Fleet priſon; and the decree was ordered to be read in the open market in Newcaſtle, two ſeveral market days.

In 1615, there were employed in the coal trade of Newcaſtle 400 ſail of ſhips, one-half of which ſupplied London, the remainder the other part of the kingdom; the French too are repreſented as trading to Newcaſtle at this time for coal, in fleets of 50 ſail at once, ſerving the ports of Picardy, Normandy, Bretagne, and as far as Rochelle and Bourdeaux, while the ſhips of Bremen, Embden, Holland, and Zealand, were ſupplying the inhabitants of Flanders.

In 1622, an order was iſſued by the hoſtmen, againſt the ſecret and diſorderly loading of coals, but not until they had received ſeveral precepts from the king and privy-council, concerning this abuſe. They were ſummoned to anſwer again, by proceſs from the exchequer chamber, againſt the governor, ſtewards, and ſome others of the company, for the above default; and as we are not informed of the reſult of this proceeding, we may conclude it did not terminate in their favour. Soon after this, David Ramſay, a great projector, obtained an excluſive charter to raiſe water from low mines and coal pits, by a method entirely original. In the year 1630, the king let to farm an impoſt on coals of 5*s.* per chaldron, for thoſe tranſported out of England, Wales, and Berwick-upon-Tweed, to any part beyond the ſeas, except Guernſey, Jerſey, and the Iſle of Man; of 1*s.* 8*d.* over and above the 5*s.* on thoſe to be exported, as above, by any Engliſhman; and alſo of 3*s.* 4*d.* for every chaldron to be exported except for Ireland and Scotland. In 1631, an information was again made in the ſtar-chamber, by Heath, attorney-general, againſt the hoſtmen of Newcaſtle, for mixing 40,000 chaldron of coals with ſlates, &c.; from whence it ſeems, that the former fines and impriſonment had no effect, but that they had ſtill proceeded to cheat the metropolis and the country at large, even after thoſe ſevere meaſures of government. A. D. 1634, the king, ſolely by his own authority, impoſed a duty of four ſhillings per chaldron on all ſea-coal, ſtone-coal, or pit-coal, exported from England to foreign parts.

In 1637, one ſhilling per chaldron appears to have been paid, on the foreign vent of coals, to the mayor of Newcaſtle and corporation. Government being applied to for redreſs, letters were ſent to the biſhop of Durham, requiring him to write to the ſaid mayor, and order an immediate reſtoration of the above exaction; the biſhop's letter is dated 10th of January, 1638. In 1643, when the Scots beſieged Newcaſtle, all the coal-mines were, it is ſaid, ordered to be ſet on fire, which was prevented by general Leſlie, who took the veſſels by ſurprize. In 1648, coals were ſo exceſſively dear in London, that many of the poor are ſaid to have died for want of fuel. In November 1653, articles were again exhibited againſt the town of Newcaſtle, concerning the coal-trade; and the cauſe, as uſual, was given againſt them. About this time the port of Sunderland appears to be riſing into importance. In 1667, coals are ſaid to have been ſold in London for above 20*s.* a chaldron; about 320 keels were at that time employed upon the river Tyne, in the coal trade, each of which carried annually 800 chaldrons on board the ſhips. To adjuſt the difference of meaſures it muſt be noted, that 16 chaldrons of Newcaſtle, are equal to 31 of London pool meaſure, according to Mr. Eddington. In 1658, the cuſtoms upon all coals exported, were let to Mr. Martin Nowel at 22,000 pounds per annum, of which ſum 19,783*l.* 14*s.* 8*d.* were for the coals of England, and 2,216*l.* 5*s.* 4*d.* for thoſe of Scotland. Commiſſioners were now appointed by the lord protector, under the great ſeal of England, for the meaſuring of keels, which was performed in a new and better manner than had been before known. In December 1667, the parliament made an order, that the price of coals, till the 25th of March following, ſhould not exceed 30*s.* per chaldron; and by an act made that year, after the great fire in London, a duty of one ſhilling per chaldron was granted to the lord mayor of that city, to enable him to rebuild the churches, and other public edifices. This, however, being inſufficient, it was made three ſhillings, to continue twenty years. In 1677, Charles II. granted to the duke of Richmond one ſhilling per chaldron on coals brought to London, which was continued in the family till the year 1800, when it was purchaſed by government, for the annual ſum of 1,900*l.* payable to the duke and his ſucceſſors. This duty at preſent produces to government 2,500*l.* annually. At the end of the ſeventeenth century, 1400 ſhips are ſaid to have been employed in exporting yearly from Newcaſtle, two hundred thouſand chaldrons of coal, Newcaſtle meaſure, which was about two thirds of the whole trade. The over-ſea trade in this article, at the ſame time, employed nine hundred thouſand tons of ſhipping. In 1710, a duty was laid upon coals for building 50 churches; a curious and particular account of the monies collected by duties on coal, for the building of St. Paul's church, in London, from October 1, 1668, to May 5, 1716, is preſerved in the Antiquarian Repoſitory, vol. ii. page 40. In the year 1741, a drawback was granted on the duty on coals, uſed in fire-engines for working the tin and copper mines in Cornwall. Mention occurs in 1758, of a machine invented by Michael Meninzies, eſq. by which coals were drawn up, not by the ſtrength of horſes or of men, but by the deſcent of a bucket full of water, of a weight ſuperior to that of the coals drawn up, lifting a corve of ſix hundred pounds weight, out of a pit about fifty fathoms deep, in two minutes. A machine, nearly ſimilar, was afterwards erected at Worſley, by James Brindley, on the duke of Bridgewater's canal, and is mentioned in our article CANAL. See alſo *bucket* ENGINE. In the year 1764, there were exported from the river Tyne, for London, and coaſtwiſe, twenty thouſand chaldrons of coals, and forty thouſand chaldrons of London meaſure for foreign parts, more than had been exported in any one year. From the years 1770 to 1776, were ſhipped to London, and other parts of Great Britain, 351,000 chaldrons of coals, of which 260,000 were ſent to London: to the Britiſh colonies and plantations, 2,000 chaldrons; and exported to foreign parts, 3,700; in all, averaging 380,000 chaldrons, Newcaſtle meaſure, per annum. The weight of theſe, at 53 cwt. per chaldron, is one million, ſeven thouſand tons; the duty paid to the crown at the ports of diſcharge, on 351,000 chaldrons, at 5*s.* per chaldron, is 167,000 pounds.

In 1776, from a note communicated by the ſurveyor of the cuſtoms of Newcaſtle, we find, that 14,000 chaldrons were exported in that year from Blyth; 18,000 chaldrons from Hartley Haven; 350,803 chaldrons from Newcaſtle, coaſtwiſe.

The trade, thus rapidly encreaſing, acquired its preſent importance. The following account of coals exported from the river Tyne, in the years 1802, 1803, 1804, and 1805, will give an idea of the amazing extent to which it is now carried.

	Coaſtwiſe.	Over-ſea.	Plantations.
In the year 1802	494,488	41,157	2844
1803	505,137	42,808	1516
1804	579.929	48,737	3852
1805	552,827	47.213	2360

We do not here include the quantity exported from the harbours adjoining near to Newcaſtle, *viz.* Sunderland, which exports, annually, about three hundred thouſand chaldrons; and Blyth and Hartley, which alſo export conſiderable quantities; neither do we notice the proportion conſumed in the town and neighbourhood of Newcaſtle.

It is calculated, that the ſum expended in materials for boring and ſinking for coal, ſuch as wood, iron, ropes, &c. independently of the money paid for the excluſive privilege of working, amounts, in ſome collieries, to upwards of 30,000 pounds per annum. By a calculation lately made, it is ſuppoſed that 64,724 people are employed by the coal trade on the rivers Tyne and Wear. See theſe under our article CANAL. The following is a calculation of the capital employed in the ſame trade.

In the collieries	-	1,030,000
In ſhipping	- -	1,400,000
Capital employed by the London coal-merchants	-	700,000
	Total	3,130,000

From this detail, the coal-trade muſt appear of the utmoſt importance, not only in a local, but in a national point of view, as a nurſery of excellent ſeamen for the Britiſh navy; and as the means of employment for many thouſands of induſtrious working people. Beſides the important advantages already enumerated, others deſerve to be noticed. Coal is in many reſpects, and in a very high degree, uſeful to the landed intereſt, not only by greatly enhancing the real value of thoſe lands in which it is found, and thoſe through which it muſt paſs, from the works to the place where it is ſhipped, but from the general improvements which it has occaſioned, in conſequence of the wealth it has brought into the country.

An act of parliament paſſed in 1803, as hereinafter mentioned, for preventing the mixing of coals of different ſorts together, by the dealers, before delivery in London and its environs; and for that purpoſe, it required the name of the coals contained in each ſhip's cargo to be certified to the buyers. It were much to be wiſhed, that ſome better criteria could have been adopted for aſcertaining the different ſorts of coals (the worſt of which often are, or rather ſhould be, ſelling in London at two thirds of the price of the beſt ſorts, or leſs,) than merely the names of the ſeveral pits' mouths out of which they were drawn; when it is well known, that all the deeper pits are ſunk through ſeveral veins of different qualities, and ſometimes have one of theſe veins in work, and ſometimes another, or perhaps ſeveral of them at the ſame time; whence the facility ariſes, of ſending better or worſe coals to market under the ſame name, according as the relative prices of good and bad coals may induce: could not the names of the different veins which have diſtinct qualities, have been certified, along with the coals dug therefrom, inſtead of the arbitrary, and perhaps worſe than uſeleſs name of the pit, containing ſeveral veins exactly the ſame with, and actually opening into the works of the neighbouring pits? The following is an alphabetical liſt of the names of the different cargoes of coals publiſhed in the newſpapers, as ſold at the coal-exchange, London, during a conſiderable period, with the name of the river, canal, or port from which they were put on ſhip-board, after being conveyed thither by rail-ways, &c. (ſee our article CANAL) and a ſeries of numbers, expreſſing the number of times that each name appeared among the coal-exchange ſales of the day, during the period alluded to.

Adair's Main	*Tyne*	126
Allan's Main	*Wear*	1
Baker's Main	*Tyne*	16
Bedford Main	*Wear*	45
Bedworth	*Grand Junction.*	
Benton	*Tyne*	301
Benwell	*Tyne*	4
Biddick Main	*Wear*	17
Bigg's Main	*Tyne*	419
Birtley Moor	*Wear*	3
Blyth	*Blyth*	199
Boundry Main	*Wear*	14
Bourn Moor Main	*Wear*	343
Brandling Main	*Tyne*	141
Byker	*Tyne*	73
Cowper Main	*Blyth*	122
St. David's	-	17
Eden Main	*Wear*	138
Eighton Main	*Tyne*	51
Elmore Main	*Tyne*	3
Flatworth	*Tyne*	6
Flocton	-	2
Gate's Head Park	*Tyne*	2
Greenwich	-	42
Harecaſtle	*Grand Junction.*	
Harraton	*Wear*	3
Hartley	*Seaton Burn*	232
Heaton Main	*Tyne*	359
Hebburn Main	*Tyne*	377
Hollywell Main	*Tyne*	178
Howard's Main	-	2
Hutton Seam	*Wear*	2
Kenton, Eaſt and Weſt	*Tyne*	103
Lambton Main	*Wear*	6
Lawſon's Main	-	5
Marley Hill	*Tyne*	3
Montague Main	*Tyne*	266
Murton Main	-	12
Newbottle	*Wear*	90
Newton	-	4
Percy Main	*Tyne*	1
Pontop, Simpſon's	*Tyne*	48
——— Windſor's	*Tyne*	154
Primroſe Main	*Wear*	32
Rectory Main	*Tyne* or *Wear*	87
Ruſſel's Main	*Tyne* or *Wear*	153
Scotch Coal	-	3
Sheriff Hill	*Tyne*	105
South Moor	*Tyne*	122
Stanley	-	8
Tanfield Moor	*Tyne*	115
——————— Pitt's	*Tyne*	154
Team	*Tyne*	94
Tyne Main	*Tyne*	25
Uſworth	*Tyne*	4
Wallbottle Moor	*Tyne*	101
Walker	*Tyne*	292
Wall's End	*Tyne*	468
Warwick Main	*Wear*	55
Wedneſbury	*Grand Junction.*	
Wentworth	*Wear*	28
Weſtfield	-	7
Wharton	*Wear*	1
Whitfield	*Tyne*	15
Willington	*Tyne*	337
Wooler	-	12
Wylam Moor	*Tyne*	152

The number of the different ſorts of coals as above, which were in one day on ſale in the market, on four particular occaſions, within the above period, amounted to 24; on three market days, there were 23 different ſorts ſold; on three days, 22 ſorts; on two days, 21 ſorts; on eight days, 20 ſorts; on ſeven days, 19 ſorts; on 10 days, 18 ſorts; on 18 days, 17 ſorts; and on 235 market days, cargoes of from 10 to 15 different ſorts of coals, were reported as ſold in the London market.

From the above table, the proportionate frequency of demand and facility of ſupply in London, for different ſorts of coals, appears to have ſtood as follows, *viz.* Wall's end, Bigg's main, Hebburn main, Heaton main, Bourn moor main, Willington, Benton, Walker, Montague main, Hartley, Blyth, Hollywell main, Pontop (Windſor's), Tanfield moor (Pitt's), Ruſſel's main, Wylam moor, &c. The order of the different ſorts of coals, as to price per chaldron, on ſhip-board in the pool, have, on ſeveral occaſions, ſtood as follows, beginning with the higheſt, *viz.* Wall's end, Percy main, Bigg's main, Heaton main, Hebburn main, Kenton, Walker, Willington, Benton, Montague main, Adair's main, Eighton main, Cowper main, Tanfield moor, Pontop, Brandling, Blyth, Bourn main, Team, Hartley. Newbottle, Ruſſel's main, Bedford main, Hollywell main, Wallbottle, &c. Theſe prices are of courſe ſubject to vary conſiderably, according as the veſſels arrive in conſiderable numbers or not, with the ſorts which happen to be at that time in demand. We have been at conſiderable pains in collecting the above particulars, in order to throw all the light in our power upon a branch of commerce, of the firſt importance in a national point of view, but particularly ſo to the metropolis, whoſe proſperity and comforts ſo much depend upon it. In Eddington's "Eſſay on the Coal Trade, 1803," many highly uſeful particulars on this ſubject will be found.

By 30 C. II. ſt. 1. c. 8. and 6 and 7. W. c. 10. and 11 G. II. c. 15. a penalty of 10*l.* is enacted, for defacing marks on keels, boats, waggons, &c. uſed for the carriage of coals in the ports of Newcaſtle, Sunderland, &c.; and by 15 G. III. c. 27. extended to the other parts of this kingdom. By 31 G. III. c. 36, regulations are enacted to the ſame purpoſe; and any perſon convicted of removing, defacing, or deſtroying ſuch marks, is ſubject to the forfeiture of a ſum not leſs than 40*s*, and not exceeding 5*l.* By 12 Ann. ſt. 2. c. 17. every coal-buſhel ſhall be round, with an even bottom, be 19½ inches from outſide to outſide, and contain one Wincheſter buſhel; and all ſea-coal and culm, chargeable with any duties by the Wincheſter meaſure, ſhall be charged, ſold, meaſured, and paid by the chaldron, containing 36 ſuch buſhels heaped up. By 17 G. II. c. 35, three juſtices may ſet the retail price of coals, after landing in any place to which the 16 and 17 G. II. reſpecting the price of coals brought into the river Thames, doth not extend, as they ſhall judge reaſonable. Concerning the weights, meaſures, and prices of coals, eſpecially in and about London; and alſo concerning the duties upon them, there are various regulations enacted by about 40 different acts of parliament, which we ſhall not recite. The ſtat. 43 G. III. c. 134, which is an "act for eſtabliſhing a free market in the city of London, for the ſale of coals, and for preventing frauds and impoſitions in the vent or delivery of all coals brought into the port of London, within certain places therein mentioned," ſituate within the diſtance of 25 miles from the Royal Exchange, in the city of London, empowers the corporation of London to purchaſe the coal-exchange in the ſaid city, and regulates the mode of indemnity to thoſe whoſe buildings may be requiſite for the purpoſes of the ſaid act. For preventing the ſale of one ſort of coals for another, the vender and dealer ſhall forfeit, for every ſuch offence, 20*l.* per chaldron ſo ſold; and ſuch vender or dealer ſhall not be ſubject to any penalty inflicted by the 3 Geo. II. c. 26, on every perſon who ſhall knowingly ſell one ſort of coals for, and as a ſort of coals which they really are not; provided always, that no ſhip-owner, maſter, or other perſon, having the care or command of any veſſel within the ſaid port of London, ſhall be ſubject to ſuch penalty in reſpect of any number of chaldrons exceeding 25 chaldrons, for the ſame cargo of coals. This act directs, that no coal-meters or coal-heavers ſhall be unneceſſarily detained on board a ſhip, and ſettles how the wages of coal-heavers ſhall be paid; it alſo requires, that ſhip-meters ſhall give certificates of the coals delivered in each lighter; and that no fractional part of five chaldrons ſhall be delivered into any room of a barge, under a penalty of forfeiture in the firſt caſe, of a ſum not exceeding 10*l.*, and in the latter not exceeding 20*l.* This ſtatute further enjoins and preſcribes the mode of remeaſuring coals by the vat; and alſo enacts, that in caſe the coals ſo remeaſured ſhall not amount to the quantity mentioned in the certificate of ſuch ſhip-meter as required by this act, the coal-meter, who meaſured them from the veſſel into the craft, ſhall, for every buſhel found deficient, if the deficieney be not equal to three buſhels in five chaldrons, forfeit 5*s.* per buſhel, and if ſuch deficiency ſhall equal or exceed three buſhels in five chaldrons, then ſuch meter ſhall forfeit 5*l.* per buſhel; and alſo the expences of placing the vat for the remeaſurement. Carmen are required to carry a buſhel meaſure in their carts, of the form, ſize, and dimenſions directed by the 12 Ann. c. 17; and the carmen, not having ſuch meaſure, ſhall, for every offence, forfeit not exceeding 10*l.* nor leſs than 40*s.*; and the vender or dealer in ſuch coals, ſhall forfeit not exceeding 20*l.* nor leſs than 5*l.* Carmen are alſo to deliver a printed ticket in a preſcribed form, previous to the delivery of any coals; and in default of ſuch delivery, for every ſuch offence forfeit not exceeding 10*l.* nor leſs than 40*s.* Meters are forbidden to give certificates without actually meaſuring the coals compriſed in them, under forfeiture of a ſum not exceeding 20*l* if it ſhall appear upon the remeaſurement of ſuch coals, or any part thereof, that any ſack ſhall not contain three buſhels; then the vender of, or dealer in ſuch coals, ſhall for every ſack of coals deficient, on the remeaſurement, forfeit not exceeding 40*s.* for every ſack ſo found deficient. Every ſack uſed for the delivery of coals within the limits determined by this act, ſhall meaſure in the inſide, at leaſt four feet two inches in length, by two feet one inch in breadth, under a forfeiture of a ſum not exceeding 40*s.*; and no ſack ſhall, after the paſſing of this act, be marked at the Guildhall of London, or at the exchequer at Weſtminſter, that ſhall meaſure leſs than above. The penalty on carmen for driving away coals without meaſuring, when required, for every ſuch offence, is a forfeiture of a ſum not exceeding 10*l.*; and the vender or dealer ſhall incur the ſame forfeiture; and ſuch coals ſhall be forfeited for the benefit of the poor,

From this account of coal, as an article of commerce, and the laws relating to it, we now proceed to its natural hiſtory. There are three genera or families of **coal**; *viz.* brown coal, black coal, and uninflammable coal.

I. Family.—*Brown Coal.*

Sp. 1. *Common brown Coal*, *Bovey Coal*, *Surturbrand*, or *bituminized Wood.* Its colour is light browniſh black; it occurs in maſs; its longitudinal fracture is fibrous lamellar, paſſing into ſlaty or woody, and is ſlightly glimmering; its croſs fracture is more or leſs conchoidal, with a ſhining reſinous luſtre; it acquires a poliſh by friction, and is moderately hard. Sp. gr. 1.4, when pure, but when mixed with pyrites, it is often conſiderably heavier.

It burns with a weak flame, like half-charred wood, giving out an unpleaſant bituminous odour; when ignited in an open fire, it leaves a ſmall quantity of white aſhes. According to Mr. Hatchett (Phil. Tranſ. for 1804), 100 parts yield by diſtillation

30.	Acidulous water.
10.5	Thick, brown, oily bitumen.
45.	Charcoal.
14.5	Hydrogen, carbunetted hydrogen, and carbonic acid.
100.0	

It is found in England at Bovey, near Exeter, and in ſmaller quantities in the iſland of Purbeck, ſome parts of Hampſhire, Suſſex, &c. lodged in pipe-clay. It is alſo found in the territory of Heſſe and other parts of Germany, in Denmark, Iceland, Greenland, Italy, Faro iſlands, &c.

Sp. 2. *Moor Coal.* Its colour is dark blackiſh brown; it occurs in maſs, forming thick beds, which are full of rifts and cracks. Internally, it exhibits a bright reſinous luſtre; its longitudinal fracture is imperfectly ſlaty, its croſs fracture is even, approaching to flat conchoidal. It breaks into rhomboidal fragments. It is very tender, eaſily frangible, and of low ſpecific gravity.

It is found in Bohemia, Tranſylvania, in Denmark, the Faro iſlands, &c.

II. Family.—*Black Coal.*

Sp. 1. *Slate Coal.* Its colour is pure black, or greyiſh-black, and is often irideſcently tarniſhed. It occurs in maſs, and commonly poſſeſſes a high reſinous luſtre. Its longitudinal fracture is ſlaty; the croſs fracture is ſmall grained, uneven, paſſing into flat conchoidal. It breaks into angular fragments. It is ſoft and eaſily frangible. Sp. gr. 1.25 to 1.4. It contains from 57 to 64 per cent. of charcoal, from 33 to 43 per cent. of bitumen, and from 3 to 6 per cent. of earth and oxyd of iron. The bitumen is partly in the ſtate of aſphaltum, and partly in that of maltha; in proportion to the prevalence of the former, is the caking quality of the coal.

Almoſt all the common coals, as pit-coal, ſea-coal, caking-coal, bituminous coal, run-coal, rock coal, &c. belong to this ſpecies.

Sp. 2. *Pitch Coal*, or *Jet* Its colour is velvet black. It occurs in maſs, in plates, and ſometimes in the ſhape of branches and trunks, with the true ligneous texture. It has a brilliant reſinous luſtre, and a conchoidal fracture. It is ſoft and brittle. Sp. gr. 1.3. It burns with a greeniſh flame and a ſtrong bituminous odour. It occurs in Spain, the ſouth of France, and in the Pruſſian amber mines, where it is called black-amber. In France, this ſubſtance is manufactured into buttons, beads, and other trinkets.

Sp. 3. *Cannel*, or *Candle Coal*, *Splent Coal*, or *Parrot-Coal of Scotland.* Its colour is dark greyiſh black It occurs in maſs, and has a gliſtening reſinous luſtre. Its fracture is conchoidal. It is much leſs frangible than common coal. Sp. gr. 1.23. It is very inflammable, and crackles and flies while burning. It flames much and burns quickly, does not cake, and leaves from 3 to 4 per cent. of aſhes. The ſplent-coal of Scotland is a coarſe ſlaty variety of the above, containing pyrites, and leaving, after combuſtion, about 20 per cent of aſhes.

Cannel coal occurs occaſionally in the Newcaſtle pits, in Ayrſhire in Scotland, and elſewhere, but the largeſt beds of it, and of the pureſt kind, are near Wigan in Lancaſhire. It is an excellent fuel; it will take a good poliſh, and may, with care, be turned in a lathe, into ſnuff-boxes and other trinkets, which are often paſſed off for true jet.

III. FAMILY.—*Uninflammable Coal.*

Sp. 1. *Mineral Charcoal.* Its colour is greyiſh black. It occurs in plates and irregular pieces. It has a glimmering, ſilky luſtre, and a fibrous fracture. It ſoils the fingers, is ſoft and friable. It is ſomewhat heavier than common charcoal, and burns to aſhes without flaming. It generally occurs mixed with ſlate-coal.

Sp. 2. *Kilkenny Coal, Welſh Culm,* or *Stone-Coal.* Its colour is dark iron black, verging on ſteel-grey. It occurs in maſs, has a bright metallic luſtre. Its longitudinal fracture is ſlaty; its croſs fracture is ſmall and imperfectly conchoidal. Sp. gr. 1.5. to 1.8.

When laid on burning coals, it becomes red hot, emits a very light lambent flame, like charcoal, and is at length ſlowly conſumed without caking, leaving behind a portion of red aſhes.

The true Kilkenny coal is harder than Welſh culm, and of a brighter luſtre; it often contains pyrites, and therefore gives a ſulphureous odour when burning. This ſpecies of coal is found alſo in Hungary, Italy, and France.

Theſe are the moſt conſiderable varieties of coal commonly known; but we muſt not imagine that each of them is to be met with in a pure ſtate, in thoſe places where they are found; on the contrary, the different qualities and proportions of their ingredients make a vaſt number of other varieties, fit for different purpoſes, according to the quality and quantity of thoſe they contain. The various kinds of coals are often found mixed with each other under ground, and ſome of the finer ſorts run, like veins, between thoſe of a coarſer. Mr. Magellan obſerved in the fine coals employed in a curious manufactory at Birmingham, that they produced a much clearer flame than he had ever ſeen produced from common coal, but, on inquiry, he found that theſe were picked out from the common coals of the country through which they ran in veins, and were eaſily diſtinguiſhed by the manufacturers, though they did not afford ſufficient indications of a ſpecific difference. The purpoſe to which they were applied, was the moulding of rods of tranſparent and coloured glaſs, into ſhapes proper for common buttons, which the workmen performed with aſtoniſhing expedition.

On ſubjecting pit-coal of any kind to diſtillation in cloſe veſſels, it firſt yields watery liquor, then an ætherial or volatile oil, afterwards volatile alkali, and, laſtly, a thick and greaſy oil. But it is remarkable, that by rectifying this laſt oil, a tranſparent, thin, and light oil, of a ſtraw colour, is produced, which, being expoſed to the air, becomes black, like animal oils. From this and other obſervations, the general opinion is, that all coals, bitumens, and other oily ſubſtances found in the mineral kingdom, derive their origin from vegetables buried in the earth, during the ſucceſſive proceſſes of ſtratification; ſince it is well known, that only organized bodies have the power of producing oily and fat ſubſtances.

Before a coal-pit is ſunk, it is neceſſary to explore the ground by boring, but if there are already pits in the neighbourhood, ſections are obtained from them, which prevent the neceſſity of doing ſo.

Boring is accompliſhed in the following manner: The rods are made of iron, from three to four feet long, and one inch and a half ſquare, with a ſolid or male ſcrew at one end, and a hollow one at the other, by which they are faſtened together, and as the hole formed by them increaſes in depth, other rods are added. The chiſel is about eight inches long, and two and a half broad at the extremity, which is ſcrewed on to the end of the lower rod, and a lever or handle is put through an eye at the top of the upper rod.

The mode of operation is, to lift up the rods a little, and then let them fall, turning them at the ſame time gently round; by a continuance of this motion, a hole is fretted, and worn by degrees through the hardeſt ſtrata or rocks. The borers can fix on handles for two, three, or four perſons to work as they find it neceſſary. After they get down to a certain depth, the rods are wrought by a bracke; a box of wood is firſt inſerted into the ground, to keep the rods in a vertical or ſtraight direction, and a triangle is erected over the ſpot where the boring is to be made (which is about three inches in diameter), for the ſake of drawing up the rods; they have one key, or temporary handle, for unſcrewing, and another for ſecuring the rods from falling back again; they uſe a cloſe wimble to bring up ſludge and ſoft matter. When the chiſel is blunted, or has cut down four or ſix inches, the rods are lifted up, either all together, if there be convenience, or by pieces, when a key is uſed to keep the rods from dropping down the hole; the chiſel is ſcrewed off, and the wimple or ſcoop ſcrewed on. This being put down, brings up afterwards the duſt or pulverized matter of the ſtratum through which the chiſel has cut, and ſhews as well what kind of matter they are boring in, as the exact depth thereof.

A conſiderable improvement in this eſſential operation was made a few years ago, by Mr. James Ryan, a gentleman of Ireland, for which he took out patents in 1805; a copy of that for England may be ſeen in the 2d ſeries of the "Repertory," vol. vi. p. 324; this conſiſts in uſing a cylindrical cutter, ſomething like the ſurgeon's trepan-inſtrument, by which a core, or ſolid and unbroken piece of each ſtratum, is cut, and by other tools brought vertically to the ſurface, in the exact poſition as to the cardinal points, in which it ſtood in the ſtrata, and thus the quantity and direction of the dip, as well as the exact nature of the ſtrata or meaſures, are correctly aſcertained, the former being moſt eſſential circumſtances towards determining the proper place to ſink an engine ſhaft, for draining the bed of coals intended to be worked. The borers and apparatus of Mr. Ryan are calculated to form a hole of any ſize, from eight inches to near as many feet in diameter; ſome of two feet diameter have, we are told, been actually ſunk thereby, to a conſiderable depth, and anſwer the purpoſes of pump and air-ſhafts, and that one, nearly eight feet in diameter, is now ſinking thereby in Ireland! In April, 1807, Mr. Ryan preſented a complete ſet of his apparatus to the Board of Agriculture in London, and bored a hole of ſome depth therewith near Kenſington, under the inſpection of ſome of its members; the cores or borings therefrom, being exhibited to the Board, and lodged with the apparatus in their repoſitory, they voted a pecuniary reward to Mr. Ryan. From the apparent importance

portance of this diſcovery to mining, but to coal-finding in particular, we were induced to wiſh, to give an accurate deſcription and drawings in this place of Mr. Ryan's apparatus and proceſs, but found the time too ſhort, after the Board of Agriculture became poſſeſſed of the ſame, to do it here; under the article MINING, we ſhall endeavour to give them in the further ſtate of perfection, in which practice will doubtleſs then preſent the ſame.

Boring is of the utmoſt uſe and importance in collieries, for by boring previouſly to the ſinking of a pit, the owners procure moſt eſſential data on which to proceed, being informed before-hand of the nature of the earth, minerals, and waters through which they have to paſs, and knowing, to an inch or ſo, how deep the coal lies, as well as the quality and thickneſs of the ſtratum bored. The boring notes of collieries are the grand arcana of the coal-mining trade, which the owners ſometimes diſlike to diſcover to the prying eyes of the philoſopher. They have, however, been occaſionally exhibited, which gives us an opportunity of laying before our readers an account of what relates to the boring of two of the principal collieries in the neighbourhood of Newcaſtle.

Section of the Strata South of the Main Dike in MONTAGUE MAIN Colliery, 3½ Miles above Newcaſtle.—The Numbers in the firſt column on the left-hand form an Index, from which it will be immediately perceived, where the ſame ſtrata occur; the ſecond column contains the number of the ſtrata, the third the names of each, and the fourth, or numeral columns, expreſs the thickneſs of each ſtratum in Fathoms, Yards, Feet, and Inches.

			Thickneſs of each Stratum.			
		Particulars of the Strata.	Fa.	Yds.	Ft.	In.
0	1	Soil	0	0	1	0
0	2	Clay	2	0	2	0
1	3	White poſt	0	0	2	6
0	4	Coal	0	0	0	4
2	5	Black metal ſtone	0	1	0	2
3	6	Grey poſt	1	1	2	0
4	7	Blue metal ſtone	2	1	1	0
3	8	Grey poſt	2	0	0	0
1	9	Strong white poſt	2	1	0	0
3	10	Grey poſt	0	1	1	0
5	11	White poſt with black metal partings	5	0	0	0
3	12	Grey poſt	0	0	1	4
6	13	Brown poſt with coal pipes	0	1	1	8
1	14	White poſt	2	1	0	0
7	15	Ditto mixed with whin	0	1	0	0
0	16	Coal	0	0	0	6
2	17	Black metal ſtone	4	1	0	0
8	18	Grey metal ſtone	4	2	0	0
9	19	Brown poſt with ſkanny partings	0	1	1	0
0	20	Coal	0	0	0	9
8	21	Grey metal ſtone	1	1	2	10
10	22	Coal } BENWELL MAIN	0	0	1	9
11	23	Band } BENWELL MAIN	0	0	0	6
10	24	Coal } BENWELL MAIN	0	1	0	0
8	25	Grey metal ſtone	0	1	1	0
1	26	Strong white poſt	2	1	1	0
12	27	Whin	0	0	2	0
1	28	White poſt	1	0	2	0
0	29	Coal	0	0	1	8
2	30	Black metal ſtone	1	1	0	0
1	31	White poſt	3	0	0	0
2	32	Black metal ſtone	4	1	0	0
8	33	Grey ditto	5	0	2	4
13	34	Ditto poſt with whin girdles	2	1	0	0
1	35	Strong white poſt	6	0	2	0
8	36	Grey metal ſtone	3	0	2	0
0	37	Coal	0	0	0	8
14	38	Poſt girdle	0	0	2	0
8	39	Grey metal ſtone	1	0	1	0
15	40	COAL, BEAUMOMT SEAM	0	1	0	4
16	41	Strong white thill	0	1	0	7
1	42	Ditto do. poſt	2	0	0	4
1	42	Coal	0	0	1	6
17	44	Black thill	0	0	2	4
8	45	Grey metal ſtone	0	0	1	2
3	46	Ditto poſt	0	0	2	0
8	47	Ditto metal ſtone	0	0	2	10
1	48	Strong white poſt	0	1	0	4
0	49	Coal	0	0	1	3
2	50	Black metal ſtone	1	0	2	4
1	51	White poſt	0	0	1	8
18	52	Blue metal ſtone with poſt girdles	1	0	0	0
19	53	White poſt with whin gridies	2	0	1	9
2	54	Black metal ſtone	0	0	1	5
3	55	Grey poſt	0	0	1	2
4	56	Blue metal ſtone	0	1	0	0
1	57	Strong white poſt	0	0	1	3
4	58	Blue metal ſtone	1	0	2	1
0	59	Coal	0	0	0	8
17	60	Black thill	0	1	0	4
18	61	Blue metal ſtone with poſt girdles	1	0	1	0
3	62	Grey poſt	0	1	0	0
1	63	Strong white poſt	3	1	2	6
2	64	Black metal ſtone	0	0	0	1
20	65	COAL, LOW MAIN	0	0	2	11
8	66	Grey metal ſtone	4	1	0	0
1	67	White poſt	2	1	0	0
21	68	Grey metal ſtone with poſt girdles	1	0	0	0
19	69	White poſt with whin girdles	3	0	1	6
21	70	Grey metal ſtone with poſt do.	0	1	1	0
22	71	COAL, LOW LOW MAIN	0	0	2	10
8	72	Grey metal ſtone	0	1	2	0
1	73	White poſt	0	0	2	0
8	74	Grey metal ſtone	0	0	1	8
2	75	Black metal do.	0	0	0	10
8	76	Grey do. do.	1	0	2	6
3	77	Ditto poſt	1	0	0	6
19	78	Strong white poſt with whin girdles	3	1	1	8
8	79	Grey metal ſtone	3	0	2	6
3	80	Ditto poſt	0	0	2	0
1	81	White poſt	0	1	2	0
8	82	Grey metal ſtone	0	0	1	0
0	83	Coal	0	0	0	6
8	84	Grey metal ſtone	0	0	1	0
21	85	Ditto with poſt girdles	3	0	2	2
0	86	Coal	0	0	0	5
8	87	Grey metal ſtone	0	0	0	4
3	88	Ditto poſt	1	0	1	6
7	89	White do. mixed with whin	2	1	0	4
8	90	Grey metal ſtone	0	0	1	0
0	91	Coal	0	0	0	3
2	92	Grey metal ſtone with poſt girdles	1	0	0	6
19	93	Strong white poſt with whin do.	0	1	2	5
			122	1	2	3

Section of the Strata of the Low Main Coal at Saint ANTHONY's Colliery, three Miles below Newcaſtle.

		Particulars of the Strata.	Thickneſs of each Stratum.			
			Fa.	Yds.	Ft.	In.
0	1	Soil	0	0	2	0
0	2	Clay	4	1	1	0
1	3	Brown poſt	12	0	0	0
0	4	Coal	0	0	0	6
2	5	Blue metal ſtone	2	1	2	0
3	6	White girdles	2	0	1	0
0	7	Coal	0	0	0	8
4	8	White and grey poſt	6	0	0	0
5	9	Soft blue metal ſtone	5	0	0	0
0	10	Coal	0	0	0	6
6	11	White poſt girdles	3	0	1	0
7	12	Whin	1	1	1	6
8	13	Strong white poſt	3	0	1	0
0	14	Coal	0	0	1	0
9	15	Soft blue thill	1	1	2	0
10	16	Soft girdles mixed with whin	3	1	2	0
0	17	Coal	0	0	0	6
11	18	Blue and black ſtone	3	1	1	0
0	19	Coal	0	0	0	8
8	20	Strong white poſt	1	1	0	0
12	21	Grey metal ſtone	1	1	1	0
0	22	Coal	0	0	0	8
13	23	Grey poſt mixed with whin	4	0	1	0
14	24	Ditto girdles	3	0	1	0
15	25	Blue and black ſtone	2	0	2	0
0	26	Coal	0	0	1	0
12	27	Grey metal ſtone	2	0	0	0
8	28	Strong white poſt	6	0	0	0
16	29	Black metal ſtone with hard girdles	3	0	0	0
17	30.	COAL, HIGH MAIN	1	0	0	0
			76	0	0	0
18	31	Grey metal	4	1	0	0
6	32	Poſt girdles	0	0	2	0
5	33	Blue metal	0	1	1	0
14	34	Girdles	0	0	1	2
2	35	Blue metal ſtone	5	0	0	0
8	36	Poſt	0	0	1	0
2	37	Blue metal ſtone	3	0	0	0
19	38	Whin and blue metal	0	0	1	6
8	39	Strong white poſt	3	1	0	0
1	40	Brown poſt with water	0	0	0	7
20	41	Blue metal ſtone with grey girdles	2	0	2	0
0	42	Coal	0	1	1	0
2	43	Blue metal ſtone	3	0	0	3
8	44	White poſt	0	1	1	0
0	45	Coal	0	0	0	6
21	46	Strong grey metal with poſt girdles	2	0	0	6
8	47	Ditto white poſt	1	0	1	0
7.	48	Whin	0	0	1	0
2	49	Blue metal ſtone	1	0	2	7
21	50	Grey ditto with poſt-girdles	2	1	1	5
22	51	Blue do.. whin do.	1	1	1	3
0	52	Coal	0	0	1	6
23	53	Blue grey metal	0	1	0	8
8	54	White poſt	2	0	0	7
24	55	Ditto mixed with whin	2	0	0	0
8	56	White poſt	1	0	2	0
25	57	Dark blue metal and coal	0	0	2	2
26	58.	Grey metal ſtone and girdles	2	0	2	0
24	59	White poſt mixed with whin	3	0	0	7
7	60	Whin	0	0	1	0
24	61	White poſt mixed with whin	1	0	0	6
12	62	Dark grey metal ſtone	0	1	0	3
0	63	Coal	0	1	0	6
27	64	Grey metal with whin girdles	1	1	1	10
21	65	Ditto with girdles	1	1	0	0
0	67	Coal	0	1	0	2
23	68	Blue and grey metal	0	1	1	0
8	66	White poſt	0	1	0	0
0	69	Coal	0	0	0	9
23	70	Blue and grey metal	2	0	0	0
24	71	White poſt mixed with whin	0	1	1	6
18	72	Grey metal	1	0	0	6
21	73	Ditto with girdles	1	0	0	9
28	74	COAL, LOW MAIN	1	0	0	6
			135	0	1	6

From the foregoing ſections will be ſeen, the various ſorts of ſubſtances through which the miner, near Newcaſtle, has to paſs, before he comes to the object of his purſuit: theſe ſubſtances we may divide into ſix different claſſes, of each of which we will give an account in their order.

1ſt. Whin-ſtone; the ſtrata thus named are the hardeſt of all others, ſo that angular pieces of it will cut glaſs. It exhibits, by fracture, the appearance of large grains of ſand, half vitrified. It can ſcarcely be wrought, or broken in pieces by common tools, without the aſſiſtance of gunpowder; it decays a little by being expoſed to the atmoſphere, leaving a brown powder; in the fire it cracks, and turns reddiſh-brown. Each ſtratum is commonly homogeneous in ſubſtance and colour; the moſt common of which are black or dark blue, yet there are others of it aſh-coloured and light brown.

2d. Poſt-ſtone, is a free ſtone of the hardeſt kind, of a very fine texture, and when broken, appears compoſed of the fineſt ſand. It is commonly found in a homogeneous maſs, though variegated in colour, and is not ſubject to injury from expoſure to weather: there are four varieties of this ſtone; 1ſt. The white-poſt, which, in appearance, is like Portland-ſtone, but conſiderably harder. This is ſometimes found having brown, red, or black ſpots. 2d. Grey-poſt, which has the appearance of a mixture of fine black and white ſand; it is often variegated with brown and black ſtreaks, the laſt mentioned look like ſmall clouds compoſed of particles of coal. 3d. Brown or yellow poſt is often met with of different degrees of colour, moſt frequently that of light ochre or yellow ſand. It is as hard as the others, and ſometimes has black and white ſtreaks. 4th. Red-poſt is generally of a dull red colour. It is often ſtreaked with white or black, but is rarely met with. All theſe lie in ſtrata of different thickneſſes, but commonly thicker than any other ſtrata. They are ſeparated from each other by ſmall partings of coal, of ſand, or of ſoft matters of different colours, which are very diſtinguiſhable.

3d. Sand-ſtone: this is a free ſtone of a coarſer texture than the above; it is eaſily pervious to water, and when broken, is of a coarſe ſandy texture. It is friable, and readily moulders to ſand when expoſed to the air and rain. It has frequently white ſhining ſpangles, or plates of mica, in it, and pebbles, or other ſmall nodulous ſtones incloſed in its maſs; of this there are two kinds, diſtinguiſhed by their colours grey and brown. It is found in conſiderable thickneſs with but few partings, which are ſandy or ſoft. It is ſometimes in layers as thin as the common grey ſlate.

4th. Metal-ſtone; this is a tolerably hard ſtratum, next in point of hardneſs to ſand-ſtone, ſolid, compact, of conſiderable weight, of an argillaceous ſubſtance, interſperſed with nodules or balls of iron ore, and yellow or white pyrites. The ſurfaces of its ſtrata are hard, poliſhed, and ſmooth. When broken, it has a dull duſky appearance, is of a fine texture, like hard, dried clay mixed with particles of coal. Though hard in the mines like the ſand-ſtone, it moulders when expoſed to the action of the air. Its colour varies from black to light brown or grey; it lies in ſtrata of various thickneſs.

5th. Shiver; this ſtratum is more frequently met with in collieries than any other; it is known to the miners under the names of black ſhiver, black metal, or bleas; the black is the moſt common, it is ſofter than metal ſtone, and, in the mine, is rather a tough than a hard ſubſtance. It is eaſily ſeparable by the multitude of its partings. It breaks into long ſmall pieces when ſtruck with force, which, on examination, preſent the figures of ſmall irregular rhomboids, each of which has a poliſhed glaſſy ſurface; when broken acroſs the grain, it exhibits a dry laminated texture, like exceedingly fine clay. It is very friable, feels to the touch like an unctuous ſubſtance, and diſſolves in air or water to a fine black clay; and, like the laſt mentioned, it ſometimes contains nodules of iron ſtone, often even beds of iron-ſtone are found in it. The colour of the ſhiver is not confined to black; it diſcovers brown, dun, and grey colours, and a variety of ſhades according to the proportions of each. Its ſtrata are parted from each other by lamina of ſpar-coal, or other matter; as may be ſeen by the foregoing ſection.

Many of theſe ſtrata are conſiderably thick, being frequently found from 100 to 200 feet in depth, or upwards, of nearly the ſame kind of matter throughout, whilſt others again are of the leaſt imaginable thickneſs. They are all divided or parted from each other, either by an even, ſmooth, poliſhed ſurface, or with a very thin lamina of ſoft, duſty matter between them, called the parting, by which means they are eaſily ſeparated; yet though the ſurfaces are ſometimes ſo cloſely joined together, that it is with difficulty they can be ſeparated, which is called a bad parting, they are never known to be in the ſlighteſt degree intermingled.

There are beſides this principal diviſion or parting, ſecondary ones alſo laterally, but theſe are not ſo ſtrong or viſible, and are only met with, where the texture is not of a uniform hardneſs or colour through the whole body of the ſtrata. In almoſt every ſtratum there are other diviſions called backs, which croſs the former longitudinally, and cut the whole ſtratum through its two ſurfaces; theſe are again croſſed by others, called cutters, running either in an oblique or perpendicular direction, and which cut the ſtratum through its two ſurfaces, and, together with the other partings, divide it into various figures. The ſofter kind of ſtrata has in general more backs and cutters than the harder ones, which ſometimes have thin partitions of duſty or ſoft matter, but like the partings are ſometimes without any. Whenever the ſtrata lie regularly they are thus divided, and generally extend in this manner through a large extent of country, though it is often otherwiſe, for that regularity is frequently interrupted, and the ſtrata diſordered by various chaſms, breaks, or fiſſures, which are called *dikes*, *hitches*, and *troubles*, according to their dimenſions, and the matters with which they are filled; firſt,

Dikes, or *faults*, are fiſſures of the largeſt kind, which ſeem to be cracks, or breaks, of the ſolid ſtrata, occaſioned by one part of them being broken away and fallen from the other. They generally run in a ſtraight line for a conſiderable length, and penetrate from the ſurface to the greateſt depth ever yet tried, in a direction ſometimes perpendicular, and ſometimes oblique, to the horizon, in which caſe they are ſaid to hade or underlay. The ſame kind of ſtrata are found lying upon each other in the ſame order, but the whole of them are ſometimes greatly elevated or depreſſed on the one ſide of the dike or on the other. Theſe fiſſures are frequently two or three feet wide, and at other times many fathoms. If the fiſſure or dike be of any conſiderable width, it is generally filled with heterogeneous matter, different from that of the ſolid ſtrata on each ſide of it; ſometimes with clay, gravel, or ſand, ſometimes with a confuſed maſs of different kinds of ſtone lying edge-ways, and at others with a ſolid body of free-ſtone or even whin-ſtone. When the fiſſure is of no great width, ſuppoſe two or three feet, it is then uſually filled with a confuſed mixture of the different matters which compoſe the adjoining ſtrata, conſolidated into one maſs. If the dike runs or ſtretches north and ſouth, and the ſame kind of ſtrata are found on the eaſt ſide of the dike, in a ſituation with reſpect to the horizon, 10 or 20 fathoms lower on the other ſide, it is then ſaid to be a dip dike, or down-caſt dike, of 10 or 20 fathoms to the eaſtward; or counting from the eaſt ſide, it is then ſaid to be a riſe dike or upcaſt, of ſo many fathoms weſtward. If the ſtrata on one ſide are not much higher or lower with reſpect to the horizontal line, than thoſe on the other, but only broken off, or removed to a certain diſtance, it is then ſaid to be a dike of ſo many fathoms deep, and from the matter contained between the two ſides, it is denominated a clay, a ſtone dike, &c. There are ſome, though they are not often met with in the coal countries, whoſe cavities are filled with ſpar, ores of iron, lead, or other metallic or mineral matters; and it is pretty well known, that all metallic veins are nothing elſe than what in the coal countries are called dikes. It generally happens, that to a conſiderable diſtance on each ſide of the dike, all the ſtrata are in a kind of ſhattered condition, very tender, eaſily pervious to water, and debaſed greatly in their quality, and in their inclination to the horizon often altered.

2dly. A *hitch* is only a dike of ſmaller degree, by which the ſtrata on one ſide are not elevated or ſeparated from thoſe on the other more than a fathom. Theſe hitches are denominated in the ſame manner as dikes, according to the number of feet which they elevate or depreſs the ſtrata.

3dly. *Troubles* or bends may be called dikes of the ſmalleſt degree, for they are not a real breach, but only a tendency towards it. The ſtrata are generally altered by a trouble or bend from their regular direction to a different one. When the regular courſe of the ſtrata is nearly level, a trouble will cauſe a conſiderable aſcent or deſcent; where they have, in their regular ſituation, a certain degree of aſcent and deſcent, a trouble either increaſes or alters it to a contrary direction; and a trouble has theſe effects upon the adjoining ſtrata in common with dikes, that it greatly debaſes them from their original qualities; the partings are ſeparated; the backs and cutters diſjoined, and their regularity diſordered; the original cubic and priſmatic figures, of which the ſtrata are compoſed, are broken, the diſlocation filled with heterogeneous matter, and the whole ſtrata are reduced to a ſofter and more friable ſtate.

Notwithſtanding that the dikes and hitches, or faults, as they are as generally called, are filled with extraneous matters, in a conſiderable degree of diſorder, yet there generally is a *leading*, as the miners call it, or ſtreak of imperfect and mixed coal, which leads or directs to the vein on the other ſide of the fault, whether the ſame be higher or lower, and by which they are in a conſiderable degree directed, in cutting the fault to recover their vein; in very conſiderable faults, like that on the north of Newcaſtle, which drops the ſtrata 540 feet, it is not probable that any leading can be traced. In the coal-mines near Bath, there is a fault which has altered the level of the ſame vein of coals, much more than in the above caſe.

By the ſinking of the ſhaft, which is a narrow, perpendicular paſſage, a communication is opened with the various ſtrata above-mentioned, and the different veins of coal. The ſtrata of this foſſil are ſeldom or never found to lie in a true horizontal ſituation, but generally have an inclination or deſcent, called, as before-noticed, the *dip*, to ſome particular part of the horizon. If this inclination be to the eaſt, it is called the eaſt dip and a weſt riſe, and according to the point of the compaſs, to which the dip lies, is it denominated. This inclination, or dip of the ſtrata, is found every where; in ſome places it varies very little from the level, in others very conſiderably, even ſo much as to be nearly in a perpendicular direction; but whatever degree of inclination the ſtrata have to the horizon, if not interrupted by dikes, hitches, or troubles, they are always found to lie in the regular manner firſt mentioned. They generally continue upon one uniform dip, until they are broken or diſordered by any of the above interruptions. Wallis, in his "Hiſtory of Northumberland," tells us, that the ſtrata in that part of the iſland generally riſe to the north-weſt and dip to the ſouth-eaſt. Dr. Stukely, in his "Itin. Curioſ." 1725, ſays, that ſome of the coal-works in the ſame country dip full eaſt; but it is plain, he adds, that ſouth-eaſt is the natural dip. As thoſe at Whitehaven, inclining ſouth-weſt, receive, he ſuppoſes, a counter-bias, as being on the weſt ſide of the iſland; he further obſerves, that the principal dip is to the ſouth-eaſt; yet in this country dips in various directions, as the fall of vallies, or beds of rivers, as well as the cauſes above-mentioned, occaſionally influence its primary bent. See *Geology*, *Plate* I. *fig.* 1. where *aa* is intended to repreſent the vegetable mould or alluvial matters depoſited on the ſurface of the regular ſtrata, repreſented by *b*, *c*, *d*, *e*, &c. on the left-hand ſide of the figure. AA, and BB, are intended to ſhow the dikes, by which the ſame are disjointed, depreſſed, or elevated, as before deſcribed; and where CC ſhows a hitch or ſmaller dike; DD, EE, FF, and GG, are the repreſentations of troubles or bends of the ſtrata.

Such are the uſual diſpoſitions of the ſtrata; two principal difficulties are met with in the deſcent, the firſt is in keeping out quick-ſands where they occur, and the ſecond to keep the ſhaft ſo dry as to allow the men to work. A quick-ſand is kept out by a proceſs called "tubbing," that is forming a circle in the inſide of the pit where the ſand bed is, with ſtaves of oak, each piece being ſhod with a ſharp piece of iron; theſe are driven through the ſtratum of ſand, ſo cloſely joined that no water can penetrate, and are kept in their ſituation by internal hoops or kirbs at certain diſtances; the water is drawn out now generally by a ſteam-engine and pump. See STEAM ENGINE, PUMP, *Preſſure* ENGINE, *Bucket* ENGINE.

Through a large diſtrict of South Wales, their highly valuable veins of coals, of which an account was lately preſented by Mr. Edward Martin to the Royal Society (and publiſhed in the Philoſophical Tranſactions for 1806, p. 342, &c.) are gained at comparatively trifling expences, compared with moſt of the Newcaſtle pits; the depth of the vallies and heights of the hills in that part of the country, allowing ſeveral ſucceſſive and thick veins of coals to be worked by tunnels into the hill above the level of the rivers, or ſprings of water, in the vallies; and the coals, and the valuable iron ore which alſo abounds, are let down into the boats on the canal tunnels, or as loading for tram-waggons in the tunnels below; through which they are conveyed to open day, and thence to the iron-works or place of ſhipping: of ſeveral of theſe curious works in South Wales we have given conciſe accounts, under the names of the particular canals, railways, &c. in our article CANAL; and we ſhall take occaſion, as the names of them occur in our work, to give ſeveral material additions and corrections which have come to our knowledge, principally through the kindneſs of Mr. Martin above mentioned, ſince that article was put to preſs, ſo as to render the ſame, we hope, quite complete.

In the environs of Glaſgow there are conſiderable coal-mines of excellent quality, which are alſo worked at an eaſy expence; they are found under beds of quartzoſe freeſtone, which in ſome mines are more than 140 feet thick; it adheres to the freeſtone, without any intermedium. The coal appears at the depth of 30 feet from the ſurface, in ſcattered lines running in an irregular manner through the midſt of the freeſtone; then follow beds of the ſame ſtone without the leaſt veſtige of coal, but as the beds deſcend, the coal re-appears in ſmall ſtraggling and interrupted ſeams from three to four inches thick; theſe are again ſucceeded by an unmixed maſs of freeſtone, which falls through a depth of more than 40 feet, and terminates in ſolid and continued beds of coal. It is much to be regretted that the operation of boring is held in ſo little eſtimation in Scotland, but the reaſon is very obvious; in England it is made a diſtinct trade, and is conducted by men of information, who have been regularly brought up to the buſineſs: in Scotland it is effected by any common workmen about the pits, poſſeſſing neither information nor experience, and their accounts are conſequently ſo confuſed, imperfect, and equivocal, as to merit no confidence whatever.

The great and univerſally felt importance of its veins of coals to this country, makes us again regret our inability, at preſent, to lay before our readers, any more than a few of the principles, of the modern and yet unpubliſhed diſcoveries of Mr. William Smith, on this and other ſubjects connected with the ſtratification of the Britiſh iſlands (ſee our articles *ſtructure of the* EARTH and STRATIFICATION.) It is confeſſedly of the firſt importance, either to the inhabitants of a diſtrict in general, or to the owners of the ſoil in particular, to be able to detect and work ſuch veins of coal, as may exiſt under their ſoil; and hence we find on inquiry in the neighbourhood, that almoſt every common, moor, heath, or piece of bad land, in parts where coals are ſcarce, have at one time or other been reported by ignorant coal-finders to contain coal: how many times, for inſtance, have our grandmothers and nurſes, repeating their ſtories, told us, that plenty of coals might be dug at Blackheath, near Woolwich, and on other commons near London, if government had not prohibited their being dug, for encouraging the nurſery of ſeamen, &c. Our inquiries, and thoſe of Mr. Smith, have brought to light hundreds of inſtances, where borings and ſinkings for coals have been undertaken in ſuch ſituations, and on ſuch advice, in the ſouthern and eaſtern parts of England, attended with heavy, and ſometimes almoſt ruinous, expences to the parties, though a ſource of profit to the pretended coal finders, who, or ſome of their never-failing race of ſucceſſors, equally ſapient, have in many inſtances been able to return to the ſame ſpot or neighbourhood, and perſuade a new proprietor to act again the ſame farce, and ſquander his money on an unattainable object; for ſuch, we can without heſitation pronounce, the publication of Mr. Smith's map and ſections of England will prove it to be. This gentleman, more than 15 years ago aſcertained, by an actual examination of the country, that the ſtratum on which London ſtands, is the higheſt but one (the Bagſhot-Heath Sand) in the Britiſh ſeries of ſtrata, and that whether we proceed from London directly for the Newcaſtle coal mines, in a direction not greatly to the weſt of a north point, or to thoſe in Somerſetſhire, near Bath, lying in an eaſterly direction, or rather ſouth of it, from the metropolis; or whether we travel thence to the neareſt coal mine, lying in any intermediate direction, as in the counties of Durham, Yorkſhire, Nottinghamſhire, Leiceſterſhire, Warwickſhire, Glouceſterſhire, &c.; on a careful examination we ſhall find, the very ſame ſucceſſion of ſtrata occurring upon the ſurface, and may eaſily ſatisfy ourſelves, by an examination of the quarries, pits, and even of the hollow roads and ditches, which are every where to be found, of the identity in the nature of the various ſtratified matters, as ſand, chalk, marle, clay, limeſtone, &c.; and of the exact occurrence of each in the ſame order, as we proceed outwards from the metropolis. A more particular examination will next ſatisfy us, that theſe appearances are occaſioned by the ſeveral ſtrata which we have mentioned, ſucceſſively riſing towards the north weſt, (and conſequently dipping in the contrary direction) generally ſpeaking, and ending one after another, with very curiouſly indented or fingered edges, after which the ſame ſtratum never occurs again: the chalk ſtrata, for inſtance, will be quitted near Dunſtable, in the road to Warwickſhire, and never be ſeen afterwards on the ſurface, or be found ſunk to in any pit or excavation during all the remainder of the journey, or even in purſuing one in the ſame direction, to the utmoſt limits of the Britiſh iſlands; and, though we ſhall, in ſuch an examination, meet with a number of different ſands, clays, and other ſtrata, which may ſeem at firſt ſight to be recurrences of the ſame ſtratum, after it has riſen to the ſurface and ended; yet, on examining two of ſuch more minutely, we ſhall find, either the ſtrata lying in undiſturbed contact with them above and below, to be different in the two caſes, or their viſible or chemical qualities to differ, their thickneſſes to vary, or, that the ſame particular ſpecies of organic remains are not found imbedded, or their impreſſions left in one of the ſtrata, as are obſervable in the other: wherever, on the contrary, theſe circumſtances concur, they may be ſaid to prove the identity of any ſtratum, at however diſtant points it may be compared; and for ſhortening our inquiries for ſuch purpoſe, ſcience happily preſents us with the proſpect of ſimilar advantages, to thoſe poſſeſſed by the botaniſt of the preſent day; who, inſtead of examining all the parts of a plant ſuppoſed to belong to particular genera or ſpecies, proceeds at once to examine ſome one or two of them, which the writings of former botaniſts have ſhown to be eſſential characters of that particular plant; and it is no unreaſonable hope now to form, that the eſſential characters of each of the moſt remarkable and uſeful ſtrata in the Britiſh ſeries, will ere long be generally known to mineralogiſts, ſince they have become ſo to ſome particular individuals. Each particular ſtratum appears to us, to have formed part of one vaſt plane, with a ſlight inclination towards the ſouth-eaſt, or nearly, and with great extenſion in the directions of N.E. and S.W. in theſe latitudes; prior to the truly enormous violence with which the earth has ſince been diſlocated and broken, during the formation of the dikes, faults, hitches, and troubles, which we have had occaſion more particularly to mention in this article, and ſome greater ones, which we ſhall have future opportunities of mentioning, particularly that by which the whole of the land of England, ſouth of the river Thames, has been diſturbed and broken from its original poſition (dipping S.E.) into one, in which all the ſtrata north of a line paſſing not far from Haſtings, Battle, Eaſt Grinſtead, Guildford, &c. have now a much greater dip, nearly at right angles thereto, or N.E.; while, on the other, or ſouth ſide, they have juſt a contrary or S.W. dip; but with as many local deviations or partial dips in each caſe, as are uſually to be found, and which ſometimes vary, perhaps in ſeveral directions, many times in travelling a mile, and yet on the whole, the ſtrata keep riſing as above, the planes being the longeſt in one particular direction.

The organic remains, or exuvia of different animals, and the remains of plants, are found lodged in our ſtrata in the greateſt abundance, and, to ſuperficial obſervers, appear to have no method or arrangement therein; but, on a cloſer examination, and taking care to notice the minuter differences in theſe organized remains, it will be found, that each particular kind, either alone, or mixed with one or more diſtinct kinds, occupies a certain thickneſs of ſtrata, ſometimes but an inch, or leſs, and ſometimes many feet, but extending to the greateſt diſtances in the plane of that ſtratum, and that either above or below thoſe limits, the remains will be found to be different, or none are found; hence the layers of ſhells, plants, &c. become the moſt uſeful, as well as certain, criteria of the identity of ſtrata; theſe often changing, where the obvious qualities of the ſtrata appear unchanged, by which means they divide thick ſtrata into thinner ones, and furniſh us with ſo many more aſcertained or known points in the progreſſion of ſtrata; which, in the confined operation of ſinking a ſhaft or well, is of the greateſt importance, but particularly ſo in boring, for aſcertaining the ſtrata. See Philoſophical Magazine, vol. xxv. p. 45.

We have been led to enter thus far into Mr. Smith's theory of the ſtratification, in order to explain in this place ſome part of that which relates more particularly to the finding of coal; and as the mention of organic remains has, and muſt often again occur, we beg here to call the attention of our readers to three diſtinct eras obſervable, relating to foſſil organized bodies; 1ſt, that period in which the animals themſelves, or their exuvia, and vegetables, were quietly depoſited and buried, in and among the ſucceſſive depoſitions of ſtrata, taking effect according to laws, apparently as uniform and extenſive as thoſe of cryſtallization; 2d, a period wherein the ſtrata were ruptured, torn, and waſhed by mighty currents of water, and during which great quantities of the organized remains from within the ſtrata were detached, broken, and worn, and at length left with the gravel and alluvial matters, which now cover almoſt every part of the ſurface, although, in many places, ſuch alluvium is no thicker than what is called the vegetable mould; 3d, a period extending from the laſt to the preſent time, in which the waves of the ſea on its coaſts, the currents of inundated rivers, and the other operations of nature, have, though in a very limited degree, been continuing the ſame proceſs of waſhing out, breaking, expoſing, and wearing the original organized matters of the ſtrata, thoſe which had in the ſecond period been depoſited with the gravel and alluvium; and expoſing alſo, in many inſtances, organized remains belonging to an earlier part of the preſent or third period; which is further diſtinguiſhed, by the growth of immenſe beds of vegetable, or peaty matters on the ſurface, which have incloſed the remains of recent animals, vegetables, &c. mixed with the occaſional depoſitions of muddy waters, to which ſuch have, in low ſituations, been repeatedly ſubject.

When, therefore, we ſpeak of organized remains, without further explanation, we wiſh to be underſtood as meaning thoſe of the ſtrata, of the firſt era, no otherwiſe altered than by the gravity or chemical action of the ſurrounding matters; when we wiſh to ſpeak of the organized remains peculiar to the ſtrata, but diſturbed during the ſecond era, we ſhall, as Mr. Smith does, call them *gravel foſſils;* and this, whether they bear marks of breaking and wear, or not, if they are found depoſited with gravel, or among angular or worn fragments of matter near the ſurface, the evident effects of colliſion and attrition; when we have to mention the organized foſſil matters of the third era, if they appear ſuch as have been depoſited by water among gravel, and the depoſitions of water, as above mentioned, or have been buried by the labour and works of men or animals, and undergone a mineralization, we ſhall call ſuch *recent foſſils*, while thoſe which owe their burial, and probably their change and preſervation, to vegetation, ſhall be called *peat foſſils;* theſe terms and diſtinctions appear to us eſſentially neceſſary for avoiding, in theſe inquiries, endleſs miſtakes and abſurdities, into which former writers on this ſubject have been led, for want of ſuch diſcriminations. When organized matters of the preſent race, are found on or near the ſurface of the earth unchanged, at leaſt not mineralized, they will ſtill be denominated recent ſhells, bones, teeth, horns, plants, &c. and will be ſufficiently diſtinguiſhed from our recent foſſils above.

A careful examination of the ſeveral ſtrata which intervene and end, between London and any of the neareſt points mentioned as coal-diſtricts, will ſhow theſe ſtrata to be very various in their qualities, and in their thickneſſes (altogether amounting to ſeveral hundred fathoms), with no one circumſtance ſo obſervable among them, as the total abſence of diſtinct vegetable impreſſions or remains (among their numerous animal remains,) except of wood, and which, it is obſervable, are generally, we believe we might have ſaid always, found in theſe upper ſtrata in the ſeries, in caſual, detached, and broken pieces of the trunk, almoſt like chips and billets, and generally with the appearance upon them of previous rottenneſs and wear, from toſſing or floating in water; not unfrequently alſo, this ſuppoſition is ſtrengthened by the worm-holes with which theſe detached pieces of wood abound, particularly in the Woburn Sand ſtratum, where mineralized remains of the worms or animals which perforated the wood, found below the fuller's-earth ſtratum, are ſtill ſeen occupying the holes in the ſilicious wood, of which we have ſpecimens now before us. The pieces of wood found in the ſeries above the coal, are in ſtates as various as the matters of the ſtrata incloſing them; in many inſtances they are ſilicious, pyritic, or ochreous, leſs frequently, perhaps, they occur in a ſoft rotten ſtate, ſometimes like charcoal, and at others bituminized almoſt to the conſiſtence of pitch; and theſe laſt ſpecimens they are, which, when accidentally accumulated, as at Bovey-Tracey, and many other places, on the out-crop of the Purbeck pipe-clay ſtratum, have been improperly denominated coal ſtrata; and in Suſſex, and other parts, have miſled the coal-finders, or perhaps rather their credulous employers, above alluded to.

This abſence of vegetable impreſſions will be found to continue in our journey outwards from the metropolis, until a remarkable ſtratum is paſſed, called by the miners in Somerſetſhire the "red earth," being a very red ferruginous earth, or ſtone, ſomething like that on which the city of Coventry ſtands: from hence, examining weſtward or northward, we ſhall find a material change take place, in the animal remains becoming very ſcarce, and vegetable impreſſions beginning to appear and increaſe, among a certain ſeries of ſtrata, called, by the miners of ſeveral counties, the "coal meaſures," which are often remarkable for their quick and varied alternations, as the two ſections of coal ſtrata or meaſures, which we have given in this article, will exemplify. For many fathoms together, among ſome of the coal meaſures, particularly in the argillaceous or coal-ſhales, ſcarcely a lamina of the ſtrata, as thick as paper, can be ſplit off, without expoſing the impreſſion or bituminized remains of ſome plant, as mentioned hereafter, many of them highly beautiful: as thoſe appearances increaſe, veins of coals, or uniform ſtrata of theſe bituminized vegetables, without the intervention of ſhale, or earthy matters, occur; theſe are often extremely thin, and have intervening ſtrata, or coal meaſures, ſometimes of conſiderable thickneſs between them, ſo that in ſome of our Britiſh coal-pits, 30 or more diſtinct and ſeparate veins of coal are ſunk through, before the "main," or moſt deſirable ſeam of coals is reached; from which, if the pit was to be farther ſunk, or if we travel weſtward or northward to the ending of the ſeveral meaſures ſunk through, and over thoſe below, we ſhall at length find theſe coal-meaſures end, and what the miners call "dead earth," or ſtrata, as diſſimilar to coal-meaſures as thoſe at the top of the Britiſh ſeries, already mentioned, will be found to ſucceed through a certain ſeries of ſtrata, but then other coal-meaſures will be found to occur again, &c. Theſe different ſets of coal meaſures traverſing the country, as now ſeen on Mr. Smith's map, have often been noticed by practical men, and by ſome writers, under the title of "runs of coal;" and that on which Newcaſtle is ſituated, probably from its early and great importance in ſupplying the metropolis, has been called the "great run." The firſt workings of all our coal has evidently been upon their out-crop, or breaking to day, either at the ending of the ſtrata, or where the former and convulſive heavings of the ſtrata have left their edges bare, or nearly ſo: but experience has progreſſively proved, as the improvements of pumps, and machinery permitted, that the coals were better in quality, and leſs troubled, the farther they were purſued into the deep, or in the direction of the "ten o'clock ſun," from their out-crop, moſt generally: and thus the Newcaſtle mines have been progreſſively creeping nearer to the ſea, and now extend to, or under it, and ſtill find their coals improve; of which the Wall's End coals, brought to the London market, are an inſtance: in like manner, the mines on the oppoſite coaſt, near Whitehaven, for working ſeams, which the local dip of that part occaſions to deſcend under the ſea, have their works now extended near a mile under the ocean, at about ſix hundred feet beneath its bottom. Accordingly it has occurred, that mines have been begun higher and higher up, on the ſeries of ſtrata, called coal-meaſures, and, conſequently, had their pits of greater depths, and now the attempt is making at Bath-Eaſton, in Somerſetſhire, of ſinking in matters above the red earth, in hopes of there reaching the Somerſetſhire coal-veins, hitherto not worked ſo far eaſtward, or into the deep, by ſome miles, although ſome of their mines, owing to the rapidity of the partial dips are, we believe, working at the greateſt depths of any in the kingdom. An application of the principles above explained will enable any ingenious perſon to judge, whether his diſtrict is likely to contain coals, at practicable mining depths; for it ſeems an uſeleſs inquiry, whether they exiſt or not beyond this; for inſtance, whether the vicinity of London, and the more ſoutheaſterly parts of our iſland have the coal veins of the middle counties dipping under them, it can be of ſmall uſe to inquire; from the immenſe number and thickneſs of the known ſtrata which intervene, and contain no coals, or other very valuable matters. The very open and porous ſtate of ſome of theſe ſtrata, the chalks (more than 50 fathoms thick) for inſtance, occaſion them to be ſo powerfully ſupplied with water, as to render the proſpect of ſinking even one ſhaft through them at London, utterly hopeleſs. Mr. Dodd, whoſe ſcheme for a tunnel in chalk under the Thames, at Graveſend, we have noticed in our article CANAL, has ſince complained to the public, that the boring of one ſmall augre hole, before his ſhaft was ſunk, let up ſo much water into it, that he was unable to penetrate more than 122 feet deep; what then was he to have expected, had he ever come to open the length of 900 yards of an 18 feet tunnel in this ſame chalk? We hope to be excuſed for theſe digreſſions, as they tend, we think, to illuſtrate the queſtion, of the practicability of finding coals, through a large and important part of our iſland; and we ſhall now proceed to the methods uſed in ſinking for coals.

The firſt operation after ſinking the engine pit of a coal mine is the working or driving in the coal, and ſinking the firſt coal pit; the ſituation of which ſhould be a little higher up the plane of the ſtrata, or to the riſe of the engine pit, that the water which collects may not obſtruct the working of the coals when the engine ſtops: yet it ſhould not exceed the diſtance of 30 or 40 yards, becauſe when the firſt mine is to be driven a long way, it becomes both difficult and expenſive. After the pit is thus ſunk to the coal, the miner is to begin his work; he firſt digs or undermines with his pick-axe, a light inſtrument for hewing coal, (nearly in the ſhape of an inſtrument of the ſame name uſed by paviors and gardeners) at the bottom, and on one ſide, into the ſeam or ſtratum as far as he can; he then forces down great pieces of coal by a wedge and mallet, taking care to leave, at proper intervals, pillars for ſupporting the roof.

Fig. 2. in *Plate* I. repreſents the plan of the workings of a coal mine, where A A repreſents the main paſſage or gangway, in the direction of the dip, and in which tram-plates or rails are now often laid, for the paſſage of the trams loaded with coal to the pit or winding ſhaft; B B, C C, D D, and E E, repreſent other parallel and ſtraight paſſages, between the pillars of coal, *a*, *b*, *c*, *d*, &c. *e*, *f*, *g*, *h*, &c. which are left for ſupporting the roof and ſtrata above.

The coal is often wrought in this manner to the limits of the mine; when theſe pillars, or ſo many of them as can be got, are taken out by a ſecond working, and the roof and other ſolid ſtrata are permitted to fall down and fill up the excavation, often to the great and permanent injury of the ſurface of the land, and ſometimes to canals, and other works, as particularly mentioned under our article CANAL.

If the roof and pavement are both ſtrong, as well as the coal, and the pit only 30 fathoms deep, then two-thirds or three-fourths may be taken away at the firſt working, and one-third or one-fourth left in pillars; if tender, it will require a larger proportion to be left, probably one-third or nearly one-half.

There is an overman, whoſe office it is to go through the pit to examine the places which the men have wrought, to meaſure their work, and to ſee that the pit is free from inflammable vapour. There is alſo a deputy overman to ſuperintend the pillars of coal that are left, and to ſet up props or build walls, when the roof is looſe and threatens to fall. The buſineſs of the perſon called an "onſetter" is to hang the corves (uſually baſkets made of hazel rods) upon the rope to be drawn up the ſhaft. Collieries are liable to an accident of a very dangerous nature, called a "creep" or "fit," when the pillars of coal are left ſo ſmall as to fail or yield under the weight of the ſuperior ſtrata, or when the pavement of the coal is ſo ſoft as to permit the pillars to ſink into it, which ſometimes happens, by the great weight that lies upon them; in either caſe the ſolid ſtratum above the coal falls and cruſhes the pillars to pieces, and cloſes up a great extent of the working, or probably the whole colliery.

Mr. Ryan, we underſtand, propoſes to cure the defect of a ſoft pavement, in the principal paſſages, which are required to ſtand for a long time, by forming them in the coal, of the form ſhown in *fig.* 3. *Plate* I., or nearly approaching to elliptical; the tram-plates or rails *a*, *a*, in their bottoms occupying nearly the whole width in that part, with the undiſturbed coal nearly or quite meeting under them: in this caſe it will be neceſſary to conſtruct two parallel paſſages at a proper diſtance, one for the going of the trams to the pit, and the other for their return. Another fatal accident to which coal-miners are ſubject, in the vicinity of old workings between water-tight ſtrata, ariſes from the water contained in theſe artificial cavities, or ſometimes in natural cavities or fiſſures filled with looſe and porous matters, burſting in and ſuddenly filling their works: the only ſecurity againſt this, is to bore an augre hole before the working as it proceeds, to prove the regular continuance of the coal. The collieries about Radſtock, on the Somerſetſhire coal canal, have been ſubject to this accident, on imprudently cutting through their faults, or dikes, which, as well as ſeveral of their intervening ſtrata, are of water-tight matters.

There are two other evils to which coal mines are ſubject; hydrogen gas called by the workmen, "fire-damp" by the exploſion of which many lives are loſt; and carbonic acid gas commonly called "choak damp," which is not ſo fatal as the former. Hydrogen gas is principally generated, by the contact of pyrites with water in ſome of the old workings of the collieries which have been neglected and not ſufficiently ventilated: it there accumulates until diſcovered by the occaſional viſit of ſome of the overmen, whoſe office it is to examine the old workings called "waſtes:" ſometimes for want of due caution it cauſes the death of many of the miners, being ſet on fire with their lights. On theſe occaſions the men throw themſelves on their faces to the ground to avoid the return of the blaſt, as there is more danger to be apprehended from the vacuum formed by the total conſumption of the inflammable gas, than from the effect which the fire has upon them. It rarely happens after an exploſion that the men are much burnt; they ſuffer more by the violent concuſſion of atmoſpheric air, ruſhing into the workings to fill up the vacuum, than from any other cauſe. After an accident of this kind, it is generally conſidered dangerous to enter the pit for ſome days, on which account it is to be feared many lives are loſt which might have been ſaved by immediate aſſiſtance. At Whitehaven and Workington, where the inflammable gas is very prevalent, the miners often work without candles, in driving their adits for ventilation, by the light of a flint mill, or of ſparks produced ſomewhat in the manner of a razor grinder's wheel: but the only effectual method of preventing accidents of this nature, is to pay due attention to the ſtate of the old workings, and to cauſe a thorough ventilation by the methods uſually adopted, which are the following: the air is put in motion by means of a large furnace placed near the edge of one of the ſhafts incloſed in a covered building from which is a tube deſcending into the pit. The heated air, thus aſcending through the chimney, is ſucceeded by cold from the ſhaft, which in its turn is replaced from the loweſt part of the mine. The whole is thus ſucceſſively removed, and its place is ſupplied by air which finds its way from above, through another communicating ſhaft open to the day. The certainty of this operation has evidently no dependence on the depth of the mine, its extent, or its form. The briſk current thus produced below, naturally takes the moſt direct courſe betwixt the two ſhafts. The ventilation on each ſide is therefore accompliſhed, by means of a continued communication formed betwixt the two ſhafts in any required direction, by opening the proper avenues, and cloſing all others. A continued current is ſometimes made to paſs in this manner for twelve or eighteen miles, ſee *fig.* 4. *Plate* I. where S repreſents the ſhaft, and A the adit or working of a mine which is ſubject to damp or foul air; *a a a* is a cloſe pipe, leading from the part moſt affected to the ſurface of the ground, and there entering the lower part of a furnace, F, and aſcending through the fire therein, by the heat of which a current of air is conſtantly thrown out of the upper end of the pipe: this method is applicable, and very neceſſary, where particular and diſtant parts of the mine require ventilation; becauſe by this means freſh air can be made to deſcend down the ſame ſhaft, and along the adit through which the pipe and furnace cauſe the foul air to aſcend; for the more general ventilation of coal-mines, and where freſh air can be ſupplied by other ſhafts, as it generally can in mines at work, by means of the winding ſhaft, the water-ſhaft or engine pit, or both, a ſimpler mode is adopted, as at Worſley mine, on the duke of Bridgewater's canal, and other places, ſhown in *fig.* 5. where S repreſents the air or ventilation ſhaft, having a common roll and winch-handle erected over it, from which a cage or iron baſket, *c*, is ſuſpended by a chain, and in which a large fire of coals is conſtantly kept burning, ſome yards below the ſurface of the ground; the winch-handle is made uſe of for drawing the fire to the ſurface as often as the ſame wants repleniſhing.

Choak damp is rarely attended with any ill effects, and is eaſily diſcovered by its extinguiſhing a candle. The ſafeſt method of exploring collieries ſubject to this evil, is to walk as erect as the workings will allow; for choak damp being heavier than atmoſpheric air, occupies, of courſe, the lower part of the mine. It is more difficult to exhauſt this gas by ventilation than fire damp, as the latter aſcends, from its being lighter than atmoſpheric air, whilſt the other, by its gravity, is forced upwards with great difficulty.

It is not exactly determined by what means choak damp is generated in coal mines, but it is generally ſuppoſed to proceed from the putrefaction of vegetable ſubſtances.

After the operation of "hewing," or digging, is performed, the coals are brought to the bottom of the pit, in corves or baſkets, either drawn along the ground in the manner of a ſledge, or upon a ſmall rail or train road as they are called in Shropſhire, hooked on to a chain, and drawn or wound up by a rope to the ſurface. This is often effected by a machine called a gin, wrought by horſes. Of theſe winding machines there are various kinds; ſome wrought by water, others by the fire-engine; either of the laſt named, are only convenient in ſome particular ſituations; that wrought by horſes is therefore in moſt general uſe. There are, beſides, a ſort of gins called "whim gins," and another known by the name of "macaroni gins." In the whim gin the ropes run upon two wheel-pullies over the ſhaft, the roller is at ſome diſtance, and the circular track of the horſes is not round the ſhaft. See our article *Mine* WINDING *Engine*, and *Apparatus*. To receive the coals, there are two "bankſmen," who take off the corves at the top of the pit, and empty, or, as the workmen call it, "teem" them. The coals, by teeming, are diſcharged into waggons, by means of a grated ſpout, which allows the ſmall coals to go through it, whilſt the large paſs into the waggon. Boys or women attend to throw aſide the pyrites, or, as they are technically called, "braſſes," or in other places, "ſlates," which are ſold to the copperas manufacturers. See COPPERAS.

The coal-waggon has been already ſhortly deſcribed under our article CANAL; and for a fuller account, we refer to WAGGON. Our account of the waggon-ways, and rail-ways, alſo occurs under the article CANAL; and for other particulars relating to the conveyance of coals from the mines to the wharfs and veſſels: See WAGGON, RAILWAY, and STEATH.

Having thus given a deſcription of coal-mines, we ſhall give an account of a viſitation to a pit. That in which the beſt view is gained, and which can be entered with the greateſt eaſe and ſafety, is in the vicinity of Newcaſtle, *viz.* Eaſt Kenton colliery, the property of Meſſrs. Knowſley and Chapman. Having previouſly obtained permiſſion of a viewer, or ſome other perſon concerned in the colliery, a ſmall hand lanthorn muſt be provided, a light being neceſſary for each perſon. It is alſo adviſable to take a change of dreſs, at leaſt of upper cloaths; ſtrong boots to keep the feet dry, and an old hat. Being thus prepared, proceed to the ſteath, which is by the river ſide, about four miles above Newcaſtle, a pleaſant excurſion by water. When there, ſome of the men, who have been apprized of your coming, will aſſiſt in ſeating you on a ſet of ſmall empty coal waggons, capable of containing two perſons each, ſeven of which are drawn along a rail-way by one horſe. As ſoon as you are placed, with your candles lighted, you ſet off at full ſpeed, with a boy in the firſt waggon, for a charioteer, into a tunnel, or ſubterraneous paſſage ſix feet high, about the ſame breadth, and three miles in length. It is particularly neceſſary to guard againſt putting your hands ſuddenly out of the waggon, as the tunnel, in moſt places, is only wide enough to admit the waggon and horſes, and you are of courſe by doing ſo in danger of receiving an injury; but by ſitting quietly, you aſcend very ſmoothly, till you arrive at the place where the men are at work. At your firſt entrance into the tunnel you are ſtruck with the noiſe of the waggons, which, being faſtened with chains to each other, and going ſometimes at the rate of ten miles an hour, make a ſound reſembling thunder. The paſſage is in general hewn out of ſolid rock, compoſed of metal ſtone, a ſort of ſchiſtus. Where there is not rock, it is arched with brick or ſtone. The water from the pit runs down by the ſide of the rail-way to the river Tyne.

At intervals there are double rail-ways; and where you come to one of theſe your driver ſtops his horſe, and a dead ſilence enſues; he then calls aloud, and liſtens to hear if any loaded waggons are coming down, that they may there paſs each other; when he is paſt, your driver renews his ſpeed, until he reaches the next interval, when he repeats his call, and ſhould no anſwer be heard in return, he proceeds. If, by the negligence of the boys, the waggons ſhould meet where there is no double rail-way, the boy with the empty waggon unlooſes his horſe, which is taught to turn round, and force the waggons back with its breaſt, until they reach the double part, where they can paſs each other.

On the ſides of the tunnel you will obſerve ſeveral fungi of a pure white, which, by the heat of your hand, or expoſure to the open atmoſphere, diſſolve into water. The air up the tunnel is cold, but perfectly pure, but as you approach the workings a conſiderable degree of warmth is felt. You alight from your waggons in order to view the different operations to which your guide will conduct you.

In the upper ſeam or ſtratum, the coal is not much wrought on account of its inferior quality. Here you will ſee the ſtables for the horſes, the ſteam-engine for raiſing the coals from the lower ſeam, and the ventilating furnace, by which the impure vapours are drawn off. Here you will alſo be ſhown, on the roof of one of the lateral openings of this level, a variety of curious ſpecimens of plants, ſomewhat like graſſes, ferns, vetches, &c. impreſſed upon a ſort of blue ſlaty ſtone; the different plants are remarkably diſtinct from each other. There is alſo in one part the trunk of a tree, many blocks of which have been taken out to make ſeats in a neighbouring garden; as far as the ſtone has been cut, the tree has been traced even to its ſmalleſt branches, and the roughneſs of the bark is ſtill preſerved in the ſtone: the whole of this ſtratum is one uninterrupted continuation of theſe impreſſions of vegetables: it is nearly horizontal, and is 112 yards from the ſurface.

In Eaſt Kenton colliery, there are three ſhafts or perpendicular openings, for raiſing the coals. The firſt is the pit at the day, near the village of Kenton: it is circular, 56 fathoms deep, and at preſent only uſed for delivering coals for ſale at Newcaſtle. The coals are drawn up in baſkets. The bottom of this pit is on a line with the rail-way from the river. The ſecond ſhaft is eighteen and a half fathoms deep, and at a ſhort diſtance from the bottom of the firſt. It is ſquare, and juſt admits the waggons, which are drawn up and let down by the ſteam-engine. The third ſhaft is only 7 fathoms deep. After having examined the works, you may be drawn up to the ſurface by the firſt ſhaft in a baſket in about two minutes, in which ſpace of time you will have aſcended 56 fathoms. But ſhould this mode of conveyance not be approved of, you may return again by the tunnel. Brand's Hiſtory of Newcaſtle. Com. Magazine. Dr. Black's Lectures. Wallace's Northumberland. Pennant's Tour. St. Fond's Travels. Picture of Newcaſtle. Papers of the Literary and Philoſophical Society of Newcaſtle upon-Tyne. Philoſophical Tranſactions.

Coal-*balls*, balls made of coal and clay, or ſlack, for firing. Theſe balls are made with $\frac{1}{3}$ of clay, without ſand or gravel, and $\frac{2}{3}$ of *coal-duſt*, or *culm*, well mixed, and formed either into round balls or into bricks. This coal-duſt being the refuſe of the mine, makes this ſort of firing cheap. See Phil. Tranſ. N° 460. ſect. 3. See *Patent* Coal.

Coal-*buſhel*. The meaſure directed to be uſed in London and other places for retailing coals, is different from the Wincheſter buſhel for corn, or malt buſhel, $18\frac{1}{2}$ inches wide, and 8 inches deep, containing 2150.42 cubic inches, deſcribed under our article Bushel. By the act of 12 Anne, the coal-buſhel is directed to be round, with an even bottom, and to be $19\frac{1}{2}$ inches diameter, from outſide to outſide, capable of containing one Wincheſter buſhel and one quart of water; of which a ſtandard is to be kept in the exchequer, and 36 of ſuch buſhels, heaped up, are to make one chaldron. By the act 43 Geo. III. the coal-buſhel was directed to be heaped up in the form of a cone, but the exact height, or proportion thereof, to the baſe or top of the buſhel ($19\frac{1}{2}$ inches) not being fixed in this act, the principal land coal-meters have, from careful and long continued obſervations of the cuſtom or practice of meaſuring coals, fixed the height of the cone at 7 inches above the top of the buſhel; this we learn from Mr. Robert Vazie, a gentleman who has laudably taken much pains, in endeavouring to introduce a bow-gage to coal-buſhels, nearly ſimilar to the bail or handle of a water-pail, which ſhould at all times, by being lifted up and ſwept over the buſhel, determine the proper quantity of the heaped part, which is now left to the diſcretion of the fillers, ſubject to the inattention or partiality of the meter, who is, or ought to be, ſtanding by. According to theſe data, the content of the coal-buſhel itſelf ($= 1\frac{1}{32}$ corn buſhel, as above) will be 2217.62 cubic inches, its depth inſide varying, from about 8 to 9 inches, according to the thickneſs of the wood in the ſides, it being the outſide diameter which is fixed by law, on account of the heaping up.

A cone of $19\frac{1}{2}$ inches diameter, and 7 inches high, will contain 696.8482 cubic inches, and therefore 2914.47 cubic inches, will be very nearly the cubic content of a heaped buſhel of coals, = 1.6866 cubic feet, = .062467 cubic yards, = 5.866565 cubic links, = .477126 ſteres or new wood meaſures of France, = $\frac{1}{36}$ chaldron, = 4 coal pecks, = 1.3553 malt, or Wincheſter buſhels ſtruck. From the above calculations, our readers will ſee, what relation the coal buſhel bears to other meaſures. By the late acts for regulating the delivery of coals in and near the metropolis, every waggon or cart uſed in delivering of coals, is required to have a lawful buſhel with it, edged with iron, to prevent wear, and ſealed; and uſing others or altering ſuch buſhels, incurs a forfeiture of 50*l.*

Coal, *Cannel*, or *Candle*. See Coal *Supra* and Ampelites.

Coal *Canal*, or *Somerſetſhire Coal Canal*, commences in the *Kennet* and *Avon* canal, about $3\frac{1}{2}$ miles above the city of Bath, and proceeds S.W. in two branches, with rail-way extenſions to the collieries N.E. of Mendip hills. See Canal.

Coal-*fiſh*, in *Ichthyology*. See Gadus *Carbonarius*.

Coal-*iſland*, in *Geography*, a village in the county of Tyrone, Ireland, where the coal works are carried on with tolerable ſucceſs. In 1800, there were five pits working induſtriouſly, and the works were not much impeded by water. There is, however, great want of encouragement; and the canal, which was made at the public expence, to the Tyrone collieries called Blackwater, has been ſo much neglected, that it is choaked up with mud and weeds. Coal-iſland is about 3 miles W. from Lough-Neagh, and 4 N. from Dungannon. M'Evoy's Account of Tyrone. See Canal.

Coal *Meaſures*, a term among miners, for the ſtrata moſt frequently alternating with beds of coal; theſe often conſiſt of argillaceous ſhale, and contain numerous impreſſions of vegetables upon them, of which there was a very curious collection in the late ſir Aſhton Lever's muſeum. See our article Coal *Supra*.

Coal *Meaſuring*. In the pool or port of London, coals are meaſured out of the ſhip into the barges, or lighters, in a veſſel or low tub, called a vat, holding nine buſhels (ſee Vat), which is heaped up by the porters who fill, until the ſworn meter, who is always in attendance, is ſatisfied with the juſtice of the meaſure, and directs the vat to be emptied over the ſhip's ſide into the room of the barge, &c. below. Out of theſe barges, &c. the coals are again meaſured by a ſtandard coal buſhel (ſee Coal-*buſhel*), in the preſence of another ſworn meter, called a land meter, and are emptied out of the buſhel into ſacks, for delivery to the buyers; a few years ago, this laſt proceſs was improved as follows:

Plate XIV. of *Mechanics*, repreſents a machine for meaſuring coals, for which Meſſrs. Simeon and Thompſon took out a patent in the year 1803. The machine, from which the drawing is taken, was erected in 1803 at the Red croſs coal wharf, near London bridge, and has been at work ever ſince with great ſucceſs near the water-works. It is erected before the wall of the coal warehouſe, and communicates with the ſecond floor, by a large opening in the wall. The barges, containing the coals, are brought under the wall of the warehouſe, which is by the water ſide; they are filled into buckets, and then drawn up by a machine into the houſe, where they are emptied into a wheel barrow, and thus conveyed to the ſtage, A, *fig.* 1, in the floor of which the buſhels, B, B, B, are placed; theſe buſhels are of caſt-iron, of the dimenſion directed by act of parliament; they have moveable bottoms, opening downwards on hinges toward the wall of the houſe, and are ſhut by a chain, which is faſtened to the bottom, oppoſite the hinges, and comes up through a tube, *a*; the other end of the chain goes over, and is faſtened to a wheel of caſt-iron, E, mounted on a ſhaft, which carries ſimilar wheels for the other two buſhels; it turns on a pivot in the wall, F, at one end, and on another, working in a collar, ſupported in the wainſcoting, G, which forms the other end of the room; the ſhaft projects ſome diſtance through this partition, and has a wheel, H, fixed on it, round which a rope, I K, paſſes; the end, K, of this rope has a ring tied to it, which is hooked on a pin in the wall, which pin is adjuſtable by a ſcrew, as ſhown in *fig.* 2, ſo that when the ring is hooked on it, the bottoms of the buſhels ſhall be cloſe ſhut; *b d*, *fig.* 2, is an iron frame ſcrewed to the wall, in which a ſquare piece of iron, *e*, carrying the pin (on which the ring is hooked) ſlides; *f* is a ſcrew turning in the frame, and paſſing through the piece *e*, which is tapped, ſo that by turning the ſcrew by a winch, put on the ſquare at its upper end, the pin can be raiſed or lowered.

The chains, D, *fig.* 1, have each a ſcrew-link in them, by which the buſhels can be all made to ſhut cloſe at the ſame time. Beneath each buſhel is a wooden hopper, L, into which the coals are emptied when the bottom of the buſhel is opened, and the ſacks are hung to this hopper to receive the coals; there are two ſmall hooks at the back of the hopper, to which the mouth of the ſack, M, is hooked; *h* is an iron bar, with a hook at each end, to faſten to the ſack; two ſmall cords are tied to this bar, which paſs over two pulleys, and are both faſtened to a ring that is hooked on a pin, driven into the hopper, in order to keep the ſack's mouth cloſe up to the hopper.

The operation of the machine is as follows: the coals are filled into the buſhels by three men, and are heaped up until they touch the plummet, *d*, ſuſpended by a chain from the ceiling; when the coal-meter, who ſits before the deſk, N, ſees, through the window, that they are properly filled, he takes the rope, I, with one hand, and with the other ſlips the ring, at the end of K, off the pin, as before deſcribed; the weight of the coals, reſting on the bottoms of the buſhels, then cauſes them to open, and the coals fall into the ſacks beneath; he holds down the rope, I, until the buſhels are all emptied, then lets it return, and hooks the ring on the pin. The bottoms of the buſhels are made to ſhut, by one of the ſpaces between the arms of each wheel, E, being filled with lead, which is equal to about half the weight of the coals; when the ſacks are filled, they are placed in a hand-barrow, and are wheeled into the waggon, the ſtage, R, being juſt the ſame height from the ground, as the floor of the waggon, which is backed up againſt it.

COAL-*Mines*. See COAL. By 10 G. II. c. 32, if any perſon ſhall wilfully and maliciouſly ſet on fire any mine, pit, or delph of coal, or cannel-coal, he ſhall be guilty of felony, without benefit of clergy. By 13 G. II. c. 21, if any perſon ſhall convey water to any coal-work, with deſign to deſtroy or damage the ſame, he ſhall pay to the party aggrieved treble damages with coſts, recoverable in any court of record at Weſtminſter. By 9 G. III. c. 29, any perſon demoliſhing engines, waggon-ways, bridges, &c. belonging to coal-mines, or cauſing the ſame to be done, ſhall be guilty of felony, and be tranſported for ſeven years: the proſecution on this act being within 18 months. By 39 and 40 G. III. c. 77, any perſon, deſtroying or damaging mines or roads leading to or from the ſame, ſhall be deemed guilty of a miſdemeanor, and may be impriſoned, on conviction, for any time not exceeding ſix months. Colliers and others, who wilfully and obſtinately work in a manner contrary to their agreements, or who do not fulfil their contracts, ſhall, on conviction, upon the oath of one witneſs, before one juſtice, forfeit not exceeding 40*s*., and upon non-payment, be committed to the common gaol without bail, for a time not exceeding ſix months, or till ſuch penalty and coſts ſhall be paid; and the contract ſhall become void. Perſons convicted of fraudently walling or ſtacking coal, &c. ſhall, on conviction, by confeſſion or oath of one witneſs, before one juſtice, be committed to the common gaol or houſe of correction, for any time not exceeding three months. If any perſon ſhall ſteal coals or implements, not exceeding the value of 5*s*., he ſhall, for the firſt offence, forfeit not exceeding 10*s*. over and above the coſts, or be committed to hard labour for one month; for the ſecond offence, not exceeding 20*s*., or be committed to the houſe of correction for three months; and for the third, or any future offence, not exceeding 40*s*., or be committed to hard labour for 6 months. All proſecutions under this act ſhall commence within nine months after the offence is committed.

COAL, *Old*, an inferior ſort of charcoal, made in Kent, and other places, from the roots of trees and underwood, for ſale to the founders, and others, in London, who uſe it for ſome common purpoſes, as a ſubſtitute for charcoal.

COAL *Orton*, or *Cole-Orton*, a rectory in the hundred of Eaſt-Goſcote, in Leiceſterſhire; it is ſituate very high, yet its coal-mines have attracted the rail-way extenſions of canals, in two different directions, *viz.* the *Leiceſter* and the *Aſhby-de-la-Zouch*. See CANAL.

COAL, *Patent*, is applied to a ſubſtance manufactured in Millbank Street, Weſtminſter, under a patent, granted to Mr. Chabannes, (ſee *Repertory of Arts*, XV. 367.); it conſiſts of the ſmaller parts, ſifted out of the ſea-coals, uſed for culinary purpoſes, before they are ſold, mixed up with a certain proportion of dirt and ſweepings of the ſtreets, which mixture is watered and tempered together, until fit for making into ſmall bricks, of which great numbers are ſet to dry in a large open-boarded ſhed. One or two of theſe coal-bricks, put into a coal-fire, are ſaid to continue the intenſity of its heat for a long time. See COAL-*balls*.

COAL-*Port*, the name given by the late Mr. William Reynolds, to a new town which he founded on the banks of the Severn river, at the entrance of the Shropſhire canal. See CANAL.

COAL, *Small*, is a ſort of charcoal, prepared from the ſpray and bruſh-wood, ſtripped off from the branches of coppice-wood, ſometimes bound in bavins for that purpoſe, and ſometimes prepared without binding.

The wood they diſpoſe on a level floor, and, ſetting a portion of it on fire, they throw on more and more, as faſt as it kindles; whence ariſes a ſudden blaze, till all be burnt that was near the place. As ſoon as all the wood is thrown on, they caſt water on the heap from a large diſh or ſcoop; and thus keep plying the heap of glowing coals, which ſtops the fury of the fire, while, with a rake, they ſpread it open, and turn it with ſhovels till no more fire appears. When cold, the coals are put up into ſacks for uſe. Small coal was formerly much more in uſe in London than it is at preſent. The ſiftings of charcoal are called *charm* by the London dealers.

COAL-*ſoot*. See SOOT.

COAL-*ſpirits*. Coals diſtilled in a retort not only afford a phlegm and black oil, but a ſpirit, or gaſeous matter, which is apt to force the lute and break the glaſſes, now known to be hydrogen gas: bladders may be filled with this inflammable air, which may be kept a conſiderable time. If the bladder be pierced with a pin, and ſqueezed near the flame of a candle, the gas will take fire, and afford an amuſing ſpectacle. See Phil. Tranſ. N. 452. ſect. 5. See DAMPS and GAS-*Lights*.

COAL-*tar*. See TAR.

COALBROOK DALE, in *Geography*, a village of Shropſhire, about 13 miles from Shrewſbury, which exhibits to the traveller the beneficial effects of manufacture and commerce, in its celebrated iron-works, as well as a variety of romantic ſcenes. The river Severn winding between high wooded hills, oppoſite to the forge of Broſeley, is croſſed by a bridge of one arch, 100 feet in length, and formed entirely of caſt-iron, with ſtrong ſtone abutments, which preſents at once a ſtriking effect in landſcape, and a ſtupendous ſpecimen of the powers of mechaniſm. This was the firſt iron bridge erected in England, and was caſt in 1779, under the direction of Mr. Abraham Darby. Beſides the communication of theſe works with the Severn river, they have a branch of the Shropſhire canal extended to connect with their rail-ways. See CANAL.

COALESCENCE, the union or growing together of two bodies before ſeparate. It is principally applied to ſome bones in the body, which are ſeparate during infancy, but afterwards grow together; or to ſome morbid union of parts which ſhould naturally be diſtinct from each other. Thus there is a coaleſcence of the ſides of the vulva, anus, and nares; of the eye-lids, fingers, toes, and many other parts.

COALITION, the re-union, or growing together of parts before ſeparated. See CONGLUTINATION, &c.

COAMANI, in *Ancient Geography*, a people of Aſia, in the vicinity of the Paropaniſiani, according to Mela; the ſame with the Comani of Pliny, who probably inhabited the country called by Xenophon *Comania*.

COAMINGS, in *Ship Building*, are thoſe planks, or that frame, forming a border round the hatches, which raiſe them up higher than the reſt of the deck. Loop holes for muſkets to ſhoot out at, are often made in the coamings, in order to clear the deck of the enemy when the ſhip is boarded.

COANCA, in *Ancient Geography*, a town of India, placed by Ptolemy on this ſide of the Ganges.

COANE, among the Greeks, a name given to a peculiar ſpecies of tutia or tutty, which was always found in a tubular form. It has its name from κωνη, a word uſed to expreſs a ſort of cylindric tube, into which the melted braſs was received from the furnace, and in which it was ſuffered to cool. In cooling, it always depoſited a ſort of recrement on the ſides of the veſſel or tube; and this was the tutty called *coane*.

COANEPILLI, in *Botany*, Hernand. See PASSIFLORA *normalis*.

COANGO, in *Geography*, a river of Africa, in the kingdom of Congo, called *Zaire*, which ſee.

COANZA, a large, deep, and rapid river of Africa, which riſes in the unknown interior parts towards the eaſt; and, after receiving many rivers in its courſe, and bounding the kingdom of Angola on the ſouth, empties itſelf into the Atlantic, about 9° 20′ S. lat. and about 12 leagues S. of St. Paulo Loando, the capital of Angola. It is navigable about 150 miles upwards, quite to *Cambamba* (which ſee); and abounds with variety of fiſh, forms ſeveral iſlands, and has ſome cataracts, one of which, in particular, bears its name. Its mouth, between the capes Palmerino and Lego, is above a league wide; and its fall into the ocean is ſo rapid, that the ſea is rendered muddy 2 or 3 leagues below it. Its mouth is not eaſily perceived from the open ſea, on account of an iſland quite covered with high trees, which lies juſt before it. About 15 or 16 leagues above, it divides its waters into two ſtreams, of which the ſouthern is the deepeſt, and moſt frequented. The two chief iſlands formed by this river, are *Maſſander* and *Motchiama*, which ſee.

COAPAIBA, in *Botany*, Marcgr. Piſ. Rai. See COPAIFERA.

COARA, in *Ancient Geography*, a town of Syria, in the province called *Chalcidene*, which ſee.

COARI, in *Geography*, a river of South America, which runs into the river of the Amazons, in Terra Firma.

COAS, in *Ancient Geography*, a river of India, ſo called by Ptolemy, but by others called *Choes*. See COPHENES, and COW-*river*.

COASINA, a town of the French department of Liamone, on the iſland of Corſica, and chief place of a canton in the diſtrict of Sartene; 5 miles N. of Cervione. The canton contains 2631 inhabitants.

COASSE, in *Zoology*. See VIVERRA *Vulpecula*.

COAST, in *Geography*, a ſea-ſhore, or the country, adjoining to the edge of the ſea. Buffon diſtributes the coaſts of the ſea into three kinds; *viz*. 1. High coaſts, compoſed of hard rocks, commonly perpendicular, and of a conſiderable elevation, riſing ſometimes to the height of 700 or 800 feet. 2. Low coaſts, of which ſome are almoſt level with the ſurface of the water, and others have a ſmall elevation and are often bordered with rocks nearly on a level with the water, which give riſe to breakers, and render the approach of ſhips very dangerous. 3. Downs, or coaſts formed by ſand, either accumulated by the ſea, or brought down and depoſited by rivers; theſe downs form hills of greater or leſs elevation, according to circumſtances. The depth of the water along the coaſt is generally proportional to their elevation; ſo that a high coaſt indicates a deep water, and, on low coaſts, the water is commonly ſhallow. See SEA.

COAST, *Gold*, ſometimes called *Guinea Proper*, a province of Guinea on the coaſt of Africa, ſo called from the abundance of gold which it produces, is bounded by Nigritia or Negroland on the north; by the Slave coaſt on the eaſt; by the Ocean on the ſouth; and by the Tooth or Ivory coaſt on the weſt. It commences at the river Ankobar, or Cape Apollonia, and extends to the Rio Volta, comprehending from 100 to 120 leagues from weſt to eaſt. The Gold coaſt, ſtretching along the ſea, contains a variety of different kingdoms and ſtates, *viz*. Adomir, called likewiſe Saku and Avira; Axim, Ankobar, Adom, likewiſe called Little Inkaſſan, or Warſhes; Jabi or Jabs; Commendo or Guaffo; Fetu; Sabu; Fantin; Acron, or Akron; Agonna, or Anguirra; Amra, or Aquamboe; Labbade; and Ningo, or Lambi. Each of theſe kingdoms or provinces has one, two, or more towns or villages on the ſea coaſt, between, or under the European forts and ſettlements. Some of them are monarchies, having their own proper kings, and others are republics, governed by magiſtrates, who are ſubject to the laws and periodical changes. The gold of this country is generally found in three different kinds of places; the firſt and beſt in vallies, ſituated between mountains; the ſecond at and about rivers and falls of water; and the third at the mouth of rivers and rivulets on the ſea coaſt, which laſt the negro women, after a fall of rain, collect, by waſhing the earth that contains it, in bowls, and thus ſeparating the one from the other. The negroes practiſe various methods for ſophiſticating the gold, which they obtain. One is the caſting of it into fetiches, mixed with half or a third part of ſilver and copper. (See FETICHE.) Another method of adulteration is that of caſting pieces of gold ſo artfully, that the external cruſt, about the twelfth of an inch thick, ſhall be pure, while the inſide conſiſts wholly of copper, or of iron. The third method by which they attempt to deceive the Europeans, is by means of a powder of coral or of copper filings, tinged ſo exactly like gold, that only ſcales can detect the counterfeit.

The natives of the Gold coaſt are in general tall, ſtraight, and well-proportioned, with oval faces, ſparkling eyes, regular and white teeth, thick eye-brows, and ſmall ears; mouths moderately large, and lips tinged with a better colour, and thinner than thoſe of the negroes of Angola. With regard to their mental faculties they have a quick apprehenſion and retentive memory, and a ſurprizing degree of ſelf-poſſeſſion upon the moſt ſudden and alarming occaſions. As to their diſpoſition and character, they are, in general, extremely indolent in the exerciſe of the talents with which nature has endowed them; they are crafty, fraudulent, and diſſembling; covetous and intemperate. When they obtain a victory over their enemies, they return home dancing and ſinging; and, if they are defeated, they do the ſame round the graves of their friends and fellow-ſoldiers; ſo that a ſtranger cannot diſtinguiſh a victory from a defeat, except that after the latter they ſhave their heads. The women are handſomer than the men, ſtraight, ſlender, and well limbed; with high cheſts, ſmall mouths, and eyes ſpirited and lively. They are cheerful and loquacious; gay in their diſpoſition, and looſe in their principles as to gallantry, but temperate in their diet. Both the men and women, when neceſſity ſurmounts their natural indolence, are ingenious, diligent, and laborious; and when they are excited by avarice or indigence, they apply themſelves with great aſſiduity to agriculture and fiſhing. Upon the whole, their natural talents are good, but their paſſions are ſtrong, their ignorance great, and they abandon themſelves to the calls of nature without dread of ſhame, that ſhield of decorum, decency, and virtue. Their dreſs is various, depending upon fancy and circumſtances; ſome wear long hair, curled, plaited, or tied upon the crown of the head in the form of a roſe, which they moiſten with oil, and tinge with different colours, and others wear it ſhort, for conveniency; or looſe, either for ornament or from negligence. Their hair, however, is generally adorned with gold fetiches; a ſort of collar, called "conte de terra," four times the value of gold; or with a blue coral, which they call "accori," eſteemed of equal value with the precious metal. Their arms, legs, and likewiſe waiſts, are ſet off with gold, conte de terra, and accori. Their uſual dreſs is a petticoat of velvet, ſilk, cloth, or ſome ſtuff; and thoſe who pretend to a taſte ſuperior to the vulgar, make their "paans" of a mixture of 50 different kinds of cloth. This paan they plait ſo artfully that it fits neat round the middle, hanging half way down the legs; round their necks they wear ſtrings of gold and coral, amounting ſometimes to 100*l.* in value; and by theſe worth among them is eſtimated, ſo that thoſe who want them are excluded the company of thoſe who poſſeſs them. The common people, as fiſhermen, &c. are very poorly attired, with a yard or two of mean ſtuff formed into a kind of petticoat, or with a girdle drawn between their legs; to which they frequently add a cap made of ruſhes, or when they can obtain it by ſtealth or intereſt, a ſailor's old hat, which they wear in hot as well as cold weather. The rage of dreſs is chiefly prevalent among the women, ſo that the ladies are loaded with gold, coral, and ivory trinkets. In the manners of all the negroes, both male and female, there is a neatneſs peculiar to warm climates, and indeed neceſſary in ſuch climates, which is a practice of waſhing their bodies twice every day, either in ſalt or freſh water. With this view they fix their habitations either on the ſea-coaſt or on the banks of rivers; and in defect of theſe, they make tanks or baths; habit rendering cleanlineſs no leſs eſſential to them than food. They teach their children to ſwim when very young: and thus they become expert divers, and are able to continue for a long time under water. So fond are they of this element, that half their time is ſpent in it, and they may not improperly be denominated amphibious.

Beſides the natural inhabitants of the Gold coaſt, there is a great number of Mulattoes, a mixed progeny, ariſing from the commerce of Europeans with the black women. This ſpurious race, it is ſaid, form gangs of thieves and robbers, void of decency, honour, honeſty, or principle, in their dealings with each other, with the negroes or Europeans. They call themſelves Chriſtians, but in reality are the groſſeſt idolaters; and their women very generally proſtitute themſelves, publicly to Europeans, and privately to the negroes.

The towns and villages of the Gold coaſt conſiſt of a multitude of little huts or cabins, diſperſed in groups, without order or deſign, and communicating with each other by narrow crooked roads, which terminate in the centre of the town or market-place. The farther you remove from the ſea-coaſt the more civilized do the natives appear, at leaſt, as to their building and mode of living. On the coaſt the towns and villages are ſituated in dry, barren, ſandy lands, or upon rocks and precipices; but, in the interior parts, they occupy the moſt delicious ſpots that can be choſen; they are better built, kept in a neater and cleaner ſtate, generally paved and better peopled.

The diet of the negroes on the Gold coaſt is neither delicate nor expenſive; conſiſting commonly of a pot of millet boiled to the conſiſtence of bread, yams, and potatoes, over which they pour palm-oil; and the diſh is garniſhed with herbs and putrid fiſh. On holidays they feaſt upon beef, mutton, and fowls. The diſh called "malaguet," which is uſed by people of a ſuperior rank, conſiſts of fiſh, corn, dough, palm-oil, and herbs, boiled in water and ſeaſoned with ſalt and pepper. The negroes, though ſomewhat temperate in eating, indulge to a great degree in drinking. The morning is uſhered in with brandy, and the evening concludes with palm-wine, mirth, riot, and tobacco, of which they are extravagantly fond.

In their marriages they have no ceremonies, nor have they any previous courtſhip, or any diſputes about marriage-ſettlements. Polygamy is allowed among them without any reſtriction beſides what reſults from humane or worldly circumſtances; however, the uſual number of wives is from two to ten, and ſeldom exceeds twenty. The women conſtitute the labouring part of the people, and are employed in cultivating the ground, and providing ſubſiſtence for the huſband, who ſpends his time idly in goſſipping, drinking, and ſmoaking. On the coaſt, however, the caſe is different; for in many towns and villages the men toil and labour for the females. The rich have two wives, exempt from ſervile employment, to whom the management of the houſe is entruſted, and who exercise a delegated authority over all the other women. Of the honour of theſe the huſband is particularly jealous; but as to the reſt he is unconcerned, provided that he can profit by their incontinence; for among the negroes it is not uncommon for the huſbands to derive ſupport from the voluntary proſtitution of their wives; and as the wealth of the negroes conſiſts chiefly in the number of their family, they direct their chief attention to the increaſe of their children; accordingly great reſpect is paid to a woman with child; and ſhe is delivered without much pain or anxiety. Beſides their lawful wives, the negroes often keep concubines, who are frequently preferred, and more tenderly treated than thoſe to whom they are actually married; but their children are illegitimate, and, if begotten upon a ſlave, are retained as ſuch by the heir of the father's fortune, unleſs he previouſly manumits them with the uſual ceremonies; in which caſe they are free after his death, and enjoy every right of free-born perſons. Legitimate children never inherit the fortune of parents in any kingdom on the Gold coaſt, except at Acra. The eldeſt ſon of a king or chieftain ſucceeds his father in his employment; but, beſides his ſhield and ſabre, he has no claim on any other part of his fortune. Among the negroes, maſters are accountable for their ſlaves, and are obliged to repair the injury they commit by theft, robbery, adultery, or murder. They are likewiſe reſponſible for their ſons, nephews, and other relations; and unleſs the impoſed fine be paid, the delinquent muſt ſuffer corporal puniſhment, and even death, if the crime be of a heinous nature. He who debauches the wife of another man in the interior countries, is not only ruined himſelf, but entails deſtruction on all thoſe who are connected with him by blood. If the delinquent be a ſlave, the puniſhment is a cruel death, beſides a fine impoſed upon the maſter. If a woman be caught in adultery, her life is forfeited, unleſs it be redeemed, at a great expence, by her relations; and the woman who indulges her paſſion for a ſlave dies, without poſſibility of redemption. The ſlave alſo periſhes with her, and her relations are obliged to pay a conſiderable ſum of money to the injured huſband. In this caſe every conſiderable negro is his own judge. The woman, on the other hand, has no redreſs, if the huſband ſhould prove unfaithful. On the ſea-coaſt all the women marry young; and many families ally themſelves by marriage as ſoon as the children are born. Chaſtity, however, is held in no high eſtimation; for thoſe who violate it before marriage forfeit no reſpect either from their huſbands or the world; nay, they are eſteemed the better qualified to enter into matrimony, and are conſequently preferred to abſolute veſtals. In the countries of Eguira, Axim, Ancobar, Anta, and Adom, there are certain females who never marry, but are dedicated by profeſſion to the public uſe, and formally initiated in their vocation. The negroes, though in various reſpects unpoliſhed, are by no means deficient in a certain exterior politeneſs in all their mutual intercourſe. When they firſt meet in the morning, they claſp each other in their arms, and pray that the day may be proſperous. Upon an accidental meeting, after they had before ſeen each other, and the uſual compliments had paſſed, the negroes on the coaſt pull off the hat or cap; but the interior negroes do not eſteem uncovering the head as any token of reſpect. At Elmina, when a ſtranger from another country is introduced, after the firſt compliments, the wife, or female ſlaves, bring water, greaſe, or ointment, to waſh and anoint him; which office they perform with their own hands. The viſits of kings and perſons of ſuperior rank, are attended with ſeveral peculiar and extraordinary ceremonies, which it is needleſs to recite.

Few families on the coaſt keep any conſiderable number of domeſtic ſlaves; nor do they make any great parade of them at their feſtivals or viſits. The excluſive right of ſelling ſlaves is veſted in the rich, not ſo much by law as from the neceſſities of the meaner rank, which render them unequal to the purchaſe and maintenance. Thoſe who are employed in this capacity in almoſt all the maritime parts, conſiſt of ſuch as have bartered their freedom to the rich for ſuſtenance, and are marked by them with certain ſigns, that atteſt them to be their property. If after this any attempt ſhould be made to run away, they loſe the left ear for the firſt treſpaſs, the right ear for the next, and the third fault is puniſhed either by death, or ſelling them as ſlaves to Europeans. Thoſe who are born ſlaves are treated with a degree of tenderneſs on the coaſt which is uncommon in the inland countries. They are chiefly employed in fiſhing, agriculture, and thoſe arts that are neceſſary for the ſupport of their maſters and themſelves.

Among the negroes, there is a variety of mechanical arts, in which they are conſiderable proficients; ſuch as making wooden and earthen veſſels and plates, chair-matting, copper ointment-boxes, bracelets, necklaces, rings, and ear-rings of gold, ſilver, or ivory. Their chief excellence conſiſts in the manufacture of all ſorts of weapons and inſtruments of war, and all kinds of ſmith's work; their tools, however, are very rude and ſimple. They alſo manufacture gold and ſilver hat-bands of a very fine thread and exquiſite workmanſhip. In building canoes of various ſizes, and uſed for trading from one port to another, loading and unloading ſhips, and fiſhing on the coaſt, they are very ingenious; as well as in the uſe of them. Their agriculture is chiefly performed in the rainy ſeaſon; the ground being at other times too hard for tillage. At ſeed-time they chooſe a convenient ſpot of ground, which is eaſily obtained with the conſent of the king, who claims a nominal juriſdiction; and in three days after it is ſown the whole field is covered with a beautiful verdure, and the crop is ready for reaping in leſs than three months. For maize they ſelect an elevated ground; and for rice and millet, low marſhy lands. The natives of the coaſt find it ſo eaſy a matter to diſpoſe of all their grain, that they have eſtabliſhed corn-markets in every village, where the current money is gold duſt, cowries, and bujis. The price of grain is rated by police officers of the king's appointment; and to theſe markets the men and women reſort early in the morning to buy or ſell, or to exchange one ſort of grain or fruits for another. Such are the induſtry and ſtrength of the negro women that they frequently travel from the interior country ſix miles to market, under heavy loads, and ſell their fruits or grain at the ſea-port markets for European commodities, looking-glaſſes, bracelets, ear-rings, glaſs-beads, and other female trinkets, ſo paſſionately fond are they of dreſs and finery. The markets are exempted from all ſorts of duties and impoſts. At mid-day, the wine merchants bring their pots of palm-wine to market; and when the buſineſs of the day is finiſhed, multitudes of men and women are to be met on all the roads, ſinging and dancing with an enviable cheerfulneſs, and without the ſmalleſt remaining veſtige of the care and fatigue of the day. Beſides theſe markets, they have alſo fairs, which regularly occur twice a-year, whither the natives reſort to purchaſe European wares, which they tranſmit to the inland countries. On theſe occaſions the women aſſemble in the evening to dance, ſing, and make merry for an hour before they go to bed. They appear in their beſt habits, and the women in particular rival each other with all the emulation and jealouſy of dreſs conſpicuous among European females. Their dance is a kind of regular confuſion, which, with the appearance of diſorder, preſerves a certain method adjuſted to the muſic, which is compoſed of horns, trumpets, flutes, and other inſtruments. The women wear on their legs a number of ſmall bells, which jingle as they move in their dance; and the men hold in their hands a kind of fan, made of horſe-tail, or the extremity of an elephant's rump, with which they ſtrike each other's ſhoulders as they paſs. The dances performed in honour of the fetiche are more grave and ſolemn, bearing about them an air of religious devotion. At Abramboe, they have dances for eight ſucceeding days, in honour of the king, which they call the dancing ſeaſon: to theſe there is a reſort of a large concourſe of negroes of both ſexes, and the whole is conducted with extraordinary pomp. All the diverſions among the negroes conſiſt of theſe dances, muſic, and mock-combats, which latter often terminate tragically. Among other cuſtoms and manners that diſtinguiſh the negroes, we cannot forbear mentioning one excellent inſtitution, in conſequence of which a common beggar is not to be ſeen on the coaſt. When a negro is unable to ſubſiſt by labour, he binds himſelf to a maſter, who is obliged to ſupply him with all neceſſaries. In return he engages to defend his maſter with all his power, to watch his affairs, and, in ſeed and harveſt time, to labour as a huſbandman. Thus every man becomes uſefully employed, and the infirm and aged are taken care of by their friends.

Among the negroes, the fear of death is a very general and diſtreſſing paſſion; and, accordingly, for prolonging life, they recur firſt to medicines and natural remedies; and when their caſe is deemed peculiarly dangerous, they have recourſe to their ſuperſtitious religious worſhip, as the moſt effectual antidote. The prieſt of courſe diverts the patient by liberal offerings to appeaſe the fetiche; nor does he on this occaſion neglect his own intereſt. If the diſeaſed perſon recover, the prieſt is ſure of ample recompence. The chief medicines uſed by the negroes are lime juice, malaguet, or cardamoms, the roots, branches, leaves, bark, and gums of trees, and about 30 different kinds of green herbs.

When all the arts of the prieſt and doctor have proved ineffectual, diligent inquiries are inſtituted concerning the death of the patient. Having aſcertained that it has not been owing to poiſon or incantation, his relations are examined, whether he has been attended with due care, and the neceſſary offerings have been made to the fetiche and prieſt. Should no defect in theſe particulars appear, they ſatisfy themſelves with attributing his death to his neglect of religious duties, and the performance of thoſe rites which can alone prolong life. The prieſt proceeds to interrogate the deceaſed, and then returns to the aſſembly of his friends and kindred with ſuch an anſwer as beſt ſuits his intereſt; and they are then ſatisfied. As ſoon as the patient has breathed his laſt, his relations unite in dreadful howlings and lamentations; and then preparations are made, by a variety of ceremonies, in which the fetiche and prieſt have an intereſt, for his funeral. Preſents are made in order to obtain repoſe for his ſoul, and to ſecure his ſafe paſſage into the other world. In his coffin ſeveral articles of value are depoſited, coſtly in proportion to his wealth; and when his aſſembled relations or friends have continued for two or three days to drink brandy and palm wine, and other ceremonies are finiſhed, the corpſe is carried to the grave, preceded by a number of young men, who continually diſcharge vollies of arms, till the deceaſed is laid in the ground. Men and women, in great crowds, follow, ſome dancing, ſome ſinging, and others crying or laughing. When the corpſe is covered, and the grave filled, every one departs where he pleaſes. But the greater number uſually adjourn to the houſe of the deceaſed, there to prolong their mirth and feaſting. When a king, or any eminently diſtinguiſhed perſon dies, his body is generally kept a year above ground; and, in order to preſerve it from putrefaction, it is laid over a gentle fire, upon a wooden utenſil, reſembling a gridiron, to dry by ſlow degrees. Others inter their dead privately in their own houſes. At the funeral of a king, ſeveral of his ſlaves are ſacrificed in order to attend him to the other world; and eſpecially his favourite wife. But the moſt abominable rite is the practice of ſelling thoſe who, through age and infirmity, have been rendered incapable of labour, to become victims in theſe horrible ſolemnities. The negroes uſually build a little hut, or plant a ſmall garden of rice or maize upon the grave, into which they throw all the effects of the deceaſed, of the leaſt value to his heirs. Sometimes an oration is pronounced at the funeral of a negro, which ſets forth, at the grave, the virtues of the deceaſed. In ſome countries they do not bury ſlaves, but throw their bodies into the fields, as a prey to beaſts and birds; in other countries they cover them with earth, without any attendant ceremony.

As to the religion of the Gold coaſt, it is diverſified among a number of ſects, proportioned to the number of nations, or rather families, on the coaſt. All the negroes, however, profeſs to agree in their belief of one true God, the creator of the world; but his omnipotence is the only attribute of which they have any diſtinct idea. Some have ſaid, that they conceive of the Deity as partial to the Europeans, and taking pleaſure in afflicting them with a thouſand evils. Dapper ſays, that the negroes ſacrifice to the devil; but Boſman aſſerts, that their devotion is wholly paid to the prieſt, the mediator between them and their divinities. Nothing religious is undertaken without the prieſt or fetichere, who is conſulted on a variety of the moſt intereſting occaſions. The practice of exorciſm is prevalent among them. All promiſes of importance, and obligatory oaths, are confirmed by drinking what is called an "obligatory draught;" this is accompanied with an imprecation, that the fetiche may deſtroy them, if they are unfaithful; but oaths of this nature have been ſo often violated by nations and individuals, that they are fallen into diſrepute. Their public religious ceremonies, on occaſion of droughts, floods, barren and unhealthy ſeaſons, &c. are performed by offerings to their idols in groves, which are held peculiarly ſacred; and whenever the chiefs of a town or nation aſſemble, the prieſts are conſulted as to the meaſures that are moſt likely to ſuſpend or avert public calamities, and their decrees are ſolemnly publiſhed by a crier. Every negro has his peculiar and appropriate *fetiche*, which he worſhips on the day of the week when he happened to be born. See FETICHE.

The notions which the negroes entertain of a future ſtate, are very various. Some maintain, that immediately upon the death of any perſon, he is removed into another world, where he aſſumes the ſame character in which he lived on earth, and ſupports himſelf by the offerings and ſacrifices his friends make after his departure. Boſman affirms, that the greater number of negroes have no idea of future rewards and puniſhments, annexed to the good or evil actions of this life. Some few, however, he allows to have ſome groſs notions of future judgments, which conſiſt in being wafted away to a famous river, ſituated in a diſtant inland country, called "Boſmanque." Here their god interrogates them concerning the life they have led, whether they have religiouſly kept the holy days dedicated to the fetiche, abſtained from all meats, and inviolably kept their oath? thoſe who can anſwer in the affirmative, are conveyed over the river to a land abounding in every kind of luxury and felicity. Thoſe who have offended in any of the above-mentioned particulars, held of principal importance, are plunged by the god into the river, and buried in eternal oblivion. Others believe in a kind of metempſychoſis, or tranſmigration; ſuppoſing that they ſhall be tranſported to the land of white men, aſſume that complexion, and be endowed with ſimilar ſouls; but this doctrine is only maintained by thoſe who think highly of the intellectual faculties of the white men. The inland negroes tell the maritime negroes, that, in a diſtant interior country, there lives a great fetichere, in a ſplendid houſe, who poſſeſſes extraordinary powers, and exerciſes dominion over the elements of nature, and foretels the events of futurity. All perſons in his vicinity are examined before him after death, and if the reſult be unſatiſfactory, he kills them a ſecond time; but if their conduct appears to have been pious and exemplary, he furniſhes them with a paſſport to a ſtate of true and perfect felicity. Hence proceeds the deep veneration in which they hold this prieſt, ſo that they eſteem him little inferior to a god. The negroes, it is ſaid by ſome, are not ignorant of the devil, whom they regard as a malicious, deceitful being, reſembling a white man; but Boſman denies that they pray or ſacrifice to him, as moſt other authors have affirmed. Inſtead of paying any worſhip to him, the devil is exorciſed out of all their towns at ſtated feſtivals, and with abundance of ceremony. The negroes firmly believe the reality of ghoſts, ſpirits, and apparitions; and that they walk up and down the earth, terrifying and beating people, eſpecially the unbelievers. Some have ſaid, that the negroes uſe circumciſion, prayers, and ablutions, and ſeem to have an indiſtinct idea of futurity. They believe that good men ſhall, after death, enjoy happineſs, and bad men be doomed to miſery; that the former ſhall live with fine women, upon luxurious diet, and the latter ſtroll, as vagrants, round the earth, always in motion, and always unhappy. The negroes, in general, have no ſolemn feſtivals, beſides one at the concluſion of their harveſt, which they call a fair, and that already mentioned for exorciſing the devil; nor have they any diſtinction or diviſion of time, except what they have been taught by Europeans. Months and weeks are altogether unknown to them; their method of reckoning being by the ſhining of the moon, whether it be in the change or in the quarters. Hence they determine their ſeaſons for ſowing the different kinds of grain. It is probable, however, that the diviſion of time into weeks and days cannot be of very late date, as all have reſpectively their peculiar names, which are perfectly familiar even to children. Their ſabbath falls on the Tueſday, except at Anté, where it happens on Friday; and it differs from other days in no particular, but that they abſtain from fiſh; all other kinds of food and employments being permitted without any reſtraint. The negroes of the interior countries divide time into fortunate and unfortunate days; in ſome countries the great unfortunate days are 19, and the leſſer, which differ from the other, 7. Between theſe intervene 7 unfortunate days, which are a ſort of vacation from all occupations and bodily labour. In ſome countries the lucky days are particularly obſerved, in others the unlucky ones are no leſs religiouſly kept; but the maritime negroes diſregard all diſtinctions, and eſteem one day the ſame with the other.

The government of the negroes is, in general, licentious and irregular: and its forms are divided into five diſtinct kinds. The firſt is that of pure monarchy, where the king is deſpotic; the ſecond is a kind of ariſtocracy, the chief power being lodged in the hands of the caboceroes or chiefs; the third is veſted with thoſe who have acquired weight and influence from their great wealth, which body ſome have repreſented as the nobility; the fourth is an abſolute democracy, where all are equal with reſpect to dignity and power, whatever may be their wealth; and the fifth claſs of perſons, rather than government, conſiſts of thoſe ſlaves, who have been ſold by their parents, thoſe who were born ſlaves, or thoſe whoſe poverty has reduced them to this unhappy condition. On the Gold coaſt the crown deſcends from father to ſon by right of inheritance, and in default of heirs male, it paſſes to the neareſt of blood; although ſometimes a man's wealth in gold and ſlaves procures him this honour, in prejudice to the lawful heir. The royal government is ſupported rather by force than by authority; the reſpect of the people being proportioned to the number of king's ſlaves and the greatneſs of his wealth, without which ſovereigns find but little reſpect and ſubmiſſion from their ſubjects, and are obliged to pay them for the ſmalleſt ſervices. But when their kings are rich and powerful, they are elevated by the ſervile homage of the people above all law and control. Negroe ſovereigns are obliged to exerciſe great liberality, and the firſt entertainments they give coſts a year's revenue. A negroe king is always diſpoſed to aid a neighbouring ſovereign with his troops, becauſe the greater part of the ſubſidy goes into his own pockets. There is nothing peculiar in the education of princes, and it differs little from that of the pooreſt ſubjects; ſo that it is common to ſee a man taken from the plough-tail to wield a ſceptre; and he who was yeſterday driving a flock of ſheep, ſhall to-day be at the head of an army. The judges, among the negroes, or the ſupreme officers of the courts of juſtice, are choſen from the moſt conſiderable perſons in reſpect to wealth and influence. To theſe belongs the deciſion of all cauſes, civil and criminal; and from their deciſion an appeal lies to the king. War is declared by the negroes either from views of revenge, ambition, or plunder, or as auxiliaries to ſome injured neighbouring ſtate, or, which is moſt common, for a ſubſidy Many wars are undertaken for the recovery of private debts. When war, from whatever cauſe it originates, is projected in the king's council, a general aſſembly of the nobility is ſummoned, and the matter is deliberately debated. An army is inſtantly raiſed, and no time is loſt in making an incurſion into the enemy's country, and proclaiming war, which is carried on at a ſmall expence. In their engagements, the negroes obſerve no order or diſcipline. Their principal arms are muſkets or carabines; beſides which, they have a kind of ſwords ſhaped like chopping-knives; a ſort of dart called aſſagay; and a ſhield made of twigs and oſiers, covered with leather, and ſometimes plated on the inſide with copper, to ward off the aſſagays, as well as the blows of the ſword. Some few negroes have cannon, but their engineers are ſo ignorant, that their artillery is of no importance. When the negroes are exhauſted with war, which between two deſpotic ſovereigns, who hold their ſubjects in abject ſlavery, is generally tedious and bloody, they begin to think of terms of accommodation, and of ſettling a place of negotiation. This is uſually a large plain, on the frontiers of the two contending kingdoms; to this both ſovereigns march in full armour, accompanied by a crowd of feticheres, the emblems and mediators of peace. The prieſts of both nations engage by oath to terminate all hoſtilities, to live in perfect friendſhip, and to give pledges of their faith; but the priſoners on either ſide are conſidered as the abſolute property of the ſovereign who poſſeſſes them. As ſoon as theſe ratifications are exchanged, a loud peal of warlike inſtruments publiſhes the general tidings; arms are thrown down on both ſides; and the day is cloſed with feſtivity.

As the Gold coaſt is ſituated near the 5th degree of north latitude, the heat of the climate may be ſuppoſed to be extreme; and yet it is more healthy than many voyagers have repreſented it. During the interval from October to March, the air is very hot, and the other months are tolerable; and through the whole year the extreme heat of the day is moderated by the refreſhing and cool ſea and land breezes of the evening and morning. It has been obſerved, that on account of the high mountains that abound on the Gold coaſt, and the deep vallies that lie between them, the climate is rendered inſalubrious by a thick fog, which prevails particularly in marſhy grounds and near rivers. From March to October, and in the months of July and Auguſt, fogs are very prevalent; and added to the beaſtly uncleanlineſs of the negroes themſelves, they contribute to render the climate unhealthy, and particularly noxious to ſtrangers.

The negroes, however, notwithſtanding all the diſadvantages of their climate and manners, enjoy good health and live to old age.

Boſman divides the ſeaſons on the Gold coaſt into ſummer and winter: the latter admitting of three ſubdiviſions, *viz.* two rainy, two foggy and hazy, and two windy months; but the changes are ſo frequent and irregular, that we cannot lay great ſtreſs on ſuch a diſtribution. This coaſt, however, is ſubject to heavy rains and boiſterous winds; but it derives great benefit from the land and ſea breezes.

On this coaſt the true trade-winds are weſterly, keeping a tract with the ſhore, where it ſtretches eaſtward.

Among the tame animals of the Gold coaſt, the firſt in rank, on account of their utility, are horned cattle, ſuch as bulls, cows, ſheep, and goats, with which Dinkira, Aſſiento, Axim, and all the inland countries abound, though only a few black cattle are brought to the coaſt. It has been obſerved by ſeveral writers, that all the animals are ſpecifically lighter on this coaſt, than in any other part of the globe, a circumſtance which is ſuppoſed to proceed from the nature of their aliment, that, inſtead of firm and ſolid, produces only a ſpongy, looſe, and tough fleſh. The ſheep are much ſmaller than thoſe of Europe, and covered with hair inſtead of wool; nor does their fleſh at all reſemble mutton in its taſte, being dry, lean, and hard. Goats are innumerable, but they are of a very ſmall ſize. Their fleſh, however, is ſweet, fat, and delicate. The horſes produced on the Gold coaſt are of a ſmall ſize; they are ſcarce in the maritime kingdoms, but plentiful in the interior countries. The country likewiſe produces a few aſſes, taller and handſomer than the horſes, and generally preferred for riding. Hogs abound; but their fleſh is lean and hard. Of all animal food, dog's fleſh is moſt valued among the negroes. The dogs of this country, which neither bite nor bark, and which are of all colours, are bred with great care, and driven to market like flocks of ſheep, where they fetch a high price. A cat is much eſteemed among the negroes, ſome of whom eat its fleſh.

Among the wild quadrupeds of this coaſt, we may reckon the elephant, which is of ſomewhat a ſmaller ſize than that of the Eaſt Indies, and which the negroes diſtinguiſh into three kinds, *viz.* the river, the wood, and the mountain elephant; tigers, which are very numerous in almoſt every part of the coaſt; the buffaloe, which is here very ſcarce; the jackall; a ſpecies of wild boar, leſs fierce than that of northern and cold countries, whoſe fleſh is tender, fat, and delicious; deer of all kinds and ſizes; hares, rabbits, and foxes, and a few porcupines. On the Gold coaſt is found a quadruped which the negroes call "potto," the ſluggard; the "berbe," or wine-bibber, ſo called from its fondneſs for palm-wine; the "kokeb" of the negroes; and their "arampo," or man-eater, ſo called becauſe it digs up graves, and prefers human fleſh to all others; and rats and mice, which are the moſt numerous and deſtructive quadrupeds on the Gold coaſt. Lizards, aligators, and cameleons, are alſo found in this country.

The Gold coaſt affords alſo a great variety of birds; its pheaſants are peculiarly beautiful, and it has various others of the feathered tribe, which our limits will not allow us to enumerate. Its reptiles and inſects are alſo very numerous, and of great variety. The coaſt, as well as the lakes and rivers, furniſh great abundance of various kinds of fiſh.

Among the trees, ſhrubs, &c. we may enumerate the palm, which furniſhes the negroes with wine and oil; the cocoa-tree; ſweet and ſour oranges, and lime trees; the papay-tree; the banana-tree; and vines. In a word, the Gold coaſt affords fruit-trees of all ſorts, and wood for all purpoſes.

As to the grain of the coaſt, it conſiſts of the great and ſmall millio, ſuppoſed to be the Turkiſh wheat, which affords two crops in the year; and rice, which is yielded in great abundance. Its other vegetables are yams, potatoes, and beans, ſome of which are peculiar to the country. It furniſhes alſo the Guinea pepper, Spaniſh pepper or pimento, cardamoms, and a number of fruits, and grains, common to almoſt all countries.

Tobacco is alſo produced in great plenty on the Gold coaſt, to the uſe of which the negroes are much addicted. We ſhall cloſe this detail with obſerving, that the Gold coaſt furniſhes a vaſt quantity of ſalt.

Of the inland country, little more is known, than that it conſiſts of three extenſive kingdoms, called Aſſiantee or Shantee, Akim, and Aquamboe, each of which ſupplies the maritime ſtates with a great number of ſlaves, whom they ſell to the Europeans. In the Britiſh Weſt Indies moſt of the negroes purchaſed on the Gold coaſt, are known by the general appellation of Koromantees, from *Koromantyn,* which ſee. The number of ſlaves furniſhed of late years by the Gold coaſt has been eſtimated at 10,000.

Coast, *Grain, Pepper,* or *Malaguetta,* is the moſt weſtern diviſion or province of Guinea, and bounded by Nigritia on the north; the Ivory coaſt on the eaſt; and on the ſouth and weſt by the ocean. It is contained between the Rio Seſtos and Grova, a village two or three miles from cape Palmas, extending for a ſpace of 55 miles along the ſhore. But if it commence at the river Sanguin, and ſtretch to Cape Palmas, its limits will be enlarged about 60 miles. Within theſe frontiers are the towns and villages of Seſtos, or Seſtro, W. of the river Sanguin, Bottowa, or Battaway, Seno, Seſtro Krou or Kro, Wappo, Bado, Great Seſtro, Little Seſtro, Goyava, Garaway, &c. &c. The chief rivers are the Rio de Seſtro, the Rio de St. Paul, and the river de Sierra Leona. The climate on this coaſt is materially affected by the exhalations raiſed by the ſun from the rivers and ſea-coaſt, which are ſaid to occaſion putrid fevers almoſt always fatal to Europeans. The productions of the earth are peaſe, beans, gourds, lemons, oranges, and bananas. The palm-wine and dates of this country are excellent. Cows, hogs, ſheep, and goats abound; but that which conſtitutes the chief wealth of the Grain coaſt is the abundance of Guinea pepper which it produces. But the principal commerce of the Grain coaſt conſiſts in ivory and ſlaves. As to the manners of the natives, they are not chargeable with any kind of intemperance; but they allow their women, who are well-formed and handſome in their perſons and features, every kind of intercourſe with Europeans, and ſome of them are guilty of the moſt infamous proſtitution. Theft is common among them, as it is among all negroes. Their language is altogether unintelligible not only to Europeans, but to their neareſt neighbours; and as they have no interpreters their commercial tranſactions are carried on by ſigns and tokens. Among theſe people there are many excellent mechanics, and particularly ſmiths, who underſtand the art of tempering ſteel, and making arms: their ſhipwrights are alſo expert in the ſtructure of canoes. They have likewiſe derived from experience many improvements in huſbandry, eſpecially ſuch as regard the culture of rice, millet, and Guinea pepper, which are the chief articles of their ſubſiſtence and commerce. Their government is arbitrary and deſpotic; and their ſovereign, who on all occaſions appears among them with pomp and magnificence, is regarded with a kind of awe, as if he were a ſuperior being. Although

though ignorance attaches them to the rites of paganiſm, natural reaſon ſuggeſts to them ſome ideas of a future ſtate, as we may infer from the ceremonies performed in relation to the ſouls of the deceaſed, which they hope to find in a ſtate of happineſs. They welcome the new moon with ſongs, dances, and various kinds of diverſion; and their ſuperſtitious regard for ſorceries is extreme. For a further account of theſe people, we refer to the article SESTOS. The months moſt favourable to trade on this coaſt are February, March, and April; and ſmall veſſels are more convenient than large ſhips, as they are better adapted for entering the rivers and ſailing up the country. The ſouth-ſouth-eaſt winds begin to blow on this coaſt in the month of May, and they are conſtantly attended with heavy rains and tornadoes, extremely dangerous to ſhipping, with thunder and lightning that are terrible.

COAST, *Ivory*, *Tooth*, *or Quaqua*, ſo called from the elephants' teeth which are found here, is a province of Guinea, bounded by Nigritia on the north; by the Gold coaſt on the eaſt; by the ocean on the ſouth; and by the Malaguetta, or Grain coaſt on the weſt. Geographers and ſeamen are much divided in their ſentiments concerning the extent and limits of this coaſt: ſome confining it between the Rio Suero da Coſta, where the Gold coaſt begins, and Grova, about three miles from Cape Palmas; whilſt others ſtretch its boundaries from Cape Palmas to Cape Tres Puntas, the whole of that ſhore being known to mariners under the appellation of the Tooth coaſt. However, the moſt preciſe and accurate limits are contained within Cape Apollonia to the eaſt, and Cape Palmas to the weſt. The principal towns of the Ivory coaſt are Grova or Grua, Great Tabo, Little Tabo, Great Drewin, Batrou, Laho, Apollonia, and Vallo, each of which ſtands at the mouth of the river, whence it reſpectively derives its name. As for the interior country, it is but little known; the natives refuſing the Europeans leave to eſtabliſh ſettlements, or even to trade among them, except by means of the coaſt-negroes, and this they allow with the moſt circumſpect caution. The ſame commodities are found here as in the other provinces of Guinea; *viz.* gold, ivory, and ſlaves. Grova ſtands three miles E. of Cape Palmas; Great Tabo, 30 miles from Grova, eaſt; Little Tabo four miles farther eaſt; thence to Great Drewin 11 miles, thence to Batrou 19 miles, to Laho 7, and from thence to Cape Apollonia 20 miles:—the whole amounting to 94 miles. The river St. Andrew on this coaſt is a fine, deep ſtream, increaſed near its mouth by the influx of another river, both which unite in forming a large road. The entrance is ſurrounded with lofty trees, beautiful verdant meadows, and rich fields of great extent. About 500 paces from the mouth of the river a peninſula runs a great way into the ſea, joined to the continent by a ſlender neck of land, about 5 or 6 fathoms broad. The whole peninſula is a high level rock; having a platform 400 feet in circumference, and commanding the whole neighbouring country. At the foot of a little eminence, N. of the neck of land, there is a fine freſh water ſpring, capable of ſupplying a large garriſon, and of being ſecured by the cannon of the fort. The land-marks here are ſo diſtinct that it is impoſſible for ſhips to miſtake them. They conſiſt of lofty, thick, and ſhady trees, with three or four large villages, within leſs than half a mile of each other. The fields and meadows near the mouth of the river are fertilized by meandering ſtreams, and are thus rendered fit for producing every ſpecies of grain, fruits, and roots; but eſpecially maize, millet, rice, peaſe, yams, and melons. Here alſo grow oranges, limes, cocoa-nut trees, and citrons, forming large groves; and here alſo the ſugar-cane, and a thouſand other plants, which ſpring up without cultivation are abandoned to the ravages of the elephant, and as haunts for wild beaſts. Whatever the Gold coaſt produces is alſo found here, in greater abundance and perfection; and, indeed, the fruits and vegetables of the warmer climates ſeem to be all united on the Ivory coaſt. As to the manners of the natives in this diſtrict, the men wear a looſe dreſs which hangs down to the knees, and the women, a narrow cloth round their waiſts. Many of them are naked. The richer of both ſexes have a paan of fine cloth, and the men wear poniards, or long knives by their ſides. The women are ſmall, but neatly proportioned. Their features are regular, their eyes lively, and their teeth white, ſmall, and even. The men are likewiſe well-formed; and are not deficient, either in courage or underſtanding. They are very fond of bracelets of iron and ivory, mounted with little bells, which they put round their arms and the ſmall of each leg. Theſe bells inſpire them with additional joy in dancing, to which they are much addicted, as well as all the negroes. Eaſt of the river St. Andrew are at leaſt a dozen of craggy, rugged mountains, ſtretching three or four miles along the coaſt; but the intermediate fields, well watered by nearly twenty rivulets, are rich and fruitful: ſo that if the inhabitants were ſomewhat more civilized, no country on earth bids fairer for a profitable commerce. The elephants are of an enormous ſize: ſlaves and gold are alſo very plentiful.

From the Rio de Suero da Coſta to Cape Apollonia, the coaſt is low and even, extending itſelf 12 miles towards the eaſt, bordered with large trees, and covered with villages, the chief of which are Boquun, Iſſini Peguena, Great Iſſini, Albiani, Jabo, and Akanimina. Between Boquun, which ſtands at a ſmall diſtance from the ſhore, near the mouth of the river Da Coſta, ſurrounded by woods, and pleaſantly ſituated, and Akanimina, ſeated on a riſing ground half a mile W. of Cape Apollonia, and commanding an extenſive ſea and land proſpect, the interior country is high, rugged, and mountainous, but affording ſome fine gold, ivory, and a few ſlaves. Near Cape Apollonia is the kingdom of *Guiomere*, which ſee. The whole coaſt from Cape Palmas to Cape Apollonia, a few capes excepted, appears ſo low, but ſo equal and ſtrait, that places cannot be eaſily diſtinguiſhed, and, beſides the capes, the only diſtinct land-marks are the heights and mountains about Drewin. The landing is dangerous, on account of high ſurfs and ſwelling waves; and the negroes alone are ſo acquainted with the coaſt, and ſo reſolute, as to encounter its dangers in their little canoes; which are employed in loading and unloading the ſhipping. Round Cape Apollonia there are large tracts of fallow land, in which the negroes ſow Indian corn. The complexion of the natives is ſo black, that it has been compared to the fineſt jet; in their diſpoſition they are lively and enterpriſing, and in commerce indefatigable. Their huts are neater and cleaner than thoſe of their neighbours, and their dreſs more elegant, being ſet off with ornaments of gold, ivory, and cowries. The hair or wool of their heads is divided into innumerable ſmall treſſes, which they adorn with fragments of oyſter ſhells and other ſhining baubles. On the left cheek they have a ſcar, of the figure of a poniard, and the reſt of the body is often marked in the ſame manner, to denote the warlike diſpoſition of the perſon; this cuſtom is very ancient, and ſerves to diſtinguiſh the inland from the maritime natives; the former of whom are often reduced to ſlavery by the latter, and ſold as ſlaves. From Cape Apollonia to the river Mankaw, where the province of Axim, the firſt diviſion of the Gold coaſt, begins, are two or three fine villages. From hence to Axim, the ſhore takes its courſe S.S.E., and near the village of Boggio the river

Mankaw empties itſelf into the ſea, at the mouth of which the negroes find a conſiderable quantity of gold.

Every country within the limits of the Ivory coaſt is fruitful in rice, peaſe, beans, gooſeberries, citrons, oranges, and cocoa nuts; and ſugar-canes might alſo be cultivated here to great advantage. Upon the whole, the Ivory coaſt is reckoned one of the fineſt diviſions of Guinea; the proſpect of the mountains and vallies, filled with villages, is delightful; moſt of theſe little towns being ſurrounded with lofty palms and cocoa trees. The ſoil of the high land is a reddiſh earth, which, with the perpetual verdure of the trees, forms an agreeable mixture of colours. Cotton and indigo are the ſpontaneous growth of the diſtricts of Great Drewin and St. Andrew, which are indeed the richeſt of the whole. Palm-wine and oil are plentiful; together with a ſpecies of fruit, growing on a ſort of palm-tree, called by the natives "tombo," or bourbon." All ſorts of tame animals, ſheep, cows, goats, and hogs are very numerous and cheap: and the coaſt ſupplies great abundance and variety of fiſh.

The natives, in general, are above the common ſtature, well-limbed and well-proportioned, though their features on the firſt glance are hideous: and yet they are deemed the moſt rational, civilized, and poliſhed people in Guinea; applying this character to the natives of the Quaqua coaſt, or from the river Drewin to Cape Apollonia; for as to the others, authors concur in repreſenting them as the moſt barbarous, cruel, and ſavage of all nations. Their diet is coarſe and indelicate. Black ſoup is a favourite diſh all over Guinea, both among Europeans and negroes. The Europeans make it of fleſh or fowl, with pepper, vinegar, ſalt, and ſome ſweet herbs peculiar to the country; but the negroes add fiſh, ocra, which is a viſcous vegetable ſubſtance well known in our Weſt Indian iſlands, where it is uſed to thicken ſoup, and palm-oil. The men are fond of a great quantity of hair, with which they are ſupplied by the women, who cut off their own for this purpoſe. Some of the women, who wear their hair, adorn it with little plates of pure gold. Their form of ſalutation they have in common with all negroes; which is that of laying hold of the fingers, making them crack, and repeating the word "quaqua" ſeveral times, in a low voice. It is a conſtant rule, that the ſon follows the profeſſion of his father. In the mechanic arts they are unſkilled, inſomuch that a common door-lock is reckoned among them as a very great curioſity; a watch ſtill further increaſes their admiration; and making paper to ſpeak, as they expreſs it, is a perfect miracle. Their religion, like that of the inhabitants of the Gold coaſt, is founded in ignorance and ſuperſtition. They revere their princes and prieſts, under a perſuaſion that magic and ſorcery are qualities inſeparable from majeſty and prieſthood. The uſual trade carried on with the inhabitants of this country, who are generally very timid and jealous in their intercourſe and commercial tranſactions with Europeans, conſiſts of cotton cloths, ivory, gold, and ſlaves. From the river Babas to the Rio de Suero da Coſta, the country produces great abundance of good cotton, which the negroes of the interior country manufacture with great induſtry, and which they ſell to the inhabitants of the Gold coaſt, and to thoſe who fetch it from it central parts of Africa. The Quaqua negroes manufacture a kind of plant, reſembling hemp, into a ſtrong cloth, to which they give a beautiful colour, and ſome pretty flowers and deſigns, that indicate them to be no bad artiſts in this way. They have alſo a conſiderable trade in ſalt, with their inland neighbours. All the countries behind Quaqua furniſh a large ſtore of the moſt beautiful ivory in the world, which they ſell principally to the Engliſh and Dutch. They obtain likewiſe from the mountains a conſiderable quantity of gold. The European commodities, which the negroes accept moſt readily in exchange for their own, are of much the ſame nature as in other parts of Guinea. When the natives of this coaſt trade with any European ſhip, they let fall a few drops of water into their eyes, by which ſymbol, equivalent to a kind of oath, they intimate that they would ſooner loſe their eyeſight than cheat thoſe with whom they trade. They are no leſs averſe to drunkenneſs than to fraud; for though their country abounds with palm-trees they drink no palm-wine, but only a certain ſmall liquor which they mix with water. Although this country be divided into a variety of petty ſtates and kingdoms, yet they have ſcarcely any ſeparate intereſts: for among themſelves war ſeldom happens; and, conſequently, the ſlave trade here bears but a ſmall proportion to that traffick on the Gold and Slave coaſts.

COAST, *Slave*, is generally included by European navigators under the limits of the kingdom of Benin. It is bounded by the Rio de Lagos in this kingdom, and extends to the Rio da Volta, the boundary on this ſide of the Gold coaſt. The coaſt is generally diſtinguiſhed by the appellation of Great Benin. (See BENIN.) From port Douarre it extends towards the ſouth of Cape Formoſa; then turning eaſtward to Rio del Rey, and again inclining to the ſouth of Cape Gonſalvo, towards the equator, it forms the gulf of Guinea. Thus, in its whole length, it meaſures about 350 leagues in a curve line, or arc of a circle. The Slave coaſt comprehends the coaſts and kingdoms of Coto or Koto, Popo, Whidah, and Ardrah: which ſee reſpectively.

COAST, *Windward*, an appellation commonly given to that part of Africa, which extends from Cape Roxo, or Rouge, to Cape Apollonia. The European ſettlements on this coaſt, except a ſmall Engliſh factory in the river Sierra Leone, are chiefly thoſe of the Portugueſe. The negroes obtained from them, as well as from the Engliſh factory, have been called "Mandingoes," though not with ſtrict propriety, as many different languages are ſpoken on the coaſt between Senegal and Apollonia.

COAST, *Cape*, the chief ſettlement of the Engliſh on the Gold coaſt in Africa: the ancient Portugueſe appellation is "Cabo Corſo." This Cape is formed by an angular point, waſhed on the ſouth and eaſt by the ſea, upon which ſtands the Engliſh fort, abont 9 miles from Elmina. Here the Portugueſe ſettled in 1610, and built the citadel of Cape Coaſt, upon a large rock that projects into the ſea. Some few years afterwards they were diſlodged by the Dutch, to whom this place owes its principal ſtrength. In 1664, it was demoliſhed by admiral Holmes; and in 1665, De Ruyter, the famous Dutch admiral, had orders from the ſtates to retaliate the injuries committed by the Engliſh. But though, with a ſquadron of 13 men of war, he attacked all the ſettlements of this nation along the coaſt, ruined all the factories, and took, burnt, and ſunk all the ſhipping of the Engliſh company, he was fruſtrated in his attempts upon this fort, which had not at that time recovered the damage which it had ſuſtained in the expedition of Holmes. The treaty of Breda having confirmed Cape Coaſt to the Engliſh, and the king granting a new charter in 1672, the directors applied all their attention to fortifying and rendering commodious this, their chief poſſeſſion. The walls are high and thick, eſpecially on the land ſide, built partly of ſtone, but chiefly of brick, which the Engliſh made at a ſmall diſtance. To the height and ſtrength of its walls the fort owes its chief ſecurity, and the neighbouring negroes dependent on the company, derive from them a protection againſt the incurſions of the Fantins. The interior parade, raiſed 20 feet above the ſurface of the work, forms a quadrangular ſpace, cooled by the gentle refreſhing ſea-breezes to which it lies open, and pleaſantly ſituated, having queen Anne's point, and all the ſhipping in the road of Anamaboa in view. The platform is defended by pieces of artillery, which command the road and its entrance. The fort has four baſtions, mounted with cannon; other pieces are placed on the battlements, and others on the wall towards Tabara for the purpoſe of keeping the negroes in awe; towards the ſea, the perſpective of Cape Coaſt is beautiful and regular; the fortifications are well conceived, and the advantages of natural ſituation are aided by art. Cape Coaſt, however, has inconveniences, among which we may reckon ſome neighbouring hills, by means of which an enemy might without difficulty embarraſs and annoy the fort. The ſoldiers are lodged in the beſt barracks of any on the coaſt of Guinea. The governor's apartments communicate with the chapel: near the gate is a priſon for criminals, and beneath the platform, a large vault is cut in the rock for the confinement of ſlaves. The preſidency of Cape Coaſt is lodged in the hands of a ſingle perſon, appointed by the directors of the African trade; and the uſual commerce conſiſts chiefly in gold duſt and ſlaves. The company's gardens occupy a ſpace of no leſs than 8 miles in circumference, being ſurrounded by trees; and the ſoil is every where ſo fertile, that it produces every ſort of fruit commonly found in the warmer climates, as lemons, oranges, citrons, guavas, mangoes, plantains, bananas, pine-apples, tamarinds, cucumbers, water-melons, cocoa-nuts, and every kind of ſallad and roots.

In the neighbourhood of Cape Coaſt, the Engliſh have built two forts, the one called "Philips's tower," and the other "Fort Loyal," or "queen Anne's fort," each of them being three-quarters of a mile diſtant from the Cape Coaſt. The firſt ſtands on an eminence on the ſide of the garden S. E. of the fort. The ſecond is ſituated near the village of Manfro, upon a hill called Daniſtein, where Fredericſburgh formerly ſtood. Cape Coaſt is in N. lat. 4° 58′. E. long. 1°.

COASTING, that ſort of navigation, wherein the places, ſailed to and from, are not far diſtant; ſo that a ſhip may ſail in ſight of the land, or within ſounding, between them. Such are the voyages on the Narrow, or Britiſh ſeas, between England, Holland, and France; alſo thoſe about the Britiſh ſeas, and in the Mediterranean, &c.

For the performance of this navigation, there is only required good knowledge of the land, of the time and direction of the tide, of the reigning winds, of the roads and havens, the uſe of the compaſs, and of the lead, or ſounding-line. See Sailing.

Coasting *Pilot*. See Pilot.

Coasting, in *Agriculture*, &c. denotes the tranſplanting of a tree, and placing it in the ſame ſituation, with reſpect to eaſt, weſt, north, &c. as it ſtood before.

COAT, in *Anatomy*. See Tunica and Eye.

Coat *of Arms*, in *Heraldry*, a ſurcoat reaching to the waiſt, open at the ſides, and ornamented with armorial bearings, worn by the ancient knights in times of war, or at tournaments over their armour, being the principal characteriſtic by which they were diſtinguiſhed from one another, the face being covered with the helmet.

During the period of five centuries after the conqueſt, the variation in the mode of exhibiting coat-armour was very trivial.

The Norman in the field being cloſely inveſted in armour, which exactly fitted his ſhape, threw over it an ornamented ſurcoat without ſleeves, at firſt looſe; but during the ſucceſſive reigns of the three firſt Edwards, it was confined to the body in narrow folds. After that, the mixed armour (compoſed of mail and plates) became common, and the ſteel boddice was gilt and otherwiſe ornamented. This armour did not, however, long continue in faſhion, but was ſucceeded by tabards of arms, larger than the original ſurcoat and made of the richeſt ſilk ſtuffs, ſumptuouſly embroidered, which afterward became the dreſs worn by the nobility and gentry, till the commencement of the ſixteenth century: ſince that time they have been continued only as the ſtate dreſs of the officers of arms. See *Plate* of *Heraldry*.

Coat *of Mail*, in French *cotte de mailles*, in *Military Language*, armour made of ſcales or iron rings connected together net wiſe.

Coat, in a *Ship*, a piece of tarred canvas put about that part of the maſts, or bowſprit, which joins to the deck, or lies over the ſtem of a ſhip. They are alſo put about the pumps at the decks, that no water may go down there; and they are alſo uſed at the rudder's head.

Coat likewiſe denotes the materials with which the ſhip's ſides and maſts are varniſhed, to preſerve them, as tar, &c.

COATI, in *Zoology*, the name given by Seba to the little ant-eater, Myrmecophaga *didactyla*.

Coati is a name alſo aſſigned by Marcgrave to the Braſilian weeſel, the animal deſcribed in the Tranſactions of the French Academy under that of *Coati mondi*, Viverra Nasua of Gmelin.

Coati, of Ray's quadrupeds, is the animal commonly called the racoon, Ursus Lotor of Schreber, and Gmelin.

COATING, in its general ſenſe, denotes the covering of a body, or the ſpreading of one ſubſtance over another; and this is practiſed, with various views, in civil economy, in the arts, and in ſome ſcientific branches of knowledge. Thus, human beings are covered with various garments, both for defence and for ornament; houſes, veſſels, and moſt works of wood, are covered with paint, or pitch, or lead, or copper, or other matter, for the ſame purpoſes; the baſer metals are covered with the richer, ſilver is coated with gold, copper with gold or ſilver in ornamental works; iron or copper is coated with tin for culinary purpoſes, in order to prevent the ruſting of the former, and the noxious effects of the latter; and ſo forth. See the practical methods of performing theſe operations under the articles Painting, Plastering, Gilding, Silvering, Tinning, &c.

Coating, in *Chemiſtry*, is uſed principally for the purpoſe of defending certain veſſels from the immediate action of fire; thus, glaſs retorts and the inſide of ſome furnaces are coated with various compoſitions. See Lorication, and Luting.

Coating, in *Electricity*, means the covering of electric bodies with conductors, or the latter with the former, or, laſtly, electrics with other electrics. Electrics are coated with conductors, for the purpoſe of communicating to, or removing from, their ſurfaces, the electric fluid in an eaſy and expeditious manner; otherwiſe an electric body, on account of its non-conducting property, cannot be electrified deprived of the electric fluid, without touching almoſt every point of its ſurface with an electrified or other body. This coating generally conſiſts of tin-foil, ſheet-lead, gilt paper, gold leaf, ſilver leaf, or other metallic body, either in the form of a thin extended lamina, or in ſmall grains, ſuch as braſs filings, and leaden ſhot. The coating may be faſtened to the ſurface of the electric by means of paſte, glue, wax, or other adheſive matter. In lining Leyden phials, care ſhould be had not to faſten the coating (if it conſiſts of braſs filings or gold leaf) with varniſh; for this is apt to take fire on making the diſcharge. But in ſome caſes the metallic coating is merely laid upon the electric; for inſtance, in certain experiments, a piece of tin-foil, or a braſs plate, is laid upon a pane of glaſs, ſo that after having charged the glaſs, the coating may be eaſily ſhook off; and a Leyden phial is, ſometimes, partly filled with leaden ſhot, which performs the office of an inner coating, and may be eaſily poured out of it. Alſo, when two extended parallel metallic ſurfaces are placed at the diſtance of about an inch or two from each other, the intervening ſtratum of air (being an electric) is ſaid to be coated, and may be charged and diſcharged like a Leyden phial. When the electric is of a very fuſible nature, ſuch as ſulphur, ſhell-lac, ſealing-wax, &c. a caſe of it may be coated by pouring it melted upon a metallic plate, or in a cup, which is required in certain experiments. See ELECTRICITY, ELECTROPHORUS, and LEYDEN *phial*.

In certain caſes conductors are coated with electrics, either partially or entirely, for the purpoſe of preventing the abſorption or diſſipation of the electric fluid from their ſurfaces. This is done with varniſh, or more effectually with ſealing-wax, the latter of which, when the ſhape and ſize of the conductor allows it, may be eaſily performed by warming the conductor to a certain degree, which is indicated by actual trial, and then rubbing a ſtick of ſealing-wax over its ſurface.

Laſtly, the coating of electrics with other electrics, is principally, if not excluſively, practiſed with articles of glaſs; for, ſince moiſture eaſily adheres to the ſurface of glaſs, the inſulating quality of the latter is thereby greatly diminiſhed and often annihilated; hence the glaſs feet of inſulating ſtools, the glaſs handles of directors, the pillars of ſome electrical machines, &c. are generally covered with ſome other electric ſubſtance of a reſinous quality, which is not apt to attract moiſture. The ſubſtances principally uſed for this purpoſe are ſealing-wax and varniſh. When the glaſs article is ſufficiently ſmall, the beſt way of covering it with ſealing-wax is, to heat the former, and then to rub a ſtick of ſealing-wax over it, ſo as to form an equal coat of the wax over the ſurface of the glaſs; and this is, by far, the beſt mode of obtaining the deſired object; but when the piece of glaſs is too large, then the ſealing-wax muſt be diſſolved in ſpirit of wine, and muſt afterwards be ſpread over the glaſs with an hair pencil; having previouſly wiped the glaſs perfectly clean and dry. In this caſe, however, care muſt be had to uſe the beſt rectified ſpirit of wine, or alcohol; for if impure ſpirits be uſed, the ſolution of ſealing-wax, when ſpread upon the glaſs, will inſulate very imperfectly, or even not at all. Of the diſſolved ſealing-wax you may lay two, three, or more, coats upon the glaſs, always allowing one coat to become perfectly dry, before the next is put on.

With reſpect to the uſe of varniſh, it muſt be obſerved, that very few of the common varniſhes will anſwer this purpoſe in any tolerable degree. This is one, however, which, when properly made, and carefully applied, anſwers as well as the ſealing-wax coating. This varniſh, which was long kept a ſecret, is made in the following manner: Take half a pint of linſeed-oil, one ounce of ſaccharum ſaturni, and one ounce and a half of litharge. Set them in an iron veſſel to boil over a ſmall charcoal fire (*viz.* ſuch as is barely ſufficient for the purpoſe), ſtirring the materials frequently with an iron ſpatula or an old knife. As ſoon as theſe ingredients are incorporated, add one ounce and a half of prepared amber, and let it continue to boil, ſtirring the materials frequently, until you find upon trial, that a drop of the liquor, placed between two knife blades, ſtretches like thick glue, or like turpentine. When this takes place, remove the veſſel from the fire, ſuffer it to cool a little, and then mix ſpirit of turpentine with it, ſtirring the whole together, which will thin it; but take care not to render it too thin; for by keeping, in a few days, it will of itſelf grow thinner. Laſtly, keep it in bottles for uſe. *N. B.* The iron veſſel muſt be much larger than the quantity of ingredients might require, and it muſt be furniſhed with a handle, becauſe the oil, &c. in boiling, is apt to ſwell and will run over, if the veſſel be not quickly removed from the fire. The amber is prepared, firſt, by powdering it; ſecondly, by melting, or rather charring it, in a ſhovel over the fire; and, laſtly, powdering it again in a mortar. This varniſh is uſed in the ſame manner as the above mentioned ſolution of ſealing-wax; but you need not lay on more than one coat of it, or, at moſt, two.

COATZACUALCO, in *Geography*, a navigable river of Mexico, or New Spain, which diſcharges itſelf into the gulf of Mexico, near the country of Onohualco.

COAVO, or CUAVO, a river of Africa, which runs into the Indian ſea. S. lat. 8° 40′. E. long. 38°.

COB-*Nut*. See HAZLE.

COBA, or COBE, in *Ancient Geography*, a trading town or emporium of Ethiopia; ſeated on the Avalite gulph, according to Ptolemy.

COBÆA, in *Botany* (ſo named by Cavanilles, in memory of father Barnabas Cobo, a Jeſuit, who, after living forty-five years in North and South America, compoſed a natural hiſtory of the new world, ſtill extant, but never publiſhed), Vent. v. ii. p. 401. Cav. Ic. 16, 17.

Gen. Ch. *Cal.* pentagonous, one-leafed, with five expanding ſegments. *Cor.* monopetalous, funnel-ſhaped; tube very long, gradually dilated; border campanulate, five-cleft; ſegments open, ſlightly crenated. *Stam.* Filaments adhering to the lower part of the tube, declining,; anthers oblong, verſatile, at firſt ſhorter than the corolla, afterwards longer, and becoming twiſted in a ſingular manner. *Piſt.* Germ ſurrounded at its baſe with a pentagonous glandular rim or nectary; ſtyle longer than the ſtamens; ſtigmas three or five, reflected. *Capſule* from three to five-celled. *Seeds* numerous, imbricated.

Sp. C. *ſcandens*, Cav. Icon. tab. 16, 17. Bot. Mag. 851. (Cobbea, Bot. Rep. 342.) An elegant climber. *Leaves* alternate, equally pinnated, terminated by a dichotomous tendril; leaflets egg-ſhaped, acute. *Flowers* at firſt green, finally changing to a bright violet, large, axillary, ſolitary. A native of Mexico, where it is called yedra, morada, or violet ivy. It grows with aſtoniſhing rapidity, and is eaſily propagated by cuttings. Firſt raiſed by Cavanilles in the royal garden at Madrid, and ſince both in France and England

COBALT, *Kobolt*, Germ. in *Mineralogy*. Cobalt is a metal of a white colour, inclining to bluiſh, or ſteel grey; when tarniſhed, acquiring a reddiſh tinge; its fracture is compact, fine-grained, and uneven. Its ſpecific gravity is 8.53. It is attracted by the magnet, and is itſelf capable of polarity. At a common temperature it is brittle, and eaſily reduced to powder, but when red hot may be ſlightly extended under the hammer. It requires for its fuſion nearly the ſame heat as caſt iron does. When in the ſtate of oxyd it tinges the ſaline vitreous fluxes of a deep blue. It is ſoluble in nitro-muriatic acid, and the ſolution forms a blue-green ſympathetic ink.

§ 1. *Ores of Cobalt.*

Cobalt occurs, 1ſt, mineralized by arſenic; 2d, as an oxyd; 3d, combined with arſenic acid; 4th, combined with ſulphuric acid.

Sp. I. *Arſenical Cobalt.*

Cobalt is never found pure in the metallic ſtate, but is always alloyed with arſenic, and often beſides contains iron and ſulphur, and ſometimes nickel, biſmuth, and ſilver.

Of the ſub-ſpecies only the cryſtallized (3d ſub-ſpecies) has been analyzed, and both by Klaproth and Taſſaert. The following are the reſults. Klaproth obtained

Cobalt	44.
Arſenic	55.5
Sulphur	0.5
	100.0

Taſſaert obtained

Cobalt	36.66
Arſenic	49.
Iron	5.66
Sulphur	6.5
	97.82
Loſs	2.18
	100.

Similar differences are obſerved between the analyſes of this variety by other chemiſts, ſo that it may be conſidered as allowing conſiderable range both in the proportion and nature of its conſtituent parts, without materially affecting its cryſtallization. It appears, however, from Hauy, that when the cryſtals diſplay a lamellar fracture, they contain a notable proportion of ſulphur and iron. We ſhall follow Brochant's arrangement of the ſub-ſpecies.

1. Sub-ſpecies. White cobalt. *Weiſſer Speiſkobolt. Cobalt blave,* (ſpecies 2 of Kirwan and Hauy).

The colour of this mineral, when recently broken, is tin-white, but its ſurface is generally yellowiſh, bluiſh, greyiſh, or irideſcent, like ſteel that has been heated. It occurs in maſs, diſſeminated, kidney-ſhaped, and rarely in minute quadrangular tables, or imperfect cubes and octohedrons. Their external luſtre is ſlight, but internally is brilliant and metallic. Its fracture is fine-grained and uneven: when broken, it flies into ſharp-edged irregular fragments: when in maſs, it contains fine-grained granular diſtinct concretions. It requires a poliſh by friction, is brittle and hard: when expoſed to the blow-pipe, white cobalt melts with great eaſe, giving out a white vapour, and a ſtrong arſenical odour, and a white brittle bead of metal remains, which gives a blue colour to glaſs of borax, when melted with it.

It is found in Norway, at Tunaberg in Sweden, Annaberg in Saxony, and alſo, rarely, in Swabia and Stiria. In Saxony and Norway, it is contained in beds of micaceous ſchiſtus, accompanied by the red earthy cobalt, quartz, hornblende, and pyrites.

2. Sub-ſpecies. Dull-grey cobalt. *Grauer Speiſkobolt. Cobalt gris,* (ſp. 1. of Kirwan and Hauy.)

The colour of this mineral is a clear ſteel-grey, but by expoſure to the air it acquires an irideſcent tarniſh. It occurs in maſs or diſſeminated, ſometimes in kidney-ſhaped or cluſtered maſſes, and very rarely in ſpecular laminæ. Its external luſtre is very feeble, but internally it exhibits a bright metallic luſtre. Its fracture is compact, generally even, but ſometimes paſſing into flat-conchoidal; its grain is remarkably fine and cloſe. Its fragments are ſharp-edged, indeterminate. It is not ſo hard as the preceding, and is leſs brittle. Its ſpecific gravity varies from 4.3 to 5.3, or even 5.5. It gives a bluiſh-grey metallic ſtreak.

When expoſed by itſelf to the blow-pipe, it gives out an arſenical vapour and ſmell; but ſeldom fuſes: when treated in the ſame way with borax it gives the flux a blue colour, and is reduced to a metallic globule.

A ſpecimen from Cornwall was analyſed by Klaproth, who procured from it about 20 per cent. of cobalt, 24 of iron, and 33 of arſenic, the remainder conſiſting partly of biſmuth and ſulphur, together with earthy matter. Some varieties have alſo been found to contain nickel and ſilver. It is found in Saxony, Bohemia, Swabia, and Hungary; alſo in Stiria, France, Norway, and Cornwall.

3. Sub-ſpecies. Bright white cobalt. *Glauz Kobolt. Cobalt eclatante.*

The colour of this mineral is tin-white, but tarniſhes to greyiſh, whitiſh, or irideſcent. It is found in maſs, diſſeminated or inveſting, or of particular ſhapes, as cluſtered, kidney-ſhaped, globular, or cryſtallized in cubes or octohedrons. The cryſtals are middling-ſized or ſmall, their ſurface is commonly ſmooth and brilliant, and marked with ſtriæ on the ſides of the primitive cube. The fracture of the cryſtals is lamellar, that of the other varieties is fine-grained, uneven, or radiated. When in maſs it preſents granular, or lamellar, or teſtaceous diſtinct, concretions. Its hardneſs is ſomewhat inferior to the preceding ſub-ſpecies: when pulverized, it is of a ſteel-grey colour. Sp. gr. 6.2 It is brittle, and eaſily frangible.

Before the blow-pipe, it burns with a faint white flame, diſengaging arſenical vapours; it then becomes black, is attractable by the magnet, and is, with the utmoſt difficulty, reduced to a metallic globule. It often contains as much as 50 per cent. of reguline cobalt.

This is the commoneſt of all the ores of cobalt: it occurs for the moſt part in primitive mountains, together with the other ſpecies of cobalt ore, with vitreous, red, and native ſilver, with arſenical and cupreous pyrites, &c. It is met with in various parts of Germany; alſo in Sweden, Norway, Stiria, and Cornwall.

Sp. II. *Earthy Cobalt.*

Of this there are the four following varieties:

Var. 1. Friable black cobalt. *Schwarzer Kobolt muhn. Cobalt terreux noir friable.*

The colour of this is black, bluiſh, browniſh, or greyiſh black. It is without luſtre, has a looſe earthy conſiſtence, is friable and meagre, ſtains the fingers in a ſlight degree, and gives a brightiſh ſtreak. It is ſoluble in muriatic acid; tinges borax blue, and very rarely ſhews any indications of ſulphur or arſenic, when treated by the blow-pipe.

Var. 2. Indurated black cobalt. *Verharteter ſchwarzer kobolt. Cobalt terreux noir endurei.*

In colour it reſembles the preceding, except that it is ſometimes of a dark greeniſh black. It occurs maſſive, diſſeminating, inveſting, kidney-ſhaped, cluſtered, or in veins. It is dull, but takes a poliſh by friction. Its fracture is earthy and compact, paſſing into flat-conchoidal. It poſſeſſes a moderate degree of hardneſs. Sp. gr. from 2. to 4. With nitric acid it gives a red ſolution, and a bluiſh-green one, with muriatic acid. It has not been accurately analyſed, but conſiſts of oxyd of cobalt, with a ſmall variable proportion of arſenic and ſulphur mixed with vitreous ſilver ore, oxyd of iron, and clay.

This, and the preceding variety, are always found together; but the indurated is by much the moſt rare. It is found in Saxony, Thuringia, Swabia, and the Tyrol.

Var. 3. Yellow cobalt. *Gelber erdkobolt. Cobalt terreux jaune.*

Its colour is that of faded ſtraw, paſſing into yellowiſh white, and often ſtreaked with brick-red. It is found in maſs, diſſeminated or inveſting. It is without luſtre, has a fine-grained earthy fracture, gives an unctuous ſtreak, and is ſoft and friable.

It is infuſible *per ſe*, gives a feeble, arſenical odour, and communicates a deep blue tinge to borax: but when mixed with iron, as it often is, the colour is greeniſh.

This is one of the rareſt of the ores of cobalt. It has hitherto been found only in Thuringia, Wirtemberg, and Dauphiné.

Var. 4. Brown cobalt. *Brauner erdkobolt. Cobalt terreux brun.*

Its colour is a clear liver-brown, paſſing into grey, yellow, and black. It occurs in maſs or diſſeminated; it is dull, but acquires a greaſy luſtre by friction. Its fracture is fine-grained, earthy. It is eaſily broken, being almoſt friable. It has been analyſed, but appears to be the connecting link between the ſecond and third varieties. When thrown on burning coals, it generally gives out an arſenical odour.

Sp. III. *Red Cobalt.*

Of this there are two varieties.

Var. 1. Cryſtallized. *Koboltblute. Fleurs de Cobalt.*

The uſual colour of this mineral is peach-bloſſom-red, paſſing into cochineal and greyiſh-red; by expoſure to the air it becomes paler, and almoſt white. It is found very rarely in maſs, or diſſeminated, and ſtill ſeldomer cluſtered, or kidney-ſhaped; its moſt uſual ſtate is that of a thin cryſtalline covering, or minute druſes of cryſtals. The forms which it generally affects are rectangular tables, or tetrahedral acicular priſms, or hexahedral priſms terminated by dihedral ſummits: theſe figures, however, are not often determinable, on account of the minuteneſs of the cryſtals, and their tendency to form radiates and globular groupes. The ſurface of the cryſtals is ſmooth and brilliant, and their fracture lamellar. The fracture of the other kinds is radiated, paſſing into fibrous. It is tranſlucent, and often, when cryſtallized, ſemi-tranſparent.

Before the blow-pipe it gives a faint arſenical odour, and becomes of a dark-grey colour; it is almoſt infuſible by itſelf, and gives a beautiful blue tinge to borax.

Var. 2. Earthy. *Koboltbeſchlag. Cobalt terreux rouge pulverulent.*

The colour of this is the ſame as that of the preceding variety. It occurs in a pulverulent or indurated ſtate, diſſeminated through, or inveſting other minerals, and occaſionally in maſs. It is dull, opake, and has an uneven earthy fracture. In other reſpects it agrees with the preceding.

Sp. IV. *Native ſulphat of cobalt. Naturlicher koboltvitriol. Sulfate de cobalt natif.*

At Herrengrund, near Neuſohl in Hungary, is found a ſaline ſubſtance, in the form of tranſlucent ſtalactites, of a pale roſe-red colour. It was at firſt ſuppoſed to be ſulphat of manganeſe, but from an analyſis of Klaproth, it appears to be a pure ſulphat of cobalt.

§ 2. *Reduction of the Ores and Analyſis.*

Cobalt is never employed in manufacture in the reguline ſtate; the ſole uſe of this very valuable metal being to give various ſhades of blue colour to glaſs and enamel, and when thus employed, it is in the ſtate of oxyd. In this ſtate it forms either *zaffre*, or *ſmalt*, when prepared in the method, which will be deſcribed in the next ſection.

Many of the cobalt ores are complicated, and difficult to be analyzed completely, nor is it eaſy to obtain the cobalt alone from them in conſiderable purity. The metals naturally varied with cobalt are the following: 1ſt, arſenic, generally in very large quantity, part of which is in the reguline ſtate, and, as appears, another part is in the ſtate of arſenic acid, which, uniting with the oxyd of cobalt, forms an arſeniat of cobalt, that has often been miſtaken for the pure oxyd. The entire ſeparation of the two is extremely difficult. 2d. Nickel exiſts with many cobaltic ores; and being ſoluble in the ſame menſtrua, it is not eaſily ſeparated. 3d. Iron, in variable quantity, is found with moſt of the ores of cobalt, and is hurtful, as it impairs and degrades the fine blue for which alone cobalt is valued. 4th. Manganeſe, which is a ſtill worſe admixture. 5th. Copper, in ſmall quantity, is ſometimes found, which, however, does not much injure the cobalt.

An imperfect analyſis of the common cobalt ores, and which merely has for its object the extraction of the cobalt, is made in the following way: Mix the ore, in fine powder, with charcoal or ſaw-duſt, and roaſt it in a low red heat, till the arſenic is driven off, and no arſenical fumes are any longer perceived. Calcine the reſidue ſome time longer with a ſtrong red heat, and in an open fire, and then mix it with about four parts of a ſaline, reducing flux, (ſuch as that compoſed of equal parts of tartar and carbonat of potaſh) and heat it in a roomy covered crucible, at firſt moderately, till the firſt ſwelling of the materials has ſubſided, and then for a quarter of an hour in a heat fully ſufficient to melt iron. When cold, a button of reguline cobalt is found beneath a maſs of ſcoriæ of an intenſe blue-black colour. From 100 grains of the Tunaberg ore, Klaproth obtained in this way 44 grains of regulus of cobalt, which, however, muſt have been ſtill very impure, retaining iron and a portion of the arſenic. It may be further purified by alternate deflagration with nitre, and reduction with a ſaline carbonaceous flux, repeated two or three times, in the way that Lampadius and Tromſdorf have employed with ſmalt, as will be preſently mentioned.

The reducing flux for cobalt ore, employed by Beaumé, is the following: Mix 1 oz. of the roaſted ore with 3 oz. of black flux, and ½ oz. of carbonat of potaſh, cover it when in the crucible with about 1 oz. of ſalt, and heat the whole, at firſt ſlowly, and afterwards very briſkly for a quarter of an hour.

But, for the purpoſes of mere analyſis, where all the conſtituent parts of the ore are required to be known with as much preciſion as poſſible, theſe methods are much too inaccurate to be depended on, and recourſe muſt be had to the more tedious and difficult analyſis in the humid way. The proceſs given by Taſſaert (An. de Chim. tom. 28.) is highly valuable and inſtructive.

The method given by Lampadius, of purifying cobalt by fuſion is the following: Project in a red hot crucible a mixture of 4 oz. of zaffre, 2 oz. of nitre, and ½ oz. of charcoal. A ſtrong arſenical ſmell is perceived in the proceſs, and a blackiſh-grey maſs is left, which is to be again mixed with charcoal and nitre and deflagrated as before: then throw in the crucible 2 oz. of black flux, and heat it intenſely for an hour. This gives a tolerably pure regulus of cobalt, weighing 6 drams. Powder it, and mix it with 1 dram of nitre, and as much manganeſe; put it into a luted double crucible, and heat it for an hour in a forge-furnace. The metal, by this operation, loſes all its iron and is nearly pure.

Tromſdorf's proceſs is the following: The zaffre, or ſmalt, is to be twice detonated with nitre, then waſhed in hot water, which carries off the arſenic now united with the potaſh of the nitre, and the reſidue is to be digeſted in dilute nitric acid, which will only touch the cobalt and leave the iron. The nitrous ſolution may then be decompoſed by an alkali, and the purified oxyd of cobalt, thence reſulting, may be afterwards reduced if required.

§ 3. *Preparation of Zaffre and Smalt, or Azure.*

All the zaffre and ſmalt of commerce are prepared in ſome parts of Germany, and particularly at Schneeburg in Miſnia, which affords a very lucrative trade to Saxony. The following is the method of preparation as given by Kunckel. (See *Neri's Art de la Verrerie.*) The cobalt ore, broken in ſmall pieces, is ſpread on the hearth of a furnace, like a baker's oven, ſo conſtructed that the flame of the wood is reverberated on all ſides over the ſurface; which ſoon heats it red-hot. A very denſe arſenical vapour then ariſes, which is conveyed from the furnace into a horizontal wooden ſquare trough, or chimney, ſometimes of the enormous length of a hundred fathoms, where moſt of the arſenic is condenſed and collected for ſale. The cobalt ore is calcined for ſome hours, till it ſcarcely emits any more vapours, after which it is taken out, ground to fine powder, replaced in the oven, and calcined a ſecond time, and then again ground and paſſed through a very fine ſieve. This powder is then mixed with about twice its weight of powdered flint or quartz, wetted to the conſiſtence of ſtiff mortar, and rammed into ſmall barrels, where the maſs ſoon acquires a ſtony hardneſs, and is then the *zaffre* of commerce. The reaſon of uſing the flints appears to be partly to dilute the cobalt ore, and partly for ſome purpoſe of concealment; the exportation of the ſimple calcined ore being forbidden under heavy penalties.

Smalt, ſometimes alſo called *azure blue*, when finely powdered, (which muſt not be confounded with the true *azure*, or *lapis lazuli*) is an intenſely deep blue glaſs, made of the calcined cobalt ore and the common vitrifiable fluxes, which is uſed as a colouring matter for a variety of purpoſes. The intenſity of colour of courſe depends on the proportion of roaſted cobalt ore which it contains, regard being had to its quality, and the proportion of oxyd of cobalt which it is eſtimated to contain. On an average about equal parts of the roaſted ore of potaſh, and of ground flints are uſed. This mixture is firſt *fritted*, and then melted in pots ſimilar to thoſe of glaſs-houſes, and about ten or twelve hours of fuſion are required. When the glaſs is thoroughly fuſed, it is laded out and dropped into cold water to crack it in every direction, and then ground in a mill made of a very hard ſtone. At the bottom of the glaſs-pots a quantity of regulus of biſmuth is always found, lying under a mixed alloy of arſenic, iron, and copper.

The grinding of the blue glaſs is a work of much difficulty, and different degrees of fineneſs of the powder are obtained by ſubſequent waſhing and ſifting.

Smalt is a valuable colour, on account of the fine body which it poſſeſſes; and being indeſtructible in any heat, it is uſeful for all enamel colours, but it will not mix with oil colours, and therefore can only be partially uſed. Starch is ſlightly coloured with it to give a ſmall degree of blueneſs, which corrects the yellow hue which linen and cotton acquires by being worn.

Zaffre is alſo prepared in Bohemia, Wirtemberg, Sileſia, and Lorraine, but the Saxon is preferred.

The oxyd of cobalt contained in the zaffre is ſtill intimately mixed with a ſmall portion of arſenic, partly as arſenic acid, and partly as oxyd of arſenic. If zaffre is digeſted in liquid cauſtic ammonia, a red ſolution is formed, which, on evaporation, depoſits a yellow powder, which is a mixture of the oxyds of cobalt and arſenic. If zaffre is boiled in water, a ſolution is alſo obtained, which is ſenſibly acid, and was thought by Brugnatelli to indicate the exiſtence of a cobaltic acid, but Darracq has ſhewn it to be an arſeniat of cobalt.

§ 4. *Chemical Properties of Cobalt*

Cobalt, when perfectly pure, has a ſteel-grey colour, not very reſplendent, and when ſlowly cooled, has ſomewhat of a reticulated texture. It melts at about the fuſing point of caſt iron.

Cobalt, when heated ſtrongly in contact with air, is converted into a black oxyd, with an increaſe of about 18 parts on 100; hence 100 parts of the oxyd contain 84.75 of metal, and 15.25 of oxygen. When it retains any arſenic, the colour is reddiſh.

This metal burns in oxymuriatic acid gas, with a bright white flame.

The ſulphuric acid diſſolves cobalt with difficulty, but its oxyds more readily. If zaffre, or which is better, the wet precipitate from nitrat of cobalt by carbonat of potaſh, is digeſted with ſulphuric acid, and the mixture evaporated nearly to dryneſs, the reſidue digeſted with hot water, gives a ſolution of ſulphat of cobalt, which, by ſlow evaporation, affords the ſalt in cryſtals, that are of a fine red when the metal is pure, but greeniſh when it contains nickel. This ſalt is ſoluble in 15 parts of boiling, and 24 parts of cold water.

Nitric acid diſſolves cobalt or its oxyd copiouſly and with great eaſe by digeſtion in a moderate heat. The ſolution is red, or claret-coloured, or yellow, if it holds iron. It ſcarcely can be brought to cryſtallize, but by evaporation to dryneſs and calcination, it leaves a dark red or violet oxyd.

Muriatic acid acts with great difficulty on cobalt, and can ſcarcely be made to diſſolve it, unleſs by repeated evaporations to dryneſs and affuſion of freſh acid. But it diſſolves the oxyds of this metal with much more eaſe when aſſiſted by heat. The ſolution is of a roſe-red, but when evaporated to dryneſs and warmed, it acquires a beautiful blue-green, which more approaches to blue in proportion as the ſolution is free from iron. This ſingular property of the muriat of cobalt was firſt diſcovered by Hellot, and uſed in making a beautiful *ſympathetic ink*, the properties of which have engaged much of the attention of chemiſts. If the ſolution be conſiderably diluted, characters traced by it on paper are ſcarcely viſible when cold, but when held near the fire, they very ſpeedily aſſume a beautiful blue green, which colour again totally diſappears when cold, and may be made to re-appear at pleaſure by the ſame means. The paper, however, ſhould not be heated more or longer than is neceſſary to produce the full effect. It is found, that not only the pure muriat of cobalt, but any ſolution of this metal into which muriatic acid, or a muriatic ſalt, enters, will have the ſame effect. Hence the commoneſt method of making this ſympathetic ink, and that employed by the inventor, is, to digeſt zaffre in a moderate heat, with a mixture of about three parts of nitric and one of muriatic acid, diluted with as much water, till a high claret-coloured ſolution is formed, which ſhould then be diluted with as much water as poſſible, to prevent the paper from being corroded by the acid. But a much more concentrated ſolution may be made, which ſhall not injure the paper, in the following way: Boil ſome moderately dilute nitric acid or zaffre, till much of the cobalt is diſſolved out of it, then add to it any alkali as long as any precipitate takes place; pour off the clear liquor after ſtanding ſome time, waſh the ſediment with hot water, and throw it on a filter. Take the ſediment which is left on the filter, and put it, while ſtill wet, into a glaſs flaſk, and boil it with diſtilled vinegar, which will readily diſſolve it, and make a roſe-coloured ſolution, which may then be made into a fine ſympathetic ink, by diſſolving in it ſome common ſalt or ſal-ammoniac.

It has been mentioned that the colour of the common cobaltic ſympathetic ink is green, and when made ſimply by diſſolving the ſoluble part of zaffre in nitro-muriatic acid, it is generally a pale graſs green, but in proportion as the cobalt becomes purer, the colour approaches to a bright blue green. This is probably owing to the ſeparation of iron which the common zaffre contains in abundance, and which may be effected more or leſs perfectly in various methods. The ſimpleſt (though not the moſt economical) is to add to the ſolution very gradually carbonat of potaſh as long as the precipitated oxyd is roſe-coloured, and to ceaſe when it begins to have a yellow ochery hue; for the former conſiſts chiefly of the cobalt, and the latter chiefly of the iron. Then by collecting, waſhing, filtering, and re-diſſolving the roſe-coloured precipitate in the nitric or acetous acid, a much purer ſolution is obtained, which contains very little iron, and gives a blue-green ſympathetic ink, when any muriatic ſalt is added. Another way of ſeparating moſt of the oxyd of iron is to evaporate the nitrous ſolution nearly to dryneſs, and to expoſe it for ſome time in a ſhallow veſſel to the air, by which much of the iron will be rendered inſoluble, and ſubſide as a red ochre, whilſt the cobalt will remain in ſolution. Or elſe the acetited ſolution of both metals may be alternately evaporated to dryneſs, and the ſoluble part re-diſſolved by freſh acetous acid, for two or three times ſucceſſively, by which the iron will gradually ſeparate, and the cobalt alone be left.

But to obtain perfectly pure cobalt, ſeparate from arſenic, biſmuth, iron, and other impurities, is more difficult, for in the above-mentioned proceſſes the arſenic acid and oxyd contained in the cobalt ore muſt accompany the cobalt and be retained in all the ſolutions. We ſhould therefore recommend the following method: Digeſt a quantity of zaffre with nitric acid diluted with about three times its weight of water, and boil them for ſome time. After ſtanding for a while pour off the clear ſolution and evaporate it nearly to dryneſs. Then dilute it pretty largely with water, which will cauſe the biſmuth, if any, to ſubſide. Then neutralize any exceſs of acid in the filtered ſolution by any alkali, avoiding to precipitate any of the metal which it contains, and add, cautiouſly by drops, ſome of a ſolution of nitrated lead (made by diſſolving the cryſtals of this ſalt in water) as long as any precipitate falls down. This latter is arſeniat of lead, and by this means all the arſenic acid of the zaffre will be removed. Then entirely decompoſe the clear ſolution by cauſtic potaſh, collect and waſh the precipitated oxyd put into a phial, and add to it ſome cauſtic ammonia, which will diſſolve only the oxyd of cobalt. From this ammoniacal ſolution all the oxyd may be again ſeparated either by evaporation to dryneſs, or by boiling with cauſtic potaſh, and a very pure black oxyd of cobalt is left, which may be reduced to the metallic ſtate by being heated intenſely in a covered crucible lined with charcoal; or it may be diſſolved in the ſeveral acids. This method, however, is expenſive, on account of the quantity of ammonia employed, but it is difficult to exclude the iron totally by any other method.

A triple ſalt of cobalt, nitric acid, and ammonia, is made by adding ammonia to nitrat of cobalt, which may be cryſtallized.

The fixed alkalies have little or no action on cobalt or its oxyds in the moiſt way, but ammonia diſſolves the oxyds largely, as already mentioned.

Tincture of galls give a yellowiſh white, and pruſſic acid a green precipitate to the ſolutions of cobalt when free from iron.

Sulphur unites with great difficulty to cobalt by fuſion, but the hydroſulphurets and liver of ſulphur readily diſſolve this metal. Hydroſulphuret of potaſh added to the ſolutions of cobalt gives a very black precipitate, which an exceſs of the hydroſulphuret again diſſolves. Cobalt ore fuſed with liver of ſulphur is diſſolved thereby, and a brilliant metallic looking maſs is produced, which deliqueſces totally by expoſure to air, and falls into a dark liquid.

None of the poſſible alloys of cobalt deſerve any particular notice, for this metal has only a ſingle uſe in the arts, namely, that of giving a blue colour to vitreſcent compounds when its oxyd is melted with them, and this colouring power is ſo intenſe, that a ſingle grain of the pure oxyd (or zaffre in proportion) will give a very deep blue to half an ounce of glaſs. When the glaſs contains much more than this proportion, the body of colour is ſo intenſe as to render it nearly opake, and hence, too, it is of uſe in forming the black glaſſes and enamels.

The affinities of cobalt are ſtated to be in the following order, *viz.* the gallic, oxalic, muriatic, ſulphuric, tartareous, nitric, phoſphoric, acetic, arſenic, and carbonic acids, and ammonia. We may add, however, that the difficulty of obtaining pure cobalt, and the variety of metals with which it is uſually alloyed, render this order of affinity ſomewhat doubtful.

COBALT is alſo uſed by ſome to expreſs that ſuffocative vapour or damp in mines, which often proves fatal to the miners. It is common among the Germans, to ſay on this occaſion, that the cobalt roſe and choaked them. See DAMPS.

COBAN, in *Commerce*, a piece of gold coin in Japan, worth 30*s.* ſterling.

COBANDI, in *Ancient Geography*, a people of Germany, placed by Ptolemy on the eaſtern coaſt of the Cimbric Cherſoneſus.

COBARRUBIAS, ALONZO DE, in *Biography*, an architect of Toledo, who is ſaid to have been the firſt who introduced the Greek and Roman ſtyles of architecture in Spain. He was employed by Charles V. to erect the north front, as well as ſome other parts of the royal palace of Toledo, in which work, however, he has adopted a mixed ſtyle, partaking of the old Gothic as well as of the Greek; probably with the view of rendering the modern part of the building more conformable to the great body of that very ancient fabric. He likewiſe modernized the vaſt and magnificent cathedral of the ſame city, and built the extenſive church and monaſtery of St. Michael at Valencia. Milizia, Mem. degli. Arch.

COBAYA, in *Zoology*, the Guinea pig. See CAVIA *cobaya*.

COBBAN, in *Botany*, a ſmall tree like a peach-tree, which grows in Sumatra, called *Perſicæ affinis in Taprobana.* C. B. *Arbor Getruph, ſive cobban.* J. B. It bears a ſmall leaf, like that of the tree which produces the *ſiliqua cathartica*, with ſhort branches, and a yellowiſh or ſaffron-coloured bark. The fruit is thick and round like a tennis-ball, incloſing a nut as big as a filberd, which contains a very bitter kernel, taſting like the root of angelica.

The fruit is very proper to quench thirſt; but the kernel, however bitter, is far ſuperior in virtue. The inhabitants of Sumatra, where the tree grows, extract an oil from the kernel, which is very efficacious in pains of the liver and ſpleen, taken inwardly, or uſed by way of unction; and is alſo a ſovereign remedy in the pain of the gout, to which the inhabitants of that iſland are very ſubject.

From the ſame tree diſtils a gum, which is very ſerviceable in the before-mentioned diſorders, if it be diſſolved with a moderate quantity of oil, and applied to the affected parts by way of cataplaſm.

COBBE', in *Geography*, the capital town of Dar-fûr, in Africa, ſituated almoſt on the direct road from the north to the ſouth extremity of the country. N. lat. 14° 11'. E. long. 28° 8'. The town is more than 2 miles in length, but very narrow; and the houſes, few in number, each of which occupies within its incloſure a large portion of ground, are ſeparated by conſiderable waſte. It is full of trees of ſeveral kinds, which give it an agreeable appearance at a ſmall diſtance; for, being ſituated on a plain, it is not diſtinctly viſible more than 4 or 5 miles in any direction. During the rainy ſeaſon, the ground on which it ſtands is ſurrounded by a torrent. Fronting it to the eaſt, the town itſelf extending from north to ſouth, is a mountain or rock, diſtinguiſhed by the ſame appellation, which is the reſort of hyænas and jackals. The inhabitants are ſupplied with water from wells of ſmall depth, ſome of which are dug within the incloſure of many of the houſes; but the beſt of them are in or near the bed of the torrent. The town is ſurrounded by villages at ſmall diſtances, in various directions, which are dependent upon it, and increaſe its apparent population The inhabitants of Cobbé are, for the moſt part, merchants, employed in trading to Egypt, the greater number of whom come from the river, and ſome of them are natives of that country. Some Egyptians, chiefly from Saïd, a few Tuniſines, natives of Tripoli, and others, come and go with the caravans, remaining only a ſufficient time for the ſale of their goods. Others have married in Dar-fûr, and are now perfectly naturalized, and recognized as ſubject to the ſultan. The fathers being dead, the children ſucceed to their occupations. The other inhabitants are foreigners, from Dongola, Mahas, Sennaar, and Kordofân, who are generally indefatigable in commerce, but daring, reſtleſs, and ſeditious, ſo that the preſent ſultan has made ſome efforts to baniſh them from his dominions; they are the offspring of thoſe whoſe parents have emigrated, and who have themſelves been born in Dar-fûr; the latter are often people of debauched manners, and not remarkable for the ſame ſpirit of enterpriſe as the actual emigrates. The people firſt mentioned commonly uſe among themſelves the language of Barabra, though they alſo ſpeak Arabic. The latter are generally unacquainted with any language but the Arabic. They uſually intermarry with each other, or with the Arabs. Some, avoiding marriage with Furian women, merely cohabit with their ſlaves. Perſons of both theſe deſcriptions are eaſily diſtinguiſhable from the natives of the country, being uſually of a more olive complexion, and having a form of viſage more nearly reſembling the European, with ſhort curly black hair, but not wool. They are a well-ſized and well-formed people, and have often an agreeable and expreſſive countenance, though ſometimes indicating violent paſſions, and a mutable temper. South-eaſt of the town, in a large open ſpace, a market is held on Monday and Friday, in every week, in which proviſions of every kind are ſold, including all the commodities which the country produces, and alſo thoſe that are brought from Egypt, and other places; and from this market all the villages, ſix or eight miles round, derive their ſupplies. About the month of December grain is cheapeſt, and at this time the inhabitants commonly lay in their annual ſtock. Two, or ſometimes three, pecks of millet may be had for a ſtring of beads, worth about one penny ſterling, at Cairo. Slaves, though ſometimes brought to the market, are commonly ſold privately, which is frequently complained of as an evil, becauſe it facilitates the ſale of ſuch as have been ſtolen from other quarters. In the town they have four or five "mectebs," in which boys are taught to read, and, if they wiſh it, to write. The lecturer inſtructs gratuitouſly the children of the indigent; but thoſe who are in eaſy circumſtances make a ſmall remuneration. Two or three lectures in the Koran, and two others in what they call "elm" theology. In this town is one ſmall moſque, being a ſquare room, formed by walls of clay, where the fukkara, or pretenders to extraordinary ſanctity, blending with it brutal intolerance to ſtrangers, meet thrice in the week. A large moſque, the area of which was about 64 feet ſquare, and the walls about 3 feet thick, was begun when Mr. Brown viſited this place; but though the material was merely clay, the work advanced very ſlowly. Browne's Travels in Africa, ch. 17.

COBBESECONTE, or Copsecook, ſignifying, in the Indian language, the land where ſturgeons are taken, is a ſmall river which riſes from ponds in the town of Winthrop, in the diſtrict of Maine, and falls into the Kennebeck within 3 miles of Nahunkeag iſland, and 15 from Mooſe iſland.

COBBING, in *Sea Language*, a puniſhment inflicted at ſea on thoſe who quit their ſtation during the night watch. It conſiſts of a number of ſtrokes on the breech with a flat piece of wood, called the *cobbing-board*.

COBBS, in *Geography*, a town of America, in the ſtate of Virginia; 20 miles S.W. of Richmond.

COBCAR-ING *Iron-works*, are ſituate on a branch of the Dearne and Dove canal, in Yorkſhire. See Canal.

COBELLA, in *Zoology*. See Coluber *venoſus*, called by Laurenti *aſpis cobella*.

COBEQUIL, or Colchester *River*, in *Geography*, a river of Nova Scotia, which riſes within 20 miles of Tatamogouche, on the N.E. coaſt of Nova Scotia; from thence it runs ſoutherly, then S.W. and W. into the eaſt end of the baſin of Minas. At its mouth is a bank, with a good channel on each ſide, ſo that veſſels of 60 tuns burden may paſs, and ſail 40 miles up the river. On its banks are ſome ſcattered ſettlements.

COBER, a river of England, in the county of Cornwall, which runs into the Engliſh channel a little below Helſton.

COBESEY, in the diſtrict of Maine, in N. America. See Pittston.

COBEZA, or Cobija, an obſcure port and village in the audience of Los Charcas, in Peru, South America; the place is inhabited by about 50 Indian families, and is the moſt barren ſpot on the coaſt. It is, however, the neareſt port to Lipes, where are ſilver mines, and alſo to Potoſi, which is above 100 leagues diſtant through a deſert country.

COBHAM, a ſmall town of America, in the ſtate of Virginia, on the ſouth bank of James river, oppoſite to Jameſtown; 20 miles N.W. of Suffolk, and eight or nine S.W. of Williamſburg. N. lat. 37° 7'. W. long. 76° 55'.

Cobham *Iſle*, an iſland mentioned by captain Middleton in the journal of his voyage for finding a north-eaſt paſſage. Its two extremes bear N. by E. and E. by N. in N. lat. 63°, and E. long. from Churchill, 3° 50', which he takes to be the "Brook Cobham" of Fox.

COBI, as it is called by the Tartars, and denominated *Chamo* by the Chineſe, an immenſe deſart of Tartary, running in a parallel direction from the eaſt to the weſt, ſouth of the Altaian ridge, and occupying almoſt the whole ſouthern part of the country of the Kalkas. This deſart is reckoned to be more than 100 leagues in length from eaſt to weſt, and almoſt the ſame in breadth from north to ſouth, and even more towards the weſtern part; and it preſents nothing to view but immenſe plains of ſand, ſometimes moveable, ſometimes ſolid. Theſe plains are here and there interrupted by ſome little hills, on which are ſeen a few buſhes, but not a ſingle tree. It is in general dry, and deſtitute of paſturage and water of every kind, except a ſmall number of pools in which the rain is collected, and a few bad wells that occaſionally occur. Its ſituation is very high, and it may be eaſily perceived on leaving China, that one muſt aſcend conſiderably to croſs it; the cold, on that account, is exceedingly ſharp, and continues very long. The great quantity of ſalt with which the ſand is impregnated greatly contributes to this temperature. On digging only a few feet below the ſurface, the earth may be found frozen in every ſeaſon of the year. The ſands of this region are very inconvenient to travellers, and dangerous to horſes, many of which daily periſh; and, therefore, the neighbouring Tartars, when they traverſe them, generally make uſe of camels, becauſe theſe animals require little food, and can live without water for ſeveral days.

COBIJA. See Cobeza.

COBILUS, in *Ancient Geography*, a river of Aſia Minor in Bithynia, according to Valerius Flaccus, ſuppoſed to be the Cobulatus of Livy.

COBIOMACHUS, a name given by Cicero to a village of Gallia Narbonnenſis, ſuppoſed to be the ſame with the modern *Cabaignac*, between Toulouſe and Narbonne.

COBITIS, in *Ichthyology*, a genus of abdominal fiſhes, diſtinguiſhed by the following character.

The head is ſmall, oblong, and deſtitute of ſcales; eyes ſituated in the upper part of the head; nape flat. Gill-membrane with from four to ſix rays; gill-cover conſiſting of a ſingle piece, and cloſing beneath. Body covered with mucus, and ſmall, thin, deciduous ſcales; and nearly of equal thickneſs from the head to the tail; back ſtraight, with a ſingle fin; lateral line ſcarcely conſpicuous; vent neareſt the tail.

Species.

Barbatula. Cirri ſix, head unarmed, and compreſſed. Linn. *Enchelyopus*, &c. of Klein, and *Cobitis fluviatilis* of Ray.

The *Cobitis barbatula* is the bearded loche of Engliſh writers. This fiſh is an inhabitant of clear rivulets in many parts of Europe. The body is finely varied with pale brown, white, and black; it is a fertile fiſh, and of exquiſite flavour, and is on that account cultivated with much aſſiduity as an article of luxury for the table in ſome parts of Europe. Donov. Brit. Fiſhes.

Taenia. A forked ſpine under each eye. Linn. *Cobitis aculeata*, Marſd. Dan. *Taenia cornuta*, Willughby.

This alſo is a native of Europe; it inhabits freſh waters, and is obſerved to lurk under ſtones, whence in England it has obtained the name of groundling; it feeds on worms, aquatic inſects, and ſmall fiſhes; when handled makes a hiſſing noiſe. The colour is yellowiſh, with four rows of brown ſpots, and like the former ſpecies this has ſix beards or cirri to the mouth.

Fossilis. Cirri eight; a forked ſpine over each eye. Linn. Fn. Suec. *Muſtela foſſilis*, Marſd. *Beyſzker*, Geſner.

This ſpecies is the largeſt of the genus; it inhabits boggy places, and muddy lakes, and ſtreams in ſeveral parts of Europe, but is moſt frequent in Germany. The great loche is uſually from ten to twelve, or at the utmoſt fifteen inches in length, of a dull yellowiſh-brown colour, marked above by ſeveral longitudinal ſtripes of dark brown or black, and which extend the whole way from the head to the tail. This ſpecies conceals itſelf during the winter, or when the marſhes it inhabits begin to grow dry, at ſome diſtance beneath the ſurface of the mud. According to Bloch this fiſh is obſerved to be unuſually reſtleſs; quitting the muddy bottom in which it generally reſides, and ſwimming near the ſurface of the water. It is a prolific fiſh, very tenacious of life, and excellent food.

Heteroclita. Head without cirri; dorſal and anal fins ſpotted with white, and the tail barred with black.

Deſcribed by Dr. Garden as a native of Carolina, where, according to that writer, it is known by the name of mud-fiſh. The length is about four inches: the body roundiſh, and covered with large ſmooth ſcales, and the colour beneath yellowiſh. The head is flattiſh, lips denticulated; dorſal and anal fin placed oppoſite, and ſituated at a great diſtance from the head; they are blackiſh and powdered with pale tranſparent ſpecks. Gmelin expreſſes ſome doubt whether this fiſh in reality appertains to the genus *cobitis*.

Japonica. Head without cirri, depreſſed; jaws armed with teeth. Japaneſe loche.

A native of Japan, and firſt deſcribed by Houttuyn, in the 20th volume of the Haarlem Tranſactions. The length is five inches, and the body is of a roundiſh form. The dorſal fin contains twelve rays; the pectoral eleven, ventral eight, anal nine, and tail twenty.

Anableps. Cirri two; head depreſſed, eyes prominent. Linn. *Anableps* Arted. *Anableps*, *tetropthalmus*, Bloch.

Linnæus conſiders this as a ſpecies of cobitis, but we are clearly of opinion that notwithſtanding its general reſemblance to fiſhes of this genus, the very extraordinary, and indeed, peculiar conſtruction of its eyes at once removes it from that genus of fiſhes. Theſe eyes are protuberant, and have double pupils, ſo diſtinctly marked, that at the firſt view the fiſh appears in reality to be furniſhed with a pair of eyes on each ſide of the head. Bloch conſtitutes a new genus of this ſingular fiſh under the generical appellation of *anableps*, a genus we ſhould adopt could the article be readily referred to its alphabetical order in the Cyclopædia. Linnæus, however, having deſcribed it as appertaining to the genus cobitis, there can be little impropriety in allowing it to remain as a ſequel to that genus. This fiſh was firſt deſcribed by Artedi, who examined ſome ſpecimens of it in the muſeum of A. Seba, which were received from South America, the region it inhabits. It is ſaid principally to live in the rivers of Surinam, near the ſea-coaſts.

The length of this fiſh is from ſix to eight inches, or ſometimes rather more. It is of a very compreſſed form, and is covered with moderately large rounded ſcales, which are ſmaller in proportion on the head than any other parts. The colour is a pale yellowiſh brown, marked, like the great loche, with four or five longitudinal blackiſh ſtripes. In the ſtructure of its eyes it differs from every other fiſh known; theſe eyes are extremely protuberant, ſituated on the upper part of the head, and ſeem each divided into two diſtinct eyes, united in a ſingle tubular receptacle; it appears, however, on diſſection, that though the anterior half of each eye ſeems to be double, or furniſhed with two pupils, yet the cryſtalline is ſingle; the appearance of a double eye on each ſide ariſing merely from the deep diviſion of the anterior region. It is aſſerted alſo by Gronovius, that the anal fin varies in its ſtructure in different individuals, being in ſome of a ſimple or regular form, and furniſhed with nine ſoft rays, while in others it is formed into a tube, which is ſometimes accompanied by a ſmall additional fin.

Cobitis *aculeata*, called alſo *cobytis oxyrynchus*, and *dacolithus*, names given by Aldrovandus, Johnſton, Geſner, and other old writers, to the *Cobitis taenia* of modern naturaliſts. See Cobitis *taenia*.

COBIUS. See Gobius.

COBLENT, Herman, in *Biography*. See H. Collaert.

COBLENTZ, in *Geography*, a city of Germany, in the circle of the lower Rhine, in the electorate of Treves, or according to the French arrangement, the principal place of a diſtrict, and capital of the department of the Rhine and Moſelle, including three communes, and containing, according to the ſtatement of Tinſeau in 1803, 10,000 inhabitants; and according to Render in his "Tour through Germany," (vol. i.) about 16,000, all of whom are Roman Catholics. They are generally tall, with agreeable features, and expreſſive countenances.

The population of the whole diſtrict in 1803 is ſtated by Tinſeau to have been 69,900. It comprehends 209 communes, diſtributed into 12 cantons, *viz.* Coblentz, Andernach, Boppard, Cochheim, Raiſerſech, Luzerath, Mayen, Munſtermaifield, Polch, Ruberach, Tries, and Zell. In this diſtrict there are conſiderable bleaching yards, and ſome manufactures of woollen and linen cloth, and alſo of leather. The ſoil is moderately fertile, affording excellent vineyards; and the hills are covered with trees. The canton of Mayen has three quarries of ſlate and lime, together with ſome lead and iron mines. The mineral ſprings of Andernach are denominated Tinſtein, or Tuniſtein water. The canton of Luzerath has a warm bath.

Almoſt immediately above the city, the river Moſelle unites with the Rhine, and forms a kind of triangle, from which circumſtance it derives its name, in Latin *Confluentia.* Over the Moſelle is a ſtone bridge, conſtructed in the 14th century, which has 14 arches, 520 feet in length, and of ſuch a height that veſſels may paſs under it without lowering their ſails. The flying bridge, or bridge of boats, by which paſſengers may croſs the Rhine three times every hour, to the ſmall town of Thal, preſents a very uncommon and pleaſing ſight. In the time of the Romans, Coblentz was the ſtation of the firſt legion; and afterwards it became the reſidence of the ſucceſſors of Charlemagne. In 1249, it was encompaſſed with walls, and ſince that time it has been fortified. The ſtreets of Coblentz are generally regular, the pavement tolerably good, and the city well lighted in winter.

On the eaſtern bank of the Rhine, the elector finding the ſituation of the old palace, in the vale of Ehrenbreitſtein, inſalubrious and inconvenient, has lately built another very elegant and ſumptuous one, where he has ſince reſided. This city contains three large churches, two of which are collegiate, ſeveral convents, and other noble buildings. It has alſo a Gymnaſium or academical ſchool, in which a new plan of education is adopted, with reſpect both to the claſſics and ſciences, which, from the encouragement it has received, is likely to produce the beſt effect on the cuſtoms and manners of the inhabitants, and to promote in a very great degree the improvement of the city. Commerce, however, notwithſtanding the advantageous ſituation of the city near the Rhine and the Moſelle, does not make any great progreſs; one cauſe of which is the vicinity of Mentz and Cologne, which, by duties and tolls, impede the natural courſe of trade. Another cauſe is religious intolerance, which long prevailed here, but is now in a great degree removed by the enlightened policy of the elector. Coblentz was formerly imperial, but was taken by the French in October, 1794, and ceded to them by the treaty of Campo Formio, in 1797. The country around this city is in every reſpect very romantic. The hills on the right and left form an amphitheatre, and ſome of them are covered with buſhes. The meanders of the rivers Lahn and Moſelle, which join the Rhine, exhibit a pleaſing proſpect. Nearly oppoſite to this city is the ancient fortreſs of Ehrenbreitſtein, which is ſeated on the ſummit of a ſtupendous rock about 800 feet above the level of the river, and when ſupported by a competent garriſon, is deemed impregnable; it communicates with Coblentz by ſubterraneous paſſages cut in the ſolid rock, and is plentifully ſupplied with water from a well 286 feet deep. In the arſenal, belonging to this fortreſs, is a curious cannon, called "Der Vogel Greif," *i. e.* the bird called Griffin, 20 feet long, about two feet diameter in the bore, and four in the breech. This cannon, it is ſaid, when diſcharged with a ball of 160 pounds weight, will carry it to Andernach, about 12 miles from thence. The ancient reſidence of the electors of Treves is ſituated at the foot of the caſtle. The view from the pinnacle of the fortreſs commands the country round Coblentz for about 100 miles. A conſiderable leather manufactory has been eſtabliſhed at this place, under the patronage of the elector; and another at the diſtance of about two miles at Vallender. They receive their hides directly from Buenos Ayres in South America. The priſon belonging to this fortreſs, and the treatment of thoſe criminals who are confined in it, have been long a reproach to German juriſprudence. Coblentz is ſituated at the diſtance of 36 miles N. W. from Mentz, 54 N. E. from Treves, and 82 E. S. E. from Liege. N. lat. 50° 24′. E. long. 7° 40′.

COBLENZ, a town of Swiſſerland, in the diſtrict of Baden, at the confluence of the Aar and the Rhine, 10 miles N.N.W. of Baden.

COBLESKILL, a new town of America, in the ſtate of New York, and county of Schoharie, incorporated in 1797.

COBOB, a name of a diſh among the Moors. It is made of ſeveral pieces of mutton wrapt up in the cawl, and afterwards roaſted in it; the poorer people, inſtead of the meat, uſe the heart, liver, and other parts of the entrails, and make a good diſh, though not equal to the former. Phil. Tranſ. N°. 251.

COBOOSE, in *Sea Language*, is derived from the Dutch *kambuis*, and denotes a ſort of box, reſembling a centry-box, uſed to cover the chimneys of ſome merchant-ſhips. It generally ſtands againſt the barricade, on the fore-part of the quarter-deck. It is called in the Weſt Indies *cobre vega*.

COBOZE, in *Geography*, a ſmall iſland in the Indian ſea, near the eaſt coaſt of Siam. N. lat. 12° 43′. E. long. 97° 20′.

COBRA, in *Zoology*, a ſpecies of Coluber in the Gmelinian ſyſtem. See Coluber.

Cobra *Americana* of Seba, is Coluber *ſubalbidus* of modern authors.

Cobra *Lacheſis* of Laurenti, is Coluber *lacheſis* of Gmelin.

Beſides theſe it is to be obſerved there are ſeveral diſtinct kinds of ſnakes, known under the general and indefinite title of cobra, ſome of which it would be difficult to reduce with any degree of certainty to the modern nomenclature. *Cobra de las cabeças* is of this deſcription; it is an American ſpecies of ſerpent, whoſe bite is ſaid to be very fatal: this kind lives under ground and feeds on ants. *Cobra de coral* is alſo a native of America, and is called by the natives *Ibiboboca*. This is about two feet in length, and is much variegated with red. *Cobra de cipo* is likewiſe an American ſnake called by the natives of Braſil, *Boitjapo*.

COBRAS *de Capello*, the Portugueſe name of a kind of ſerpent, called by ſome authors, *ſerpens incoronatus, diademate, ſeu conſpicillo inſignis*, and alſo the ſpectacle ſnake, from the ſtrange double ocellated ſpots on the back of the head and neck, which bear ſome reſemblance to a pair of ſpectacles. It inhabits India, and is ſaid to be the moſt poiſonous of its tribe. See Coluber Naja.

In the ſecond volume of the "Aſiatic Reſearches," we have an account by John Williams, eſq. of ſix caſes of perſons, in the moſt dangerous ſituations, in conſequence of being bitten by the cobra de capello, who were cured by the internal and external uſe of volatile cauſtic alkali. The doſe was a tea-ſpoonful, repeated according to the neceſſity of the caſe. The author above obſerves, that convulſions of the throat and fauces are a conſtant ſymptom of the bite of this ſerpent; but he never knew an inſtance of the volatile cauſtic alkali failing in its effect, where the patient has been able to ſwallow it.

Cobras, in *Geography*, an iſland of South America, in the Atlantic, near the coaſt of Braſil, on the ſouth ſide of the river Janeiro, oppoſite the city.

COBRE, El, a town of the iſland of Cuba, ten miles W. of St. Jago.

Cobre *de verd*, Cobre verde, in *Zoology*, the name given by the Portugueſe in America, to a ſpecies of ſerpent, called by the natives Boiobi. This is the Boa Canina of Linnæus.

COBULATUS. See Cobilus.

COBUM, in *Ancient Geography*, a river of Aſia in the territory of Colchis; the ſource of which, according to Pliny, was in mount Caucaſus, and it had its courſe among the people called Suani. Arrian mentions it under the name of Chobus. It diſcharged itſelf into the Euxine ſea.

COBURG, Principality of, in *Geography*, a diſtrict ſituated near the river Saal, between the territories of Bareith, Thuringia, Henneberg, and Bamberg, in the circle of Franconia, but dependent on the circle of Upper Saxony. It formerly belonged to the counts of Henneberg, but paſſed by marriage to the houſe of Saxony, and is divided among four branches, Saxe-Coburg-Saalfeld, or Saxe-Saalfeld, Saxe-Meinungen, Saxe-Gotha, and Saxe-Hildburghauſen. The land is generally fertile, and the inhabitants export corn, wool, fat cattle, tiles, works in wood, pitch, and pot-aſh.

Coburg, a town of Germany in the circle of Upper Saxony, but inſulated in Franconia, of which it formerly made a part, when the counts of Henneberg poſſeſſed it in the 14th century. It is now the reſidence of the dukes of Saxe-Saalfeld, and is ſeated on the river Irtſch, in a valley between two mountains. The town and ſuburbs are ſurrounded by a wall. Here are four churches, and a college founded by John Caſimir, duke of Saxony, in 1597, on which the emperor Leopold, in 1677, conferred ſuch extraordinary privileges, that it might be ſaid to rival ſome univerſities, and a public ſchool, and alſo manufactures of gold, ſilver, china, and petrified wood, with which the country abounds. As Luther reſided ſome months at Coburg in the year 1530, the archives may be regarded as a treaſury of authentic papers, relating to the reformation. Coburg is 23 miles N. of Bamberg, and 40 S. of Weimar. N. lat. 50° 14'. E. long. 11° 1'.

COBUS, in *Ancient Geography*, a river of the Boſphorus, which flows, according to Pliny, from the Caucaſus.

COBWEB. See Web and Silk.

Cobweb, in *Ornithology*, a name given in Merton's Hiſtory of Northamptonſhire to the ſpotted fly-catcher, or *muſcicapa griſola* of Linnæus and Gmelin.

COCA, in *Commerce*, a meaſure in Japan, equal to an Engliſh pint.

Coca, in *Geography*, a town of Spain, in Old Caſtile, on the Ereſma; 24 miles S.S.E. of Valladolid, and 22 N.W. of Segovia.

COCABA, in *Ancient Geography*, a place of Aſia, in the territory of Baſhan, in the vicinity of Paleſtine, where the hereſiarch Ebion is ſaid to have lived.

COCALA, a place in Aſia, on the Indian ſea, in the country of the Oritæ. Arrian. This town of India, is ſuppoſed to be the *Cicacole* of modern times. See Cicacole.

COCALIA, a town of Aſia, placed by Ptolemy in the interior of Pontus Cappadocius.

COCALICO, in *Geography*, a townſhip of America, in the ſtate of Pennſylvania, and the county of Lancaſter.

COCAMA, a lake of South America, which, at 5° 14' S. lat., by a narrow channel, enters the eaſtern ſide of the river Gualaga. This lake is about 1½ league in circumference; and on the bank is a dry, elevated ſoil, on the top of which ſtands a miſſionary ſettlement, where reſide the preſident of the miſſions, and the lieutenant-governor. The number of Chriſtians is 8895, with 19 curates, and a ſuperior of the miſſions; each of the former having 200 dollars a-year, and the vicar 333, paid at the treaſury of Quito, and chiefly remitted in effects; while the Indian ſervants hunt and fiſh, and cultivate ſmall fields of rice and ſugar-canes. Boys of 10 or 12 years of age, are trained by an uſeful policy to the magiſtracy, being annual inſpectors of the conduct of their comrades, and correcting ſmall offences, whilſt rare examples of crimes are reported to the judges. Thus offences are avoided, and young perſons are trained to ſincere and good conduct. See Maynes.

COCANICUS Lacus, in *Ancient Geography*, a lake ſituated on the ſouthern coaſt of Sicily, which, according to Pliny, produced ſalt.

COCCAPANI, Sigismondo, in *Biography*, a painter and architect, born at Florence, 1583. Early in life he ſhewed a ſtrong inclination towards the mathematics, and he afterwards ſtudied painting and architecture under Lodovico Cigoli. His firſt work of painting was an altar-piece in the church of St. Ponziano at Lucca. In the year 1610, he aſſiſted his maſter in the paintings which he was then executing in the Paoline chapel in the Vatican. Few of his pictures are in public, but many of conſiderable merit, and particularly ſome excellent portraits, are to be found in the private collections of Florence. Many years of his life were ſpent in compoſing a treatiſe on architecture, mechanics, hydraulics, &c. illuſtrated by geometrical figures; which, for its ingenuity and clearneſs, was honoured with the approbation of the celebrated Galileo. About the year 1630, he was employed, in competition with other artiſts, to make deſigns for the façade of St. Maria del Fiore at Florence; which fine church, however, ſtill remains without one. This artiſt died, much reſpected, in the year 1642. Baldinucci. Orlandi.

Coccapani, Giovanni, elder brother of the above-mentioned artiſt, was born in Florence in 1582. He was firſt intended for the law, and took his doctor's degree. but he afterwards applied himſelf more eſpecially to the ſtudy of the mathematics, mechanics, and civil as well as military architecture; in each of theſe branches of ſcience, he ſoon became ſo eminent, that his inſtructions were eagerly ſought by many of the young nobility of Florence, as well as foreigners, with whom he ever after kept up a literary correſpondence. In 1622, he was called to Vienna, and employed by the emperor in the quality of military engineer: and he afterwards received a grant of lands for his ſervices. Upon his return to Florence, he built the fine palace called Villa Imperiale, for the grand duke; and erected the convent of the nuns of the order of Santa Tereſa, with the church in the form of an hexagon, and a well-proportioned cupola. The grand duke of Tuſcany having founded a college for the ſtudy of the mathematics, Coccapani was choſen profeſſor, nor would he abandon his native city when, upon a future occaſion, he was invited to occupy a ſituation of the ſame kind in Rome, ſtill more honourable. Several extraordinary pieces of machinery were found at his death in 1649, and one in particular, which, by the help of 30 flaſks of water, placed in a box ingeninouſly formed to receive it, was enabled to grind corn, and at the ſame time print copper-plates, and perform various other functions. Baldinucci. Milizia. Mem. degli Arch.

COCCEIRA, in *Botany*, a name by which ſome authors have called the cocoa-nut tree, the *palma nucifera Indiæ* of moſt writers.

COCCEIUS, John, in *Biography*, an eminent theologian, was born at Bremen in 1603, and in 1630 he was made Hebrew profeſſor in the univerſity there. In 1650 he was choſen profeſſor of theology at Leyden, and rendered himſelf diſtinguiſhed by the peculiarity of his opinions. In explaining the Scriptures, he always looked beyond the literal meaning to ſomething that ſhould wear the appearance of myſtery. He regarded the Old Teſtament as a perpetual repreſentation, or mirror of the hiſtory of Chriſt, and his church; he maintained, that all the Jewiſh prophecies have a relation to Chriſt, and that his miracles, actions, and ſufferings, and thoſe of his apoſtles, were types of future events. He was peculiarly attached to the book of Revelations, and believed in common with many divines in almoſt every age of the Chriſtian church, that there would be a viſible reign of Chriſt upon earth, which ſhould deſtroy the kingdom of Anti-chriſt. Cocceius was oppoſed in ſeveral of his darling tenets by Voet; hence in church hiſtory we have the party names of Cocceians and Voetians. Cocceius died at Leyden in 1669, and his works were collected after his death in 10 vols. fol., eight of which were publiſhed at Frankfort in 1689, and the remaining two at Amſterdam not till 1706. He was a man of great erudition, indefatigable induſtry, and the moſt ardent piety; his many virtues did not, however, ſcreen him from the attacks of his contemporaries, by ſome of whom he was branded as a heretic: a fate to which the beſt men in every age have been ſubject. Nouv. Dict. Hiſt.

Cocceius, Henry, a celebrated civilian, was born at Bremen, 1644, and educated at Leyden. After having travelled in various parts of Europe, he became profeſſor of law at Heidelberg, where he was created privy counſellor of ſtate. On the capture of this city in 1688, he loſt his library, and immediately went to Utrecht. Here he ſtayed but two years, when, in conſequence of an invitation from the elector of Brandenburg, he undertook the profeſſorſhip of law at Frankfort on the Oder. By this prince he was conſulted on the moſt important ſtate affairs, and his reputation gained him the rank of baron of the empire, in the year 1718, an honour which he ſcarcely enjoyed a ſingle year. He died in 1719, leaving behind him the character of a great man, celebrated as well for his integrity and diſintereſtedneſs, as for his aſſiduity in every thing that he undertook. His principal works are "Juris Publici Prudentia compendioſe exhibita," 1695, 8vo. "Prodromus Juſtitiæ Gentium," 1719, 4to. "Deductiones, Conſilia, Reſponſa in Cauſis illuſtrium," 1725, fol. and "A collection of Theſes," in 4 vols. 4to. He left a ſon, Samuel, who was diſtinguiſhed as a ſtateſman in the court of Pruſſia, under Frederic the Great, and who drew up the Frederician code, and publiſhed an edition of Grotius "On War and Peace," in 5 vols. 4to. He died in 1755. Nouv. Dict. Hiſt. Du Freſnoy.

COCCHI, Anthony, a learned Italian phyſician, was born at Florence in 1695, where he received the rudiments of his education. At a proper age, he was ſent by his father to France, to various parts of Germany, to Holland, and at length to England, every where aſſociating with, and cultivating the intimacy of the moſt diſtinguiſhed philoſophers and phyſicians, among others, with Boerhaave, ſir Iſaac Newton, and Dr. Mead. It was on the ſuggeſtion of Dr. Mead, that on his return to Italy, while filling the chair of profeſſor of anatomy and ſurgery at Florence, he was induced to publiſh "Græcorum Chirurgici Libri; Sorani unus de Fracturarum ſignis, Oribaſii duo de Fractis, et Luxatis, ex Collectione Nicetæ, Florent." 1754, fol. The manuſcripts from which this curious work is publiſhed, are in the library of the Medici at Florence. "Oratio de Uſu Artis Anatomicæ, Florent." 1736, 4to. The author gives a ſhort hiſtory of anatomy and ſurgery, in which he denies that the ancient anatomiſts, Herophilus and Eraſiſtratus, were accuſtomed to diſſect the bodies of men, while living. "Medicinæ laudatio in Gymnaſio Piſis habita," 1727, 4to. Spoken on opening a courſe of lectures at Piſa, where he had been appointed profeſſor, prior to his returning to Florence. "Del vitto Pythagorico," Flor. 1743, and 1750, 8vo. It has been ſeveral times re-printed. The author thinks a vegetable diet beſt ſuited to the conſtitution of man. He wrote alſo on cold bathing, which he commends. "On the Baths at Piſa, and Sopra Aſclepiadea." This was publiſhed by his ſon, Raymond Cocchi, who ſucceeded his father as profeſſor of anatomy, and phyſician to the public hoſpital at Florence. Haller Bib. Chirurg. Eloy. Dict. Hiſt.

Cocchi, Anthony Celestine, cotemporary, and probably related to the above, practiſed medicine, with credit, at Rome, in the early part of the laſt century. He was teacher of botany there, and author of the following: "Epiſtola ad Morgagnum, de lente cryſtallina oculi, vera ſuffuſionis ſede," Rome, 1721, 4to. "Epiſtolæ Phyſico-Medicæ ad Lanciſium et Morgagnum," Rome, 1725, 4to. Some judicious obſervations are offered by the author on the gaol or hoſpital fever, on aneuriſms, and on a caſe which occurred to the author of a dilatation of the vena cava; alſo on a caſe of hyſteria; a tranſlation into Latin of "Zenophon's Ambrocoſmus et Anthia," 1726, 4to. London. "An Oration on opening the botanical garden at Rome, to which the author was appointed curator; and a relation of a caſe of ſmall-pox, preceded by a paroxyſm of convulſion, which was appeaſed, we are told, by bleeding the patient, and immerſing the extremities in warm water." "Diſſertatio Phyſico-practica continens vindicias Corticis Peruviani," Rome, 1748, 8vo. The prejudices which at that time prevailed againſt the uſe of the Peruvian bark, which are here judiciouſly combated, have long ſince ſubſided. Haller. Bib. Med. Eloy. Dict. Hiſt.

COCCHI, Gioacchino, a Neapolitan opera-compoſer, of conſiderable reputation in Italy, and mentioned by Rouſſeau in his Lett. ſur la Muſ. Fran. in 1750, among the eminent maſters then flouriſhing in that country. It was in the beginning of the Mattei's opera regency, 1757, that Cocchi came to London, where he compoſed a great number of operas, ſerious and comic, arranged paſticcios, and publiſhed miſcellaneous ſongs, ſymphonies, or opera overtures, in parts, and pieces adapted to the harpſichord. Coming from Naples, where good compoſers abounded, he had good taſte, and knowledge in all the mechanical parts of his profeſſion; but his invention was very limited, and even what he adopted from others, became languid in paſſing through his hands. The only drama ſet by this compoſer, during his 15 years reſidence in this country, was "Ciro Riconoſciuto," in 1759. The air "Rende mi il figlio mio," was happily ſet, and was ſtill more happily ſung by Mattei. This air is full of ſpirit and paſſion, and perfectly ſuited to the ſituation of the character by which it was performed. This is one of the firſt capital opera airs without a ſecond part and *da capo*. The duet has conſiderable merit, but too many of the paſſages are *alla ſcozzeſe*. This drama was repreſented during a great part of the remainder of the ſeaſon. It was in this opera that Tenducci was firſt noticed on our ſtage; and, though a young performer, and only ſecond in rank, he had a much better voice and manner of ſinging than Potenza, to whom he gave precedence.

In 1760, Cocchi ſet "La Clemenza di Tito," but diſcovered no new reſources in its compoſition. At the end of May of this year, "Erginda," written by Apoſtolo Zeno, now ſet by Cocchi, was alſo brought out, but after three repreſentations, to very thin houſes, the ſeaſon was cloſed, June 7th, without its having afforded much rapture to the public, or profit to the *impreſaria;* who not having been able to procure a capital ſinger to perform the firſt man's part, and Cocchi's invention, which was never fertile, being now exhauſted, the ſeaſon paſſed on rather heavily; as did his "Tito Manlio" in 1760, which only ſuſtained three repreſentations. The ſeaſon cloſed this year with an occaſional "Grand Serenata," and the next began with an occaſional drama, "Le Speranze della Terra," both compoſed by Cocchi, both ſhort-lived, and little noticed. In 1762, he compoſed two comic operas, to which even the animated performance of the admirable Paganini could not give long life. Cocchi was quite exhauſted long before his comic operas were produced. His invention did not flow in torrents, it was but a rill at its greateſt ſwell; and now, with hardly a ſingle ſmile upon any one of the airs, his heavy and thread-bare paſſages were doubly weariſome. Indeed, his reſources in the ſerious ſtyle were ſo few, that he hardly produced a new paſſage after the firſt year of his arrival in England; but in attempting to clothe comic ideas in melody, or to paint ridiculous ſituations by the effects of an orcheſtra, he was quite contemptible. Without humour, gaiety, or creative powers of any kind, his comic opera was the moſt melancholy performance I ever heard, ſays Dr. Burney, in an Italian theatre.

When Cocchi firſt arrived in England, he brought over the new paſſages that were in favour at Rome and Naples, to which, however, he added ſo little from his own ſtock of ideas, that, by frequent repetition, the public was ſoon tired of them; and his publications in this country are now as much forgotten as if he had lived in the fifteenth century. Indeed, all the animation and exiſtence they had, were conferred on them by the performance of Elſi and Mattei. He remained here long enough to ſave a conſiderable ſum of money by teaching to ſing. Plutarch informs us, that Dionyſius the tyrant of Syracuſe, when he had loſt his kingdom, became a ſchoolmaſter, the common reſource of opera compoſers and ſingers, who, after being *dethroned* in the theatre, often ſubmit to the ſame drudgery.

The operas which he compoſed in England have been ſpecified till the year 1762, when his engagement as opera-compoſer ceaſed. In 1765, he compiled a ſerious paſticcio, called "La Clemenza di Tito," in which he introduced a few of the ſongs from his own former opera of that name, which had been performed in 1760; and in 1771, he compoſed an opera called "Semiramide Riconoſciuta," and this was his *finale;* but the nation had been too long accuſtomed to better muſic to liſten to it with much pleaſure.

About 1772, he retired to Venice, where he had been maeſtro of a conſervatorio before his arrival in England; and there he enjoyed in eaſe and tranquillity the fruits of his labours, ſeveral years. The patrons of the conſervatorios of Naples and Venice, with great liberality and kindneſs to other nations, grant permiſſion to the eminent compoſers whom they elect maſters of the conſervatorios, to accept of engagements in foreign countries, without diſpoſing of their places, but to deputies properly qualified for ſuperintending theſe muſical eſtabliſhments, which are reſtored to the travelling maſters on their return. This indulgence was granted to Haſſe, Galuppi, Sacchini, Bertoni, &c. during the many journeys which they took profeſſionally to Spain, Portugal, Germany, England, and differents parts of Italy.

COCCIÆ Pilulæ, in the *Materia Medica*. See Pills.

COCCIFEROUS, in *Botany*, ſuch plants or trees as bear berries. See Bacciferous.

COCCINELLA, in *Entomology*, a genus of coleopterous inſects, poſſeſſing, according to the ſyſtem of Linnæus, the following eſſential character: antennæ clavated, or ending in a club, which is ſolid and truncated; anterior feelers hatchet-ſhaped, poſterior filiform; thorax and wing-caſes margined; the body hemiſphærical, and the abdomen flat beneath. The Fabrician character of the coccinella conſiſts in having the anterior feelers hatchet-ſhaped, the poſterior filiform; lip cylindrical; and the antennæ terminating in a ſolid club.

This genus of inſects is divided into ſections according to the colour of the wing-caſes; and the ſpots, or dots with which they are marked. The firſt ſection comprehends thoſe which have the wing-caſes red or yellow, and marked with black dots; the ſecond, thoſe having the wing-caſes red or yellow, with white or whitiſh dots: the third has the wing-caſes yellow, ſpotted with red; the fourth, the wing-caſes black, with red ſpots; and the fifth, the wing-caſes black, dotted with white or yellow.

The coccinellæ are generally found on plants, and as they ſubſiſt chiefly on the aphides, or lice that infeſt vegetables, are to be numbered among thoſe inſects which are eſſentially ſerviceable to horticulture and agriculture. The larvæ of the coccinellæ, a lively race, are frequently ſeen running briſkly over plants in ſearch of the aphides, which they attack with ferocity, and devour in vaſt numbers. Theſe larvæ are of an elongated figure, becoming pointed towards the tail; the head is rather flat and protected by a ſcaly covering, but the reſt of the body is naked. This animal is furniſhed alſo with ſix legs, which, like the head, are of a ſcaly nature. The body conſiſts of twelve joints or annulations, and in ſome ſpecies is rough, with little verrucoſe, or wart-like puſtules. When in the pupa ſtate, the coccinellæ are enveloped in a thin and delicate membrane, and are attached to the under ſurface of the leaves of thoſe plants which they moſt commonly inhabit in the larva and fly ſtate. The pupæ of many ſpecies are elegantly dotted, and ſpotted with black, upon a ground of various colours. The inſects of this genus are, with few exceptions, of a ſmall ſize.

Species.

Firſt Diviſion. Thoſe with the wing-caſes red or yellow, and marked with black dots.

Cincta. Subrotund, yellowiſh, thorax with four black dots. Deſcribed by Fabricius in his Supplementum as a native of the Eaſt Indies, from a ſpecimen in the cabinet of Daldorff.

9 Notata. Red, with nine black dots; margin of the head and thorax white. Herbſt. Inhabits North America.

Laeta. Red, with thirteen black dots; thorax black, with the margin and two dots white. Fabr. Suppl. Inhabits Mogadore.

Lineolata. Red, with five dots, and two little lines of black at the baſe of the wing-caſes. A new ſpecies taken by the Revd. Mr. Burrel, near Holt, in Norfolk. Marſh. Ent. Brit.

11-Notata. Red, with eleven black dots; margin of the wing-caſes at the baſe yellow, body black. Marſh. Ent. Brit. Diſcovered in Kenſington Gardens.

Flava. Wing-caſes, legs, and thorax at the ſides yellow. Marſh. Inhabits Britain.

Sinuosa. Wing-caſes fulvous, with two abbreviated ſinuous ſtripes, and a black dot each ſide. Marſh. Inhabits Britain.

Marginata. Wing-caſes red, with black margin; thorax with a white marginal dot each ſide. Linn. A native of South America.

Limbata. Black; diſk of the wing-caſes red, with two black dots. Fabr. Inhabits Hamburgh. This is of the middle ſize, and has the head and thorax black; and the wing-caſes black, with the diſk red, and marked with a large black dot each.

Marginella. Wing-caſes dull teſtaceous, with yellow margin. Fabr. A native of America.

Surinamensis. Wing-caſes red and immaculate; head and thorax black. Linn. *Erotylus Surinamenſis*, Olivier. Found in South America.

Immaculata. Wing-caſes ferruginous and immaculate; thorax black; margin and two dorſal dots white. Fabr. Inhabits American iſlands.

Unicolor. Thorax and wing caſes immaculate. Fabr. Deſcribed as a native of the Eaſt Indies, from the cabinet of Abildgard.

M. Nigrum. Oblong, wing-caſes teſtaceous and immaculate; thorax white, with a black M. Fabr. Inhabits Kiel.

Sanguinea. Wing-caſes ſanguineous and immaculate; thorax ſpotted with black. Linn. A ſpecies of ſmall ſize; found in South America.

Impunctata. Wing-caſes red, and without ſpots; thorax red, and browniſh in the middle. Deſcribed by Linnæus as a native of Sweden, where it inhabits gardens; it is found alſo in other parts of Europe, as Germany, Spain, and Britain. Paykul calls it *coccinella aptera*.

Dimidiata. Wing-caſes ſcarlet, with the tip black. Fabr. A native of Coromandel, in the Bankſian cabinet. This is of a large ſize, with the head and thorax rufous, and immaculate; wing-caſes with black ſuture; body and legs yellowiſh.

Margine-punctata. Wing-caſes yellow, with whitiſh margin, and two black dots. Fabr.

This kind inhabits Saxony, according to Hybner; it is of a large ſize, with the head and thorax white, ſprinkled with many black dots; the wing-caſes are yellow, with pale ſpots.

Lineola. Wing-caſes red; ſmall line at the baſe, and the tip black. Fabr. A native of New Holland, in the Bankſian cabinet. This is of a ſmall ſize; the head is whitiſh; thorax whitiſh, with four black dots; body beneath black, and ſhanks of the legs white.

Unifasciata. Wing-caſes red, with a black band in the middle. Fabr. Deſcribed as a native of Hamburgh from the collection of Dr. Schulz; it is alſo found in Britain. Marſh. This is of the middle ſize, with the head and thorax black, and without ſpots; near the ſcutel is a ſmall oblique black line; the body is black.

Annulata. Wing-caſes red, with ſubannular black ſpot. Linn. Inhabits Europe.

Trilineata. Wing-caſes yellow, with three abbreviated black lines. Fabr. An American ſpecies in the cabinet of Zſchuck. This is a ſmall inſect; the body is black; thorax deep black, with the exterior margin whitiſh; margin of the wing-caſes with a thin edge of black.

Vittata. Wing-caſes yellow; margin, ſuture, and two ſtripes in the middle black; thorax black, with the anterior margin white. Fabr. A native of Guinea.

Striata. Wing-caſes yellow, margin, ſuture, and two abbreviated black ſtripes; thorax yellow, with two dull dots. Fabr. Inhabits the ſame country as the laſt.

Oblongo-Punctata. Wing-caſes yellow; with four abbreviated lines, and ſix dots of black. Fabr. A native of Ruſſia. A large ſpecies.

Abbreviata. Wing-caſes red; an abbreviated band behind, and two dots of black; thorax black, with two white lines. Fabr.

This is deſcribed from the cabinet of Dr. Blagden as a native of North America. The body is oblong and black; front with a large white ſpot.

6-Lineata. Wing-caſes yellow, with ſix lines, and three dots of black. Fabr. A native of Ruſſia. This is of a large ſize, the colour black; head with two white dots at the baſe; exterior margin of the thorax white, with a black dot.

2-Punctata. Wing-caſes red, with two black dots. Linn. A ſpecies very common in gardens in Europe.

3-Punctata. Wing-caſes red, with three black dots. Linn. A native of Germany, and parts of Europe.

Hieroglyphica. Wing-caſes yellow, with two longitudinal ſinuous ſpots of black. Linn. Inhabits Europe.

Rivularis. Wing-caſes yellow, with two ſinuous dorſal bands, and ſix dots of black; thorax black, with two yellow dots. Fabr. *Coccinella tranſverſalis.* Thunberg. Inhabits Sweden.

Tricincta. Ovate; wing-caſes red, with three black bands, the anterior one abbreviated and tricuſpidate. Fabr. A native of China. This is of a moderate ſize and black colour. The thorax is black and ſhining with a white marginal ſpot each ſide.

Arcuata. Ovate; wing-caſes red, with four dots, two bands, and dot at the tip black. Fabr.

Deſcribed from the cabinet of Scheſtedt as a native of China. This is of the middle ſize. The body is black; head whitiſh; thorax black, with the anterior part of the margin, and ſides whitiſh; ſuture of the wing-caſes black.

Undata. Oblong; wing-caſes pale yellow; flexuous band and two dots black; thorax dotted with yellow. Fabr. Inhabits the Cape of Good Hope. Bankſian cabinet.

The body of this ſpecies is large, oblong, and black; head with two frontal yellow ſpots; thorax with three dorſal ſpots, margin, and mark extending from the baſe of the margin yellow; ſuture of the wing-caſes black; legs yellow; joints black.

Flexuosa. Ovate; wing-caſes pale yellow; flexuous band, and two dots black; margin of the thorax white. Fabr. Inhabits Europe.

Cingulata. Wing-caſes pale yellow; with four dots at the baſe, poſterior band and dot at the tip black. Fabr. A native of Tranquebar. Hybner.

Inaequalis. Wing-caſes yellow, with three anterior dots, ſuture, and band at the tip black. Fabr.

This ſpecies is deſcribed from the Bankſian cabinet; it is an inſect of the middle ſize, and inhabits New Holland. The body is black; head yellow, and thorax black, with the fore part yellow.

Trifasciata. Wing caſes red, with three abbreviated black bands. Linn. Found in gardens in Europe.

Interrupta. Wing-caſes yellow, with two waved interrupted bands, and two poſterior dots of black. Fabr. Native country unknown.

2-Fasciata. Wing-caſes ferruginous, with two bands and four dots of black. Fabr. Deſcribed by Thunberg under the name of *coccinella flexuoſa*. It is a native of the Cape of Good Hope.

4-Notata. Wing-caſes red, with four black dots at the baſe; margin of the thorax white. Fabr.

Inhabits Europe. The head and anterior parts of the thorax with the ſides whitiſh; legs teſtaceous.

4-Maculata. Wing-caſes red, with four black dots; thorax black, with a marginal white ſpot. Hybner. A native of Saxony.

The head of this ſpecies is black with two pale dots at the baſe; thorax black, ſhining, with the marginal ſpot large.

5-Punctata. Wing-caſes ſanguineous, with five black dots. Geoffr. A very common ſpecies in Europe.

5-Maculata. Oblong; wing-caſes yellowiſh, with five black dots; thorax black with three rays of white on the anterior margin. Hybner. Found in Saxony and other parts of Europe. The body is large and oblong; anterior parts of the head white with two black dots.

6-Punctata. Wing-caſes red, with ſix black dots. Linn.

Inhabits gardens in Europe. An inſect of ſmall ſize; the head is black with two white dots; thorax black, with the margin and two dorſal dots white.

Glacialis. Wing-caſes red, with ſix dots of black, the intermediate one ſinuate, and larger. Fabr.

A native of North America. The head is black, with the frontal ſpot white.

6-Maculata. Wing-caſes red, with ſix black dots, the four anterior ones ſinuate and tranſverſe. Fabr.

An inhabitant of the Eaſt Indies, deſcribed from a ſpecimen in the Bankſian cabinet. The head is whitiſh; anterior part of the thorax white, with black ſpots; body pale yellow.

7-Punctata. Wing-caſes red, with ſeven black dots. Linn.

Common in moſt parts of Europe. Donov. Brit. Inſ. Known in England by the name of *lady-bird*, and *lady-cow*. In its manners of life it differs in no reſpect from the other ſpecies of the ſame natural family.

7-Maculata. Oblong; wing-caſes red, with ſeven black dots; the middle one on the ſuture three lobed. Fabr.

Inhabits Germany according to Dr. Schulz. The head is black; thorax black, with the anterior and lateral margin white; body white.

7-Notata. Oblong: wing-caſes red, with ſeven black dots; margin of the thorax and two dots in the middle white. Fabr. *Coccinella mutabilis,* Paykul.

Inhabits gardens in Germany; and is found in England, but not commonly. This inſect is of a ſmall ſize. The head is white, with black poſterior margin; thorax black, gloſſy, with the margin in front and at the ſides white; body black.

8-Punctata. Wing-caſes red, with eight black dots; thorax white, with black dots. Linn.

A native of the north of Europe. The head is whitiſh, with two frontal black dots.

Transversalis. Wing-caſes yellow, with eight black ſpots, the four anterior ones ſinuate. Fabr.

Inhabits Coromandel. Bankſian cabinet. The thorax is black and gloſſy, with a white ſpot each ſide at the tip; ſuture of the wing-caſes and body black.

8-Maculata. Wing-caſes pale yellow, with eight black dots; the ſix anterior ones tranſverſe and ſinuate. Fabr.

Same cabinet as the preceding; the country is unknown. The body of this inſect is dull yellow, the eyes black; ſuture of the wing-caſes black; body black.

9-Maculata. Wing-caſes red, with nine black dots, the poſterior one common; thorax with two dots.

A native of New Holland, in the Bankſian cabinet; the body is rufous; thorax rufous, with two black dorſal dots.

9-Punctata. Wing-caſes red, with nine black dots. Linn.

Found in gardens in Europe; in England not frequent. Paykul deſcribes this ſpecies under the name of *coccinella collaris*.

10-Punctata. Wing-caſes fulvous, with ten black dots; thorax with four ſpots. Degeer, &c.

This ſpecies inhabits Europe. The head is black, with a tridentated white ſpot in front; thorax, with four whitiſh ſpots. It is found chiefly in gardens.

Innuba. Oblong; wing-caſes teſtaceous, with ten black dots; thorax immaculate. Fabr. A native of India.

Dilatata. Subrotund; wing-caſes margined with fulvous, and marked with ten black dots; thorax with two dots.

Inhabits America. It is of a large ſize, and fulvous; anterior part of the thorax emarginate; the margin of the wing-caſes dilated and black.

11-Punctata. Wing caſes red, with eleven black dots; body black. Linn.

Found principally in the northern parts of Europe; occurs occaſionally in Britain.

12-Punctata. Wing-caſes yellow, with twelve black dots; the outer one linear, and repandate. Linn.

Inhabits gardens in Europe. The thorax is yellow, with dots, and two ſpots of black.

Variegata. Wing-caſes yellow, with twelve dots, and two bands of black in the middle.

Deſcribed from the Bankſian cabinet. The head is yellow, with the eyes black; thorax yellow, with five black dots at the baſe. It is a native of the Cape of Good Hope.

Crysomelina. Wing-caſes rufous, with twelve black dots; thorax immaculate.

An African ſpecies, found on the *cactus opuntia*, and firſt deſcribed by profeſſor Thunberg. The head and thorax are red, with the margin rather paler; dots on the wing-caſes diſpoſed in pairs; legs yellowiſh.

Cassidea. Oblong, red; wing-caſes with twelve dots of black, and on the thorax four. Inhabits Maryland.

13-Maculata. Wing-caſes yellow, with thirteen black dots; body orbicular. Forſter. Nov. Sp.

Deſcribed as a native of Sweden. The thorax is white, with four black dots. This ſpecies has been found in Germany, according to Panzer, and alſo in England. Marſham, &c.

13-Punctata. Body pale yellow, with thirteen black dots; body oblong. Linn. Inhabits gardens in Europe.

Versicolor. Wing-caſes yellow, with fourteen black dots, two of which are common. Fabr.

A native of China. The body is large and orbicular; the head is yellow; thorax margined, yellow, with a black ſpot in the middle.

14-Maculata. Wing-caſes yellow; ſuture, and fourteen ſpots black. Hybner. Inhabits Saxony.

14-Punctata. Reddiſh, with fourteen black dots. Linn.

A native of Europe. Found in England, not uncommon.

Donov. Brit. Inſ. &c. *Coccinella conglomerata* of Fabricius.

16-PUNCTATA. Wing-caſes yellow, with ſixteen black dots; head with four black dots.

Inhabits Italy. This ſpecies is of a large ſize; its figure oblong; the head is white, with four black dots; thorax white, with many approximate dots.

18-PUNCTATA. Wing-caſes yellow, with eighteen black dots, the laſt arched. Linn.

Inhabits the northern parts of Europe. This is of the middle ſize, and has the ſides of the thorax yellow.

19-PUNCTATA. Wing-caſes yellow, with nineteen black dots. Linn. Found on plants in Europe.

20-PUNCTATA. Wing-caſes yellow, with twenty black dots. Geoffr.

Deſcribed by Fabricius as a native of England, on the authority of a ſpecimen in the cabinet of Mr. Aiton.

22-PUNCTATA. Wing-caſes red, with twenty-two black dots. Linn. Inhabits gardens in Europe.

22-MACULATA. Ferruginous; wing-caſes yellow, with twenty-two black dots. Fabr.

A native of Guinea, in the cabinet of Iſert. This is of a large ſize; the head and thorax are dull ferruginous, glabrous, and immaculate; body yellow, abdomen in the middle ferruginous.

23-PUNCTATA. Wing-caſes red, with twenty-three diſtinct black dots. Linn. Found in gardens in Germany.

24-PUNCTATA. Wing-caſes red, with twenty-four black dots. Linn. Inhabits Europe, and is found in England.

24-MACULATA. Ferruginous; wing-caſes with twenty-four black dots. Fabr.

A native of Tranquebar. This is of a large ſize, and gibbous. The head is ferruginous and immaculate: thorax ferruginous, with black dots; legs ferruginous, with a black ſpot on the thighs.

28-PUNCTATA. Wing-caſes red, with twenty-eight black dots. Fabr.

Inhabits the ſame country as the laſt. Diſcovered by Dr. Koenig.

CONGLOBATA. Wing-caſes yellow; with numerous contiguous black dots; the tip immaculate. Linn. *Coccinella roſea,* Degeer. *Coccinella gemella,* Herbſt. A native of Europe.

LINEOLA. Wing-caſes yellowiſh, with two little lines, and ſomewhat contiguous fuſcous dot. Fabr.

Inhabits South America. This is of a ſmall ſize. The head is white, with the eyes black; body and legs white.

TRICOLOR. Wing-caſes yellow, with ten red dots, and ten marginal black ſpots. Inhabits Amſterdam iſland. Bankſian cabinet.

CRUX. Wing-caſes yellow, with two black lines and croſs. Thunberg. Inhabits the Cape of Good Hope.

COMMA. Wing-caſes yellow, with black ſuture, margin, and line. Thunberg. An African ſpecies.

Second Diviſion. Wing-caſes red or yellow, with white, or whitiſh dots.

BIGUTTATA. Wing-caſes rufous, with two yellow dots.

A ſpecies of ſmall ſize found in Europe. The thorax is black, with the lateral edge yellow.

8-GUTTATA. Wing-caſes red, with eight yellow dots. Thunberg. A native of Japan.

STRIGATA. Wing-caſes rufous, with an abbreviated whitiſh ſtreak. Fabr. Suppl.

2-GUTTATA. Wing-caſes rufous, with two yellow ſpots.

Deſcribed by Fabricius from the Hunterian collection. It is of a ſmall ſize; the thorax black, glabrous, with the lateral margin yellow. A native of Europe.

10-GUTTATA. Wing-caſes yellow, with ten white dots. Linn.

A native of Sweden, according to Linnæus; found alſo in England. Vide Donov. Brit. Inſ.

BIS-6 GUTTATA. Wing-caſes fulvous, with twelve white dots, and the thorax edged with white. Fabr. Inhabits Norway.

CAYENNENSIS. Wing-caſes fulvous, with twelve white dots, and two connected white lunules on each ſide. *Coccinella 12-guttata,* Fabr.

Found in Cayenne. The thorax is rufous, with a large white ſpot on each ſide.

14-GUTTATA. Wing-caſes rufous, with fourteen white dots. Linn. A native of Europe; and inhabits Britain.

BIS-7-GUTTATA. Wing-caſes fulvous, with fourteen white dots; margin of the thorax white. *Coccinella 14-guttata,* Schall. Act. Hall. A native of Germany.

15-GUTTATA. Wing-caſes yellow, with fifteen white dots. Herbſt, &c. A native of Germany.

16-GUTTATA. Wing caſes red, with ſixteen white dots. Linn.

Inhabits England, and other parts of Europe. Donov. Brit. Inſ.

18-GUTTATA. Wing-caſes red, with eighteen white dots, the firſt two lunate.

Deſcribed as a native of Europe by Linnæus and Schæffer. Inhabits Germany. Panzer. Rarely found in England, once taken near Barton by Mr. Sheppard. Vide Marſh. Ent. Brit.

20-GUTTATA. Wing-caſes red, with twenty white ſpots. Linn. Found in gardens in Europe.

OBLONGO-GUTTATA. Wing-caſes red, with lines and dots of white. Linn.

Inhabits pines in Europe, and is a rare ſpecies. This is an elegant ſpecies, and has been diſcovered in England. Donov. Brit. Inſ.

Third Diviſion. Wing-caſes yellow, ſpotted with red.

OBLITERATA. Wing-caſes yellow, with four rufous dots; the anterior pair obſolete. Thunberg. Inhabits Upſal. Act. Upſ. 4. t. i. f. i.

Fourth Diviſion. Wing-caſes black, with red ſpots.

7-PUSTULATA. Wing-caſes black, with ſeven red dots. Marſh.

The head is black, with two yellow lines between the eyes; thorax black, with the anterior margin yellow. Inhabits England.

10-PUSTULATA. Wing-caſes black, with ten fulvous dots. Linn.

Inhabits gardens in Europe. *Coccinella variabilis* of Paykul.

BIMACULATA. Downy; wing-caſes black, with two rufous ſpots. Marſh.

Found in England. The antennæ and mouth is rufous; body black; legs rufous, with black thighs.

BILITURATA. Downy, head ferruginous; wing-caſes black, with two ferruginous blotches; legs teſtaceous. Marſh. A native of Britain.

FULVIFRONS. Deep black, front fulvous. Marſh. Inhabits England.

RUFIPES. Wing-caſes black, with a large marginal ſpot, and legs rufous. Fabr. Suppl.

Inhabits the South of Europe. The body is ſmall and ovate; head and thorax black and immaculate; legs entirely rufous.

IMPUSTULATA. Wing-caſes black and immaculate. Linn. Inhabits the woods of Germany.

Nitidula. Wing-caſes braſſy-black; thorax margined with rufous. Fabr.

Found in the American iſlands. It is a ſmall inſect; the head is black and immaculate, and the body rufous.

Parvula. Wing-caſes black; head, thorax and legs rufous. Geoffr. Inhabits the environs of Paris.

Villosa. Villous and black; the margin of the wing-caſes yellow. Fabr.

A native of Cayenne, in the cabinet of Don Rohr.

Analis. Wing-caſes black, with the tip red and immaculate. Hybner.

A native of Saxony. The head is red, and without ſpots; thorax rufous, and at the baſe in the middle black; abdomen and legs rufous.

Hæmorrhoidalis. Wing-caſes black: the tips red, with a black band. Fabr. Inhabits Hamburgh. Dr. Schulz.

Oculata. Wing-caſes black, with two red ſpots; a large marginal white ſpot on each ſide the thorax. Fabr.

This is a native of North America, and is allied to *Coccinella cacti*, but is rather leſs.

Cacti. Wing-caſes black, with two rufous ſpots, and the thorax immaculate. Linn. Inhabits America.

Variabilis. Wing-caſes black, with two lunate ſubmarginal red ſpots. Fabr. *Coccinella auſtriaca*, Schrank. Found in the neighbourhood of Hamburgh.

Frontalis. Wing-caſes black, with two red ſpots; front, and anterior legs black. Fabr. A native of Saxony.

4-Pustulata. Wing caſes black, with four red dots; orbits of the eyes, and edge of the thorax pale. Linn. Inhabits Europe.

4-Verrucata. Wing-caſes black, with four red ſpots; tail rufous. Fabr Inhabits Kiel.

Bis-2-Pustulata. Wing-caſes black, with four red dots; head and thorax dull black. Fabr.

An European ſpecies, and is ſometimes found in England.

Erythrocephala. Wing-caſes black, with ſix red dots; head and margin of the thorax pale reddiſh. Fabr. Found in Kiel.

6-Pustulata. Wing-caſes black, with ſix red dots; body black. Linn.

Inhabits gardens in Europe, and is found in England. Vide Donov. Brit. Inſ.

Lunata. Wing-caſes black, with ten red ſpots, ſix of which are lunated. Fabr.

Deſcribed from a ſpecimen in the Bankſian cabinet, that was found in St. Helens.

Fifth Diviſion. Wing-caſes black, dotted with yellow or white.

10-Pustulata. Wing-caſes black, with twelve white dots; the exterior ones connected at the margin. Fabr. A native of Europe.

14-Pustulata. Wing-caſes black, with fourteen white dots. Linn. Found on plants in Europe.

Guttato-Pustulata. Wing-caſes black, with two yellow ſpots and four rufous ones.

Deſcribed from the Bankſian cabinet as a native of New Holland.

Felina. Wing-caſes black, with ſix white dots; body globular. Fabr.

An American ſpecies. This is of a ſmall ſize; the head is white; thorax white, with a black ſpot at the baſe.

Pantherina. Wing-caſes black, with eight yellow dots. Linn. Inhabits Europe.

Pardalina. Wing-caſes black, with ten dots, and ſinuate margin white.

Deſcribed from a ſpecimen in the Bankſian cabinet. The native country unknown.

Ursina. Wing-caſes black, with ten white dots; and the head and anterior margin of the thorax white. Fabr. A native of North America, in the Hunterian collection.

Leonina. Wing-caſes black, with ſixteen white dots.

An inhabitant of New Holland, deſcribed by Fabricius from the Bankſian cabinet.

Tigrina. Wing-caſes black, with twenty white dots; thorax ſpotted. Linn. An European ſpecies.

Canina. Wing-caſes black, with twenty black dots; head and thorax villous and immaculate. Fabr. A native of the Cape.

Thunbergii. Wing-caſes black, with the margin and two dots white; head black, with white dots. Thunberg. Inhabits Upſal.

Flavipes. Wing-caſes black; thorax black, with two yellow dots; margin of the thorax with the tail yellow. Thunberg. Inhabits the Cape.

Villosa. Villous, black; margin of the ſhells yellow. Thunberg. Inhabits Cayenne.

Lævis. Wing-caſes black, with ſix yellow dots; anterior angles of the thorax yellow. Thunberg.

Dentata. Wing-caſes black; the outer margin, tridentated line, and ſix dots yellow. Thunberg. A native of the Cape.

COCCIUM, or Coccio, in *Ancient Geography*, a place in the iſle of Albion, placed in Antonine's Itinerary on the route from Glanoventa to Mediolanum, between Bremetanacis and Mancunium; ſuppoſed to be Rilcheſter.

COCCO. the name of a plant in the Weſt Indies, and in ſome of the iſlands of the South Sea, called alſo *Indian kale.*

COCCOCYPSELUM, in *Botany* (from κοκκος, a *grain*, or *ſeed*, and κυψελη, or κυψελιον, a *cheſt* or *veſſel.*) Schreb. 1721. Mart. Willd. 207. Lam. Illuſt. 168. Juſſ. 198. (Cocipſele, Encyc.) Claſs and order, *tetrandria monogynia.* Nat. Ord. *Rubiaceæ*: Juſſ.

Gen. Ch. *Cal.* Perianth ſuperior, one-leafed, four-cleft, permanent; ſegments linear-lanceolate, erect. *Cor.* Monopetalous, funnel-ſhaped; tube longer than the calyx; border four-cleft, ſegments egg-ſhaped, half-open. *Stam.* Filaments four, ſhort, inſerted into the tube; anthers oblong, erect. *Piſt.* Germ inferior, roundiſh; ſtyle the length of the corolla, bifid at the top; ſtigmas oblong. *Peric.* Capſule ſucculent, Juſſ. La Marck; Ill. (berry; Schreb. Lam. Encyc. Willd.) inflated, roundiſh, crowned with the calyx, two-celled. *Seeds* numerous, ſmall, compreſſed, affixed to the partition.

Eſſ. Ch. Calyx ſuperior, four-cleft. Corolla funnel-ſhaped. Capſule (or berry) inflated, crowned, two-celled, many-ſeeded.

Sp. 1. C. *repens*, Mart. Willd. Swartz. Prod. 31. C. herbaceum; Lam. Ill. Pl. 64.—Herbaceum repens; Browne Jam. 144. tab. 6. fig. 1. "Stem creeping at the baſe; leaves egg-ſhaped; cymes axillary, nearly ſeſſile." Lam. *Stems* growing in tufts; each of them creeping eighteen or twenty inches from the root, and ſhooting out a few lateral branches as it runs. *Leaves* oppoſite. *Flowers* and *fruit* on ſhort, divided peduncles from alternate axils. Browne. A native of Jamaica. 2. C. *virgatum*, Lam. Ill. (Naciboea alba; Aubl. tab. 37. fig. 2.) "Stems rod-like; leaves acuminate; cymes lateral, peduncled; peduncles longer than the petiole." Lam. A native of South America, communicated by M. Richard.

C. *uniflorum*, and *biflorum*; Willd. See Fernelia *buxifolia*.

We confeſs that we are rather inclined to think with Willdenow, that there is no ſolid generic diſtinction between coccocypſelum and fernelia. For it appears to us that a ſucculent capſule, without valves, would be better called a dryiſh berry (bacca vix carnoſa), the character attributed to the fruit of fernelia. But as the two genera are kept diſtinct by Juſſieu, who muſt have had both of them in immediate contemplation, when he drew up the third ſection of his natural order, *rubiaceæ*, we have not choſen to diſſent from ſuch high authority. The only remaining differences are, that in fernelia the partition is perforated in the middle, and the ſeeds are attached to a central receptacle which ſupplies the defect. Willdenow, however, is wrong in his appropriation of La Marck's figures; for on the authority of La Marck himſelf, in his Illuſtrations, fig. 1 is not buxifolia, but his own obovata, and fig. 2. is his lygiſtum axillare, copied from Browne's tab. 3, fig. 2, and engraved by miſtake as a fernelia. The new genera coccocypſelum, lygiſtum, and fernelia, as well as the peteſia of Linnæus, ſeem to need a more accurate inveſtigation; and it will probably be found, that no violence would be done to nature if they were all united into one.

COCCODES, in *Natural Hiſtory*, a name given by Mercatus to thoſe ſtones of the AMMITES kind, whoſe grains are very large.

COCCOLŎBA, in *Botany*, (ſo called from the kernel being lobed at the bottom.) Linn. Gen. 496. Schreb. 678. Willd. 786. Gært. 261. Juſſ. 82. Vent. 2. 249. (Coccolobis; Brown. Raiſinier; Encyc.) Claſs and order, *octandria trigynia*. Nat. Ord. *Holoraceæ*, Linn. *Polygoneæ*, Juſſ. Vent.

Gen. Ch. *Cal.* Perianth one-leafed, five-cleft; ſegments oblong, obtuſe, concave, coloured, ſpreading widely, permanent. *Cor.* none. *Stam.* Filaments eight. awl-ſhaped, ſhorter than the calyx: anthers roundiſh, didymous. *Piſt.* Germ egg-ſhaped, three-ſided; ſtyles three, ſhort, ſpreading; ſtigmas ſimple. *Peric.* the permanent calyx, thickened into a berry, involving the ſeed. (Drupe; Gært.) *Seed*; nut egg-ſhaped, acute, one-celled.

Eſſ. Ch. Calyx five-cleft, coloured, corolla none. Nut covered by the calyx, which is converted into a berry.

Sp. 1. C. *uvifera*. Linn. Sp. Plant. 1. Mart. 1. Poir. 1. Willd. 1. Lam. Ill. tab. 316. fig. 2. Gært. tab. 45. Jacq. Amer. 112. tab. 73. Brown. Jam. 208. (Polygonum caule arboreo, fructibus baccatis; Linn. Sp. Pl. Ed. 1. Uvifera; Hort. Cliff. Pluk. Alm. tab. 236, fig. 7. Guajabera; Plum. ic. 145. Populus americana rotundifololia; Bauh. Pin. 430. Prunus; Sloan. Jam. 183. Hiſt. 2. tab. 220, fig. 3. Cates. Car. 2. tab. 96.) Round-leaved ſea-ſide grape, or mangrove grape tree. "Leaves heart-ſhaped, roundiſh, ſhining." A large tree. *Branches* irregularly ſpreading, not forming a handſome head, but rendered beautiful by the leaves and fruit; bark cinereous, thin; in the young trees ſmooth; in the old ones full of chinks; wood hard, ponderous, red; but of little uſe, except for burning, on account of its fibrous texture. *Leaves* large, alternate, entire, generally ending in a ſhort blunt point, but often quite round, thick, coriaceous, deep green, with alternate prominent nerves, connected by ſmall ſcarlet veins; petioles hard, ſhort, thick; ſtipules ſheathing the branches. *Flowers* whitiſh, very ſmall; racemes about a foot long, ſimple, terminal, ſolitary, thick, upright at the time of flowering, pendulous with the ripe fruit; pedicels one-flowered, thick, ſhort. *Berries*, the ſize of a ſmall cherry, roundiſh, umbilicated, conſiſting of a purpliſh membrane, which covers a ſoft, thin, not unpleaſantly aſtringent, pulp, and a large three lobed nut. Linn. *Drupe* formed of the berried calyx, becoming black and wrinkled when ripe; pulp ſoft, drying into a thin cruſt; ſhell thin, like paper, intimately united with the pulp, half three-celled; partitions membranous, narrow, to be found only at the bottom of the drupe. *Receptacle* a ſmall fungous tubercle, formed at the baſe of the fruit by the concurrence of the partitions. *Seed* ſingle, ſomewhat globular, acuminate at the top, deeply umbilicated at the bottom, ſtriated with wrinkles, ferruginous brown. Gært. A native of South America and the Weſt Indies, on a ſandy ſoil, generally near the ſea. The fruit is ſold in the market, and forms part of the deſert in its native countries. 2. C. *latifolia*. Poir. 2. Lam. Ill. Pl. 316. fig. 4, a leaf. "Leaves entire, very broad, contracted at the baſe." In habit reſembling the preceding, but differing remarkably in its leaves. Young branches ſmooth, finely ſtriated, a little compreſſed. *Leaves* thin, rather membranous than coriaceous, ſmooth, quite entire, at leaſt as broad as long, narrowed, not heart-ſhaped at the baſe; with lateral ſimple yellowiſh nerves, which are connected by capillary reticulated veins. A native of South America, cultivated in the botanic garden at Paris, where it has not yet flowered. 3. C. *auſtralis*. Mart. 12. Poir. 16. Willd. 2. Forſt. Prod. n. 176. "Leaves cordate-ovate, acute; flowers polygamous." A native of Zealand. From the drawing in ſir Joſeph Banks's collection, it ſeems to be a polygonum. 4. C. *pubeſcens*. Linn. Sp. Pl. 2. Mart. 2. Poir. 3. Willd. 3. Brown. Jam. 210. (C. grandifolia; Jacq. Amer. 113. Scortea; Pluk. Phyt. 222. fig. 8.) "Leaves orbicular, pubeſcent." A tree ſixty or eighty feet high. *Trunk* rough. *Branches* only two or three principal ones, but little ſubdivided, thick, ſpreading. *Leaves* alternate, very large, ſometimes two feet in diameter, quite entire, ſlightly heart-ſhaped, much veined and wrinkled, ſmooth when old; petioles hard, thick, very ſhort, ſheathing at the baſe. *Flower* and *fruit* unknown in Europe. A native of the Weſt Indies. The wood, according to Jacquin, is of a deep red colour, very hard, heavy, brittle, but almoſt incorruptible: when uſed for poſts or paliſades, the part under ground becomes as hard as ſtone. The fruit is ſaid to be good to eat. 5. C. *diverſifolia*. Poir. 4. Willd. 4. Jacq. Amer. 114. tab. 76. "Leaves of the branchlets ovate; of the branches ovate-heart-ſhaped." A ſhrub, ten or twelve feet high. *Leaves* alternate, petioled, a little coriaceous, quite entire, ſlightly wrinkled, ſhining, veined, ending in an obtuſe point. *Racemes* about three inches long, terminal, upright, ſimple, ſolitary. *Fruit*, about the ſize of a ſmall cherry, nearly round, almoſt umbilicated at the ſummit by the union of the thick fleſhy leaves of the calyx; pulp ſoft, of a beautiful purple colour, a little more acid than that of C. uvifera, but eaten by peaſants and children. A native of St. Domingo. 6. C. *flaveſcens*. Mart. 7. Poir. 5. Willd. 5. Jacq. Amer. 114. tab. 75. "Leaves elliptical, obtuſe, mucronate, heart-ſhaped at the baſe." Willd. A ſmall branching tree or ſhrub, about twelve feet high. *Leaves* alternate, coriaceous, ſhining, quite entire, on very ſhort petioles. *Racemes* ſcarcely an inch and a half long, terminal, ſimple, erect. *Fruit* roundiſh, purple, a little larger than a pea; pulp reddiſh, ſweet and eatable, but not much eſteemed. A native of St. Domingo. 7. C. *excoriata*. Linn. Sp Pl. 4. Mart. 3. Poir. 6. Willd. 6. (C. cortice lævi; Brown. Jam. 210. Guajabara; Plum. Ic. 146. fig. 1. Arbor indica; Pluk. Amath. tab. 353. fig. 4. ?) "Leaves egg-ſhaped; branches appearing as if ſtripped of their bark." Linn. "Leaves oblong-egg-ſhaped, rather acute, heart-ſhaped at the baſe; racemes pendulous." Willd. A lofty tree. *Branches* with a very thin, even-ſurfaced bark. *Leaves* alternate, on ſhort petioles, coriaceous, entire, ſmooth, green above, yellowiſh underneath, finely nerved and veined; ſtipules embracing the ſtem. *Racemes* long. A native of America and the Weſt Indies. 8. C. *nivea*. Mart. 4. Poir. 7. Willd. 7. Swartz. Prod. 64. Flor. ind. occid. vol. ii. p. 693. Jacq. Amer. 115. tab. 78. "Leaves oblong, acuminate, veined, ſhining above;

racemes almoſt erect." A tree about twenty feet high, erect, branched. *Leaves* alternate, half a foot long, entire, petioled, wrinkled, thin, membranous. *Flowers* ſmall, yellowiſh; racemes terminal, ſolitary, ſimple, calyx finally thick, ſucculent, of a ſnow-white colour, covering to the middle a three-ſided, black, ſhining nut. *Fruit* ſweet and pleaſant. A native of the Weſt Indies. 9. C. *leoganenſis*. Mart. 5. Jacq. Amer. 113. tab. 178. fig. 33. (C. uvifera. β. Poir. Willd.) "Leaves roundiſh, quite entire, ſhining, flat; racemes erect." A ſhrub ten feet high. *Leaves* reſembling thoſe of C. uvifera, but only half the ſize. A native of Port-au-Prince and Leogane in St. Domingo. 10. C. *punctata*. Linn. Sp. Pl. 3. Mart. 8. Poir. 8. Willd. 8. (C. coronata; Jacq. Amer. 114. tab. 77. uvifera arbor; Pluk. Almag. 394. tab. 237. fig. 4.) "Leaves lanceolate, egg-ſhaped." A ſhrub, twelve or fifteen feet high, erect, branched. *Leaves* half a foot long, petioled, flat, quite entire, a little coriaceous, alternate, veined, ſhining, commonly two or three on each flowering branchlet; ſtipules ſheathing. *Flowers* white; racemes ſcarcely an inch and a half long, erect, ſimple, terminal, ſolitary. Almoſt the whole receptacle, with a ſmall part only of the calyx, becomes a roundiſh, dotted drupe, of a dark red colonr, and a ſweetiſh, but rather auſtere taſte. A native of South America, about Carthagena. 11. C. *obtuſifolia*. Mart. 6. Poir. 12. Willd. 9. Jacq. Amer. 114. tab. 74. "Leaves oblong, very obtuſe." A ſhrub, ten or twelve feet high, much and diffuſely branched. *Branches* ſmooth, cinereous. *Leaves* narrow, elliptical, alternate, petioled, numerous, quite entire, ſhining, coriaceous, rounded at both ends, handſomely veined. *Flowers* white, ſmall; racemes terminal, often alternate on the young branches, ſolitary, ſimple; calyx-leaves finally ſucculent, enveloping almoſt to the ſummit a ſhining nut, and leaving the upper part naked. *Fruit* aſtringent. A native of South America about Carthagena, in hedges and woods. 12. C. *microſtachya*, Willd. 10. Poir. 13. "Leaves egg-ſhaped, obtuſe, quite ſmooth; racemes nodding." *Branches* cylindrical, ſmooth, cinereous. *Leaves* at leaſt an inch and a half long, alternate, petioled, broadeſt on one ſide, quite entire. *Flowers* ſmall, in very ſhort terminal racemes. A native of the Weſt Indies. 13. C. *emarginata*. Murray Syſt. Veg. 314. Mart. 9. Poir. 11. Willd. 11. Jacq. Amer. 314. Obſ. vol. i. p. 18. tab. 9. "Leaves coriaceous, roundiſh, deeply emarginated." *Branches* ſomewhat zig-zag. *Leaves* alternate, petioled, entire, heart-ſhaped at the baſe, emarginate commonly with an acute angle, nerved and veined. *Fructification* unknown. A native of the Weſt Indies. 14. C. *barbadenſis*. Mur. Syſt. Veg. 379. Mart. 10. Poir. 10. Willd. 12. Jacq. Amer. 37. Obſ. 1. 18. tab. 8. "Leaves cordate, ovate, undulated." A tree. *Leaves* very large, petioled, ſimple, entire, acuminate, ſmooth on both ſides, nerved, veined. *Fructification* unknown. A native of Barbadoes and Jamaica. 15. C. *tenuifolia*. Linn. Sp. Pl. 5. Mart. 11. Poir. 9. Willd. 13. Lam. Ill. tab. 316. fig. 1 and 3. Brown. Jam. 210. tab. 14 fig. 3. "Leaves egg-ſhaped, membranous." A ſhrub of humbler growth than any of the former. *Leaves* alternate, petioled, ſmooth, entire, obtuſe, ſometimes a little acute, thin; petioles, according to Linnæus, ſurrounded with a membrane inſtead of a ſtipule; but the ſpecimens in La Marck's herbarium have ſheathing ſtipules. *Flowers* ſcattered, pedicelled, in ſimple terminal racemes. A native of the Weſt Indies. 16. C. *Aſiatica*. Mart. 13. Lour. Coch. 239. "Climbing; leaves oblong, egg-ſhaped, veined; racemes terminal." *Stem* ſomewhat ſhrubby, branched. *Leaves* alternate, rather acuminate, quite entire, coriaceous. *Flowers* white, in looſe racemes; calyx bell-ſhaped; ſtyle cloven half way down; ſtigmas roundiſh. *Fruit* a roundiſh five-lobed berry, formed from the five ſegments of the calyx, blackiſh, pellucid, ſmall. A native of Cochin-china in hedges and woods. 17. C. *cymoſa*. Mart. 14. Lour. Cochin. 240. "Climbing; flowers axillary and terminal, in ſeſſile cymes." Exactly ſimilar to the preceding, excepting the infloreſcence; and like it, a native of Cochin-china.

Propagation and Culture. None of theſe ſpecies have produced either fruit or flowers in England: but are eaſily propagated by ſeeds imported in a perfect ſtate. Theſe ſhould be ſown in ſmall pots filled with earth from the kitchen-garden, and plunged into a hot-bed. The plants will appear in five or ſix weeks, and in about a month after will be fit to tranſplant into ſeparate pots; after which they muſt be conſtantly kept in the bark ſtove, and treated like other tropical plants.

COCCONAGÆ, in *Ancient Geography*, a people of India, on this ſide of the Ganges, according to Ptolemy.

COCCONAGARA, or COCCORANAGARA, a town of the Sines, according to Ptolemy, who were placed by the ancients in the ſouthern parts of China.

COCCONAGI, iſlands ſituated at the entrance of the Red ſea, towards the ſouth of Arabia, according to Ptolemy.

COCCONILEA, in *Botany*, Bauh. Pin. Cluſ. See RHUS *cotinus*.

COCCOS, Gært. See COCOS.

COCCOTHRAUSTES, formed from κοκκος, a grain or kernel, and θραυω, to break, in *Ornithology*, the name of a very remarkable bird, conſiderably larger than the chaffinch, very ſhort-bodied, and large-beaked, whence it is called in Engliſh, the *groſs-beak*, or *hawfinch*, the LOXIA *Coccothrauſtes* of Linnæus and Gmelin; the ſpecific character of which is, that it has a white line on the wings, that the middle quills of the wings are rhomboid-ſhaped at the tips, and that the quills of the tail are black on the thinner ſide of the baſe. It is the *Gros-bec* of Buffon. Its head is very large in proportion to its body, and its great beak tapers from a very thick baſe to a ſharp point, reſembling the ſhape of a funnel. The upper mandible is cinereous, but of a lighter tint near the baſe; the lower mandible is cinereous at the edges, which cloſe into the upper; its under ſide is fleſh-coloured, with a cinereous caſt. The tongue is fleſhy, ſmall, and pointed; the gizzard is very muſcular, preceded by a pouch, containing in ſummer bruiſed hemp-ſeeds, green caterpillars, almoſt entire, and very ſmall ſtones. It is an inhabitant of the temperate climates from Spain and Italy as far as Sweden, and lives generally in the woods and mountains all ſummer; in winter it comes into the flat country, and reſorts near the hamlets and farms. It is never ſeen in England, except in the winter months; it feeds on the kernels in the ſtones of fruit, as cherry-ſtones, and the like, and breaks theſe with great dexterity, whence its name; it will alſo eat the ſeeds of many different plants. This bird is ſolitary, ſhy, and ſilent; its ear is inſenſible, and its prolific powers are inferior to thoſe of moſt other birds, ſo that the ſpecies is not numerous. The male and female are of the ſame ſize, and much reſemble each other.

COCCOTHRAUSTES *criſtata*, the name by which naturaliſts call the bird uſually known among us by the name of the *Virginian nightingale*, it being truly a coccothrauſtes, though called by the improper name nightingale. Ray. See LOXIA *cardinalis*.

COCCULÆ, in *Botany*, *officinales*, Bauh. Pin. See CISSAMPELOS *cocculus*.

COCCULUS *indicus*. See CISSAMPELOS *cocculus*, and MENISPERMUM.

COCCUS, in the *Writings of the Ancients*, a name given by ſome authors to that fine ſhining red colour uſed to illuminate the capital letters in manuſcripts, and more generally known by the name of *encauſtum ſacrum*, from its being uſed in ornamenting the manuſcript bibles, and its reſembling the fine red glow of the enamel of that colour.

COCCUS, in *Entomology*, a genus of the hemipterous order. The inſects of this tribe have the ſnout ſeated in the breaſt, the antennæ filiform, and the poſterior part of the abdomen furniſhed with briſtles; the male has two erect wings, and is deſtitute of poiſers, and the female is apterous, or without wings.

The cocci are a prolific race, and, like the aphides and the chermes, are the peſt of plants. They are remarkably diſcriminate in their choice of food, almoſt every ſpecies being peculiar to ſome particular plant, and this ſo conſtantly, that the far greater number of the cocci bear the name of the individual vegetable on which they reſpectively ſubſiſt. The diſſimilarity prevailing between the two ſexes is very ſtriking, not only in their form, but manners of life. The male is furniſhed with wings, and is naturally very active; the female is without wings, and has ſcarcely the appearance of animation. The females fix themſelves to the branches, leaves, and ſometimes roots of plants, where they remain immoveable, and are viſited by the males; in this ſtate of apparent torpor, they produce their young, and periſh. As the cocci live on the juices of plants, which they obtain by perforating the cortex, or cuticle, with their proboſcis, they are very injurious to plants, more particularly the tender exotic kinds raiſed in ſtoves and green-houſes. The females, when affixed to plants, oftentimes loſe the very form and appearance of inſects; their bodies ſwell, their ſkin ſtretches, and becomes ſmooth, and the ſegments, or annulations of the abdomen, entirely diſappear. In this ſtate they ſo much reſemble certain kinds of excreſcences or galls found on the leaves and branches of plants, as to be in general miſtaken for ſuch. When the inſect aſſumes this laſt appearance, its diſſolution is faſt approaching; and after its death, the abdomen ſtill ſerves as a covering, under which the eggs of the future brood are concealed and protected. Others of the coccus genus, though they adhere in the ſame manner to the leaves or branches of plants, retain the true form of the inſect till the young are produced from the egg. The females of moſt ſpecies have a quantity of fine cotton, in which the lower part of the abdomen is concealed, and which ſerves as a neſt for the eggs when depoſited by the parent inſect.

Species.

HESPERIDUM. Found generally on the orange, citron, and other plants of the ſame family, and on various ever-greens reared in green-houſes. The French call it *Cochenille de l'oranger*, as it ſeems to prefer the former of thoſe plants.

The female of this ſpecies is a ſmall oval inſect, about the ſixth part of an inch in length; the back ſlightly convex, of a ſhining brown colour, with a ſmooth ſurface, and a notch in the poſterior part. It has ſix legs, and when young runs upon trees. The full-grown inſect does not envelope itſelf in a cotton-like or downy ſubſtance, like many others of the coccus tribe, but adheres, and afterwards remains attached firmly to the bark, under the form of an oval convex ſhell, or huſk, of a ſemi-tranſparent browniſh colour, with a gloſſy aſpect, as if covered with a coat of varniſh. In this ſtate the inſect dies, and ſhortly afterwards the numerous eggs concealed within the abdomen are hatched, and produce another brood. The male is a very ſmall winged inſect, and leſs frequently obſerved than the female, which latter is extremely abundant, and oftentimes proves very injurious to the plants they infeſt. The ſpecies is originally a native of the warmer regions, and has been introduced into Europe with exotic plants. An account of this inſect occurs in the Memoirs of the French Academy by De la Hire, under the title of "Deſcription d'un Inſecte, qui ſ'attache à quelques plantes etrangeres, et principalement aux orangers." t. 10 p. 10.

AONIDUM. Body purpliſh-black; crown of the head tuberculate. Fabr. Modeer Act. Gothenb. i. 30.

Inhabits various ever-green trees of Aſia; it is ſmaller than coccus heſperidum, without wings, and yellowiſh; oblong, or ſomewhat orbicular, and with antennæ nearly the length of the thorax.

CAPENSIS. Ovate, ſomewhat downy, conic-gibbous, and operculate at the tip. Modeer Act. Gothenb.

A native of the Cape of Good Hope, and infeſts the gnaphalium muricatum.

ADONIDUM. Rufous, mealy and hairy. Fabr. *Cochenille des ſerres*, Latreille. *Coccus adonidum, corpore roſeo farinaceo, alis ſetiſque niveis*, Geoffroy. *Pediculus adonidum*, Linn. Fn. Suec. *Pediculus coffeae*, Lederm.

The moſt common inſect of the coccus tribe, and is ſuppoſed to have been originally peculiar to Senegal, from whence it was long ſince tranſported to America and Europe. The female is of an oblong-ovate form, ſlightly convex above, with the body divided into many tranſverſe ſegments, which project on the ſides, and are furniſhed with ſmall proceſſes or points; theſe proceſſes are longer on the two laſt diviſions of the body than the reſt, and form a kind of bifid tail. The whole inſect is of a pale roſe colour, and appears more or leſs covered with a fine white farinaceous ſubſtance; the legs ſhort, and ſix in number. The male is very ſmall, alſo of a roſe colour, and partially covered with a white powder, with ſemi-tranſparent milk-white wings, and four long filaments at the tail. Theſe inſects wander about the plants they infeſt, and nouriſh themſelves by ſucking the juices. When the female is full grown, and pregnant with eggs, ſhe ceaſes to feed, and remaining fixed to one ſpot, envelops herſelf in a fine white fibrous cotton-like ſubſtance, and lives but a ſhort time afterwards; the young, which hatch under the huſk or body of the parent inſect, proceeding from it in great numbers, and diſperſing in queſt of food.

QUERCUS. Found on the oak, *Quercus robur*. This is ſomewhat kidney-ſhaped, and of a brown colour.

CACTI. Found on the *cactus opuntia*, or prickly pear tree.

The coccus cacti is a native of South America, and conſidered as an article of commerce and manufactory, is of far greater importance to mankind than any other of the inſect race;—it is the true cochineal, the drug ſo well known for its valuable properties in the art of dyeing, and other uſeful purpoſes of life. The body is depreſſed, downy, and tranſverſely wrinkled; the abdomen is purpliſh, the legs ſhort and black, the antennæ ſubulate, and about one third the length of the body.

The diſcovery of this valuable inſect has contributed more efficiently to enrich the poſterity of the Spaniſh adventurers in the New World, than the wealthy mines of Peru and Mexico. The cultivation of the inſect proves a ſource of employment to the induſtry of the country; and while it improves the eſtates of the land-proprietors, conſtitutes to the benefit of the revenue a branch of commerce of the firſt importance and conſideration. This is no matter of aſtoniſhment; the properties of the cochineal of South America are ſo incomparably ſuperior to thoſe of any other dye for the brilliancy at leaſt, and in no ordinary degree for its durability, that its diſcovery may be conſidered as an ineſtimable advantage to the civilized world.

The coccus dye of Portugal, Sardinia, Aſia Minor, and Africa, was in the moſt general uſe in ancient times. This was univerſally imagined to be the berry, or an excreſcence of ſome vegetable, an opinion which the common appearance it aſſumes in a dried ſtate would, in a certain meaſure, juſtify. That Pliny was of this opinion, is evident from ſeveral paſſages in his writings; it was the idea of the vulgar, and he adopted it. The ſame notion, preciſely, was entertained of the Mexican cochineal; and it was only of late years, long after its valuable properties, were known in Europe, that the true origin and nature of this inſect were clearly demonſtrated.

The cochineal of Mexico is brought into Europe in the form of little grains of an irregular figure, which are roundiſh on one ſide, and wrinkled tranſverſely; the other ſomewhat flat. That in moſt eſteem is of a ſlaty grey colour, mixed with reddiſh, and covered with a fine white powder. In trade the merchant diſtinguiſhes four ſorts, the Meſtique, Campeſchanc, Tetraſchale, and Sylveſtre, of which the three firſt are conſidered the beſt; thoſe are named from the places where they are produced; the laſt ſort, ſylveſtre, from being found wild without any culture. The firſt three are ſuppoſed to be of the ſame ſpecies, but we are yet ignorant whether the C. ſylveſtre, or wild cochineal, and the other are of two different ſpecies; we only know that the laſt furniſhes leſs of the tincture than the other. This M. Thierry attributes not to the inferiority of the grain, but to the cottony matter with which it is covered, this augmenting its weight and abſorbing part of the colour. The proceſs employed by the dyers for extracting the colour is ſufficiently known, neither is it ſcarcely requiſite to add that carmine, the fineſt and moſt beautiful crimſon we poſſeſs, is obtained from the cochineal See Cochineal.

The female of the cochineal inſect, in its full-grown or torpid ſtate of pregnancy, ſwells to ſuch a ſize in proportion to that of its infant ſtate, that the legs, antennæ, and proboſcis, are ſcarcely to be diſcovered, except with a good eye, or the aſſiſtance of the microſcope. It is the female only that is valuable for its dye. The male is a ſmall, and rather ſlender, two-winged fly, about the ſize of a flea, or ſtill ſmaller, with jointed antennæ, and large white wings in proportion to the body, which is of a red colour, with two long filaments proceeding from the tail. It is an active and lively animal, and is diſperſed in ſmall numbers among the females, in the proportion, according to Mr. Ellis, in the Philoſophical Tranſactions, of one male to a hundred, or a hundred and fifty, or two hundred females: ſome writers ſay even three hundred.

The plants upon which theſe inſects are raiſed by the cultivators of cochineal is the nopal, or nopalleca of the Indians, called by ſome the Indian fig-tree, and by botaniſts the *cactus opuntia*, or prickly pear-tree. The culture of this plant for the purpoſe conſiſts merely in lopping the rotten or decayed branches, and removing other plants and weeds away that might injure them. Thoſe they plant in an argillaceous earth intermixed with gravel and ſtones. The Indians of the provinces of Guaxaca and Oxaca, who attend particularly to the culture of the nopals, plant them near their habitations, and call them nopaleries.

The juice of the plant on which theſe inſects breed is their ſole ſubſiſtence. About the 15th of October, which, in Mexico, is the commencement of the fine ſeaſon, they diſtribute the cochineals upon the nopals. This operation conſiſts merely in placing the females, while they are yet young and active, in a number of ſmall neſts among the leaves, from whence they wander about over various parts of the plant, in ſearch of the particular branches to which they afterwards attach themſelves, and are viſited by the males.

The breeding of the cochineal is attended with precarious circumſtances; the cochineal is expoſed to a variety of dangers from the violence of the winds, the rains, fogs, froſts, and other cauſes, and alſo from the depredations of birds, who are very fond of theſe inſects.

When the inſects are at their full growth they are gathered and put into pots of earthen-ware, but much attention is requiſite to prevent them from getting out, as in that caſe great numbers of them would be loſt; though there is no danger of this when they are at liberty on the nopal leaves, theſe being their natural reſort, and where they enjoy abundance of delicious food; for though they often remove from one leaf to another, they never quit the plant; nor is it uncommon to ſee the leaves entirely covered with them, eſpecially when they are arrived at maturity. When they are confined ſome time in theſe pots they are killed, and put into bags.

The Indians have three different methods of killing theſe inſects; one by immerſing them in hot water, another by fire, and the third by expoſing them to the burning rays of the ſun; and it is owing to theſe different proceſſes, that the cochineals are ſometimes of a deep, and at others, of a bright red. Thoſe who uſe hot water are very careful to give it the requiſite heat, and that the quantity of water be proportioned to the number of inſects. The method of killing the creatures by fire is to put them on ſhovels, into an oven moderately heated for the purpoſe, the fine quality of the cochineal depending on its not being over dried at the time of killing the inſects. Some alſo are killed by the fumes of heated vinegar, and others by ſmoke. Thoſe killed and dried in the ſun ſeem, however, to have the preference. When the female inſect has diſcharged all its eggs it becomes a mere huſk and dies, ſo that the greateſt care is taken to kill the inſects before that time, to prevent the young from eſcaping, and thus diſappointing the hopes of the proprietor.

As this inſect attains to maturity, performs the ordinary functions of life, depoſits eggs, and dies within the ſhort ſpace of two months, according to M. Thierry, there are no leſs than ſix ſucceſſive generations of this inſect in the ſpace of a year. After being excluded from the egg, both the male and female remain ten days in the larva form, and five under that of the nymph or pupa, and are then become perfect inſects. Some writers, however, ſay, that there are only three broods of the cochineal annually, the firſt of which appears about the middle of December, and the laſt in May. It appears pretty certain that the female, after coupling, ſurvives for about a month, and that the males die immediately. Beſides the depredations committed amongſt theſe inſects by birds, the larvæ of the ſmall ſpecies of lady-bird, called by Fabricius *coccinella cacti*, is highly injurious to them, deſtroying the females while in a ſtate of torpidity with perfect impunity.

The principal countries where the cochineal inſects are bred, are Oaxaca, Tlaſcala, Chulula, Nueva Gallicia, and Chiapa, in the kingdom of New Spain; and Hambatia, Loja, and Tucuman in Peru: but it is ſaid to be principally in Guaxaca and Oaxaca that they are gathered in large quantities, and form a branch of commerce, the cultivation of them being there the chief employment of the natives.

Notwithſtanding ſo much has been already written on this ſubject, we are perſuaded no ſmall degree of uncertainty prevails with regard to the true hiſtory of this inſect, and time alone can develope it; we are even yet ignorant, as before obſerved, whether the kind found wild in South America is of the ſame ſpecies with that cultivated for the purpoſes of commerce; we are yet to be informed whether our own colonial poſſeſſions may not produce the ſame kind of inſects, or inſects capable of ſupplying us with the ſame kind of dye; and even whether the ſpecies of cocci indigenous, or naturalized in our own country, may not be rendered of conſiderable utility in the ſame point of view. It appears, ſtill further, from what we have ſeen, that the Eaſt Indies affords one, two, or, perhaps, more ſpecies of the cochineal tribe, which, with due attention and culture, might prove equally valuable with that of Mexico, and which, conſidering the vaſt extent of our poſſeſſions in India, might one day become the ſource of unexpected wealth. Latreille, with a degree of patriotiſm that does infinite credit to his memory, invites the particular attention of his countrymen to the ſubject; he recommends them earneſtly to attend to the indigenous products of France, ſatisfied as he is that the French need no longer remain tributary to Spain for this branch of commerce. And he addreſſes himſelf in particular to the inhabitants of the Eaſt Indies, to ſeek after, and inveſtigate another ſort of cochineal peculiar to thoſe countries, which is infinitely ſuperior in ſize to that of Mexico, as he judges by a ſpecimen brought by Maſſé, a zealous naturaliſt, to the Muſeum of Natural Hiſtory. "Le gouvernement (ſays Latreille) a le plus grand intérêt á favoriſer ces tentatives. Il me paroît aſſez démontré que nous pouvons ceſſer d'être tributaires d'l'Eſpagne pour cette branche du commerce. La cochenille ſylveſtre ſe perpétue dans les ſerres du Jardin des Plantes de Paris; pourquoi ne porteroit-on pas ſes regards ſur ce genre de culture, auquel d'heureuſes circonſtances ſemblent nous inviter? J'engagerois encore les naturaliſtes, ou hommes éclairés, qui habitent les Indes orientales, à ètudier une autre ſorte de cochenille qui eſt infiniment ſupérieure pour la grandeur à celle de Mexique. J'en juge par un individu que Maſſé, zélé naturaliſte, a envoyé au Muſéum d'Hiſtoire Naturelle."

It is but juſtice to ſome enlightened individuals of our own country to ſtate that the cocci of the Eaſt Indies, which produce the cochineal tincture, have not been entirely diſregarded. A ſeries of no leſs than fourteen letters on the ſubject of cochineal inſects diſcovered at Madras by Dr. Anderſon, and addreſſed to ſir Joſeph Banks, were printed and publiſhed at Madras in the year 1788, and two others in concluſion of this ſubject in 1789 and 1790; and alſo an account of the importation of American cochineal inſects into Hindooſtan. An intereſting paper on the lacſha, or lac inſect of that country, (coccus lacca), occurs alſo in the Tranſactions of the Bengal Society, vol. ii. p. 361, and in the Philoſophical Tranſactions, vol. 81.

Polonicus. On the roots of ſcleranthus perennis. Linn. Faun. Suec. *Chermes radicum purpureus*, Geoffr. *Coccus tinctorius radicum*, Breynnius Act. Phyſ. Med. p. i. p. 504. *Graine d'eſcarlate de pologne*, Latreille.

The body of this ſpecies is of an oblong ovate form, and of a purple or cheſnut colour. It inhabits Poland.

This is denominated the cochineal of the north, is found only in cold climates, and ſeems in a great meaſure peculiar to Poland, though not entirely confined to that country. It was one of the principal kinds of ſcarlet dyes in uſe before the diſcovery of South America; but as it is an article collected with difficulty, and is ſufficiently verified by experience to be in every reſpect inferior, as a dye, to the coccus cacti, or Mexican cochineal, its cultivation is leſs aſſiduouſly regarded than formerly.

Theſe inſects are affixed chiefly to the roots of plants, the principal of which is the ſcleranthus perennis; they occur alſo on the pimpernel, the pellitory, mouſe-ear, and ſome others, that grow in ſandy ſituations. Towards the end of June theſe cocci are in a fit ſtate for being gathered; they are then nearly of a ſpherical form, and of a fine violet colour. Some of them are not larger than poppy ſeeds, and others the ſize of a pepper corn, and each of them is lodged in a ſort of cup like that of an acorn, and in which more than half the body is contained. The outſide of the covering is rough and of a blackiſh brown, the inſide ſmooth, poliſhed, and ſhining. On ſome plants they find only one or two of theſe, and on others more than forty. Theſe are the females; the males are ſmaller, and have wings. About the end of June theſe inſects are quite full of purple juice, and it is at that ſeaſon they are gathered. Thoſe who gather them have a hollow ſpade with a ſhort handle; then taking hold of the plant with one hand, they raiſe it out of the ground with the tool held in the other; after which they very quickly and dexterouſly detach the inſects and replace the plant in the ground, where it again takes root. The coccus is then ſeparated from the earth by means of a ſieve; and ſprinkled with very cold water or vinegar. And, laſtly, they are killed by expoſure to the ſun, or keeping them for ſome time in a warm place; but this muſt be done with caution, as too haſty drying would ſpoil the colour. Sometimes they ſeparate the inſects from the veſicles with their fingers, and form them into balls, and by this operation increaſe the value of the article. The Turks and Armenians buy this cochineal for dyeing not only their wool and ſilk, but the tails and manes of their horſes. The women of Turkey alſo employ an infuſion of this drug in the juice of the citron or grape to ſtain the tips of their fingers, and feet, of a beautiful carnation colour. The Levantines, after the manner of the Dutch, ſometimes intermix the Poliſh cochineal in equal portion with the cochineal of Mexico, and extract from it the dye with which they ſtain their ſcarlet cloths, by means of citron-juice, or a ſolution of alum. In the preparation of colours for the artiſt, the Poliſh cochineal is of little ſervice. M. Macquer, who tried many experiments on it, could never produce with it any other than lilac, fleſh colour, or crimſon; and he found it far more expenſive than the Mexican cochineal, becauſe, although it bears an inferior price, it does not yield more than one fifth part of the colour in proportion.

Fragariæ. On the fragaria and potentilla. *Coccus fragariæ veſcae*, S. G. Gmelin It. i. p. 205. *Coccus potentillæ*, Mayer.

A ſpecies indigenous to ſome parts of northern Europe, Pruſſia, and Siberia. This kind is diſtinguiſhed by having the ſnout black, the thorax marked with three ridges, and the tail ſurrounded by blackiſh hairs. The Ruſſians extract a ſcarlet dye from this inſect.

Hypericornis. On the hypericum perforatum. Pallas. Inhabits Ruſſia.

Ilicis. On the quercus coccifera. Fabr. Modeer Act. Gothenb. Geoffr. Mat. Med. ii. p. 782.

This is the kermes of the *Materia Medica*, and when immerſed in vinegar and dried, produces a colouring matter of a ſimilar nature and tint, but in an inferior quantity, to that of the coccus cacti. Theſe inſects are found adhering to the ſhoots of the quercus coccifera, under the form of ſmooth, reddiſh brown, or blackiſh grains, about the ſize of peas, and covered with a white down. According to M. Hellot, of the French Academy, they are found in the woods of Vauvert, Vendeman, and Narbonne; but more abundantly in Spain towards Alicant and Valencia, and in

Murcia, Jaen, Cordova, Seville, Eſtremadura, La Mancha, and Serranias de Cuenca. The inſect occurs alſo in Greece, and the iſlands of the Archipelago.

Before the diſcovery of America, the coccus ilicis, or kermes, as it was then termed, was the moſt valuable for dyeing ſcarlet. Its utility was known to the ancients, but neither the ancients nor the moderns, till of late years, ſeem to have underſtood its origin and nature. Pliny ſpeaks of it as the berry of a plant; others, after him, conſidered it in the ſame light, or as an excreſcence formed by the puncture of a particular kind of fly, ſimilar to the gall-nuts on the oak, and other plants. Tournefort was of this opinion. Marſigli, and Dr. Niſole, a phyſician at Montpellier, made experiments and obſervations, with a view to further diſcoveries, but did not perfectly ſucceed. Two other phyſicians at Aix in Provence, Dr. Emeric and Dr. Garidel, applied themſelves about the ſame time, and with more ſucceſs, having finally diſcovered that the kermes is, in reality, nothing elſe than an inſect, aſſuming the appearance of a berry in the proceſs of drying.

It is related in Dillon's "Travels through Spain," that in Xixona and Terra de Rellen, there is a diſtrict called De la Grana, where the people of Valencia firſt began to gather it, and their example was followed all over Spain. In ſome years, this article has produced 30,000 dollars to the inhabitants of Xixona.

The culture of the kermes is ſtill an object of conſideration, though infinitely leſs ſo than formerly. The people of Hinojos, Bonares, Villalba, and other parts of the kingdom of Seville, dry it on mats in the ſun, ſtirring it about, and ſeparating the red duſt, which is the fineſt part; this they mix with vinegar, and denominate "paſtel." In other parts, the inſects are gathered from the trees as carefully as poſſible, without lopping the branches of the trees to which they adhere, and are ſteeped in vinegar, in order to kill the parent, to prevent the excluſion of the young in drying. The kermes are then ſpread or thrown on linen, and as long as they retain any moiſture, are turned twice or thrice a day, till they are thoroughly dried, when they are put up for ſale. The kermes of Spain is ſaid to be preferred on the coaſt of Barbary, on account of its goodneſs. The people of Tunis mix it with that of Tetuan for dyeing ſcarlet caps, ſo much in uſe in the Levant. The Tuniſians, according to the ſame accounts, export every year above 150,000 dozen of thoſe caps, which yield to the dey a revenue of 150,000 dollars.

The woollen cloths dyed with this ſpecies of coccus, are of a deep red colour, much inferior in brilliancy to the ſcarlet cloths dyed with the true, or Mexican cochineal, but of a more durable nature, and leſs liable to ſtain. M. Hellot, to whom the world is indebted for ſeveral uſeful obſervations on this ſubject, obſerves, that the figured cloths to be ſeen in the old tapeſtries of Bruſſels, and the other manufactures of Flanders, which have ſcarcely loſt any thing of their livelineſs by ſtanding for two hundred years, were all dyed with the kermes.

FICUS. On the ficus religioſa and indica. Fabr. *Coccus lacca kerr*, Phil. Tranſ. 1781.

This is the inſect which produces the gum lac, and is a native of the Eaſt Indies. It is of an oval compreſſed form, inferior in ſize to the head of a moderately large pin; the back is carinated, the abdomen flat, the antennæ half the length of the body, and ramoſe, or ſending forth two or three long delicate hairs; and the tail furniſhed with two briſtles.

The natural hiſtory and transformations of this inſect have not, hitherto, been attended to by any accurate and well-informed obſerver, upon whom we may implicitly rely. The following general remarks ſeem more entitled to attention. Theſe inſects are ſaid to inhabit, beſides the trees above-mentioned, the *plaſo* of the Hortus Malabaricus, and *rhamnus jujuba* of Linnæus. They commonly fix themſelves ſo cloſe together, and in ſuch numbers, that ſcarcely one in ſix can have room to complete her cell; the others die, and are eat up by various inſects. The extreme branches appear as if they were covered with a red duſt, and their ſap is ſo much exhauſted, that they wither, and produce no fruit, the leaves drop off, or become of a dirty black colour. Theſe inſects are tranſplanted by birds; for if they perch only upon theſe branches, they muſt carry off a number of the inſects upon their feet to the next tree they reſt upon. It is worth obſerving, that theſe fig-trees, when wounded, drop a milky juice, which inſtantly coagulates into a viſcid ropy ſubſtance, which, hardened in the open air, is ſimilar to the cell of the coccus lacca. The natives boil this milk with oils into a birdlime, which will catch peacocks, or the largeſt birds. A red medicinal gum is procured by inciſion from the plaſo-tree, ſo ſimilar to the gum lacca, that it may readily be miſtaken for the ſame ſubſtance. And hence it is ſuppoſed, theſe inſects have little trouble in animalizing the ſap of theſe trees in the formation of their cells. The gum lacca is rarely ſeen upon the rhamnus jujuba, and it is inferior to what is found upon the uncultivated mountains on both ſides of the Ganges, where nature has produced it in ſuch abundance, that were the conſumption ten times greater, the markets might be ſupplied. The only trouble in procuring the lac, is in breaking down the branches, and carrying them to market. The price in Dacca, a few years ago, was about 12*s.* the hundred weight, though brought thither from the diſtant country of Aſſam. The beſt lac is of a deep red colour. This inſect and its cells have gone under the various names of gum lacca, lack, and loc tree; in commerce, they diſtinguiſh four kinds of this ſort of gum.

CARICÆ. On the ficus carica. *La cochenille du figuier commun*, Olivier. The body is ferruginous, with the margin elevated and pale. Its general figure is oval, and convex. This deſcription applies only to the female, as the male is yet unknown.

This kind is found in the ſouth of Europe, and throughout the Levant, where they commit vaſt depredations on the fig trees, to which they are peculiar. Theſe inſects are ſo numerous, that it is impoſſible to deſtroy them, and in ſome ſeaſons in particular, they appear in ſuch immenſe ſwarms, as to deſpoil the trees of their foliage, and rob them of their moiſture, till they occaſion the fruit to drop off before it can ripen. Some cultivators of the fig ſprinkle their trees with a mixture of vinegar and the dregs of oil, and which, in a partial degree, may prove efficacious in deſtroying them.

UVÆ URSI. On the roots of arbutus uva urſi. Fabr. The body of this inſect is a cheſnut colour, and produces a tincture. Modeer Act. Gothenb.

CHARACIAS. *Cochenille du characias.*

This curious inſect was firſt deſcribed by Boſc in the "Journal de Phyſique," February, 1784, under the name of *Dortheſia characias*, in memory of his friend Dorthes de Montpellier, who had previouſly obſerved it. The male is about a line and a half in length excluſive of the wings, which are very large, ſemi-tranſparent, and of a leaden-grey colour. The antennæ are ſetaceous, and much longer than the body, and the extremity and upper part of the abdomen are tufted with white hairs or filets, which extend beyond the end of the wings. The female is larger than the male, meaſuring two or three lines in length, the antennæ are ſhort, filiform, and of a reddiſh brown, and entirely covered with a whitiſh matter, which forms appendages or tufts on the ſides and on the back. The abdomen terminates in a ſolid friable maſs of long filets, upon removing which the body appears reddiſh, with nine tranſverſe ſtriæ. The trunk is ſhort and ſituated in the ſpace between the anterior legs. The legs are of a reddiſh brown. Preparatory to the female beginning to lay her eggs, which ſhe does at the commencement of the ſpring ſeaſon, ſhe forms a little elongated receptacle ſomewhat in form of a ſack, and fills it with a white cotton-like ſubſtance, in which the eggs are depoſited. Theſe inſects prefer the *euphorbia characias*, and *euphorbia piloſella*, two plants on which they thrive, and are rarely found on any other. The young ſhed their ſkins ſeveral times before they acquire their full ſize. The wings of the male appear, when they have caſt their ſkins the third time, in the month of September; the latter are rare, compared with the females, not more than one or two males being found to two or three hundred females. Their amours and habits reſemble thoſe of the other cocci. A circumſtance apparently new in the hiſtory of the cocci was obſerved by Dorothes relative to this inſect. He found that the females ſurvive after laying their eggs; in the winter they conceal themſelves under ſtones, or among the bark and moſſes, and re-appear in ſpring, when the young are hatched, and the parent lives at leaſt a month afterwards. It is ſaid that the larva of a particular kind of coccinella inſinuates itſelf in the receptacle of eggs, and eats them without attacking the parent. Olivier appears to have found the ſame ſpecies of coccus on the bramble in the neighbourhood of Paris.

The coccus characias emits from the poſterior part globules of a viſcous matter, reſembling the ſaccharine moiſture diſcharged by the aphides. Some attempts have been made to diſcover whether theſe inſects might be rendered of any utility to the dyer, but without ſucceſs; an infuſion of them in boiling water produces only a weak tincture of a pale yellow colour.

Cataphractus. Milk-white; eyes, antennæ, roſtrum, and legs ferruginous.

This curious inſect was deſcribed by Dr. Shaw, in the fifth volume of the "Naturaliſts' Miſcellany," from a ſpecimen communicated by Mr. Dickſon, gardener to the Britiſh Muſeum. Dr. Shaw conſiders it as a ſpecies of coccus, an opinion that ſeems to admit of ſome doubt, but as the inſect is unknown to us, except from the deſcription, we ſhall retain it in this genus, and only repeat the account given of it by that writer in his own words.

"The natural ſize of the inſect (of which the female alone appears to be at preſent known), is that of the coccinella tigrina, or ſmall yellow-ſpotted lady-bird, and at firſt view has an appearance ſo little allied to the generality of the cocci, as to make it doubtful whether it really belongs to that tribe of inſects. The whole animal (except the eyes, legs, antennæ, and roſtrum,) being coated, in the moſt curious manner, in a complete ſuit of milk-white armour, as if caſed with ivory. The diviſions or annuli of the back are eight in number, of which the three ſuperior ones are each furniſhed with a ſmall ſcutellum or appendicular piece, which is wanting in the other. The ſides are ſurrounded by projecting laminæ, ſomewhat in the manner of tortoiſes or millepedes; the lower ſurface is compoſed of angular pieces, diſpoſed nearly as in the former of the above-mentioned animals; the eyes which are ſituated juſt below or on the underſide of the antennæ, are bright, and ſomewhat elevated, not unlike thoſe of a lobſter; the colour of the projecting parts, *viz.* the legs, eyes, antennæ, and roſtrum, is a fine bright ferruginous or reddiſh brown." The eggs were ſmall in proportion to the animal and of a brown colour. This inſect is found among ſphagnum and other moſſes in boggy and turfy ground, and is moſt frequent in Scotland, Ireland, and the north of England, particularly in ſome parts of Cumberland.

Oleæ. Feeds on the olive, myrtle, and phyllyrea. Oliv.

Olivier deſcribes this ſpecies under the name of *Coccus oleæ*, and *Cochenille de l'Olivier*. The female is oval, and of a red-brown colour, paler or deeper in different individuals, and with the nerves, raiſed and irregular. The male is unknown. This is found in the ſouthern parts of France and in Italy: it chiefly infeſts the olive, and, though common on the leaves of that plant, is obſerved never to touch the fruit. The young, ſoon after being hatched, diſperſe, and reſort to the under ſide of the leaves and buds: They multiply prodigiouſly faſt, and are, of courſe, injurious to the olive which they particularly prefer.

Rusci. Shell ſurrounded by eight ſmaller pieces. Modeer Act. Gothenb.

Inhabits Italy; on the Myrtus and Ruſcus. The ſhell is truncated, octagonal, and perforated, and has the ſmaller lateral pieces granulated in the middle.

Myricæ. Feeds on the *myrica quercifolia*, Fabr. Modeer Act. Gothenb.

A native of the Cape of Good Hope. This is the ſize of a ſmall pea, and of a ſemi-oval form, and pale fleſh colour: the crown is obtuſely pointed, and furniſhed with a very ſmall pore, and another above the thicker cartilaginous membrane.

Capreæ. Feeds on the willow. Modeer Act. Gothenb. *Coccus ſubrotundus fuſcus, linea dorſali nigra*, Degeer.

Size of a ſmall pea, and of an ovate form, with the anterior part obtuſe and bifid; the colour teſtaceous or fuſcous, with a gloſſy ſurface, and marked down the middle with a line of black. An European ſpecies.

Phalaridis. On the roots of graſſes, particularly the *phalaris canarienſis*, or canary graſs.

This kind is deſcribed by Linnæus in his "Fauna Suecica," under the name of *Coccus phalaridis*. Geoffroy calls it *Coccus graminis, corpore roſeo*. The female forms little neſts along the ſtalks, and at the roots of graſs, which are compoſed of a white cotton-like ſubſtance, in which ſhe depoſits her eggs. The body of the female is pale-red, or whitiſh, and mealy; the male is of the ſame colour, with two wings, and four threads at the extremity of the tail, two of which are longer than the reſt.

Cratægi. Feeds on the hawthorn, *Cratægus oxyacantha*, Modeer Act. Gothenb.

Inhabits Europe; is of an oblong form, and cheſnut colour.

Serratulæ. Feeds on the ſaw-wort, *ſerratula arvenſis*, Fabr. Found in England.

Zosteræ. Feeds on the *zoſtera marina*. Fabr.

This is about the ſize of a pea; the ſhields are brown, and paler at the edges. Found chiefly on the *zoſtera marina* in the Baltic.

Vitis. On the branches of *vitis vinifera*. Fabr. *Chermes vitis oblongus*, Geoffroy.

The body of this ſpecies is oblong, and of a cinnamon colour.

Liriodendri. Feeds on the *liriodendrum tulipifera*. Hamburgh Mag.

Farinosus. Ovate, downy, pale fuſcous, powdered with white. Modeer Act. Gothenb.

Infeſts the *betulus alnus*. The body of this ſpecies is depreſſed.

Clematidis. Feeds on plants of the *clematis genus.* Geoffr.

Persicæ. Feeds on the *amygdalus perſica.* Modeer Act. Gothenb.

The body of this ſpecies is gloſſy, and either of a reddiſh colour, tawny, or black.

Abietis. On the *pinus abies.* Modeer. *Le kermès du ſapin* of Geoffroy.

This is of a round and ſpherical form, and of a deep maroon colour: it is found on pines near the bifurcations of the branches.

Fuscus. On the oak, *quercus robur.* Modeer. Body brown and mealy, and of a rotundate form.

Variegatus. Round, variegated with white, yellowiſh, and black.

The general colour is a yellowiſh-white, marked with three black tranſverſe rays, and the intermediate ſpaces dotted with black.

Lanatus. Oblong, ſilky white; on the *quercus robur.* Geoffroy.

This is of a brown colour, and aſſumes a white appearance from the ſilky down with which the body is covered.

Mespili. Body ſilky-white; on the *meſpilus.* Called by Geoffroy *Le kermès cotonneux du néflier.*

Concholiformis. Body linear, and fuſcous; on the elm. Modeer.

Aceris. Body ovate; on the maple. Modeer.

Laniger. Brown, ſilky-white; on the *ulmus campeſtris.* Reaum.

Diosmatis. On the *dioſma crenata* and *pulchella.* Modeer.

Alni. In the diviſions of the branches of *betula alni.* Modeer. The body is of an oblong-ovate form, and reddiſh.

Uva. Fuſcous, inclining to yellowiſh, and ſphærico-gibbous. Modeer. Inhabits Sweden, and is found under ſtones.

Spurius. Ovate, with a few hairs, cheſnut; beneath pale yellow. Modeer. Found on the ulmus, or elm.

Coccus *Maldivia*, the Maldivia nut, in the *Materia Medica*, the name of the fruit of the *palma Maldivienſis* of Johnſton, an oval-figured fruit, of a ſweet taſte, and famous for its virtues in nervous diſorders.

COCCYGÆUS Musculus, in *Anatomy*, is a thin and flat muſcle, of a triangular figure, ariſing by its apex from the point of the ſpinous proceſs of the ſacrum, and inſerted by its baſis into the inferior lateral part of the ſacrum, and into the ſide of the os coccygis. It is ſtrongly connected to the leſſer ſacro-iſchiatic, or ſpinoſo-ſacral ligament. It will reſtore the os coccygis, when that bone has been carried backwards; and it may bend this bone forwards. This muſcle is the *levator coccygis* of Morgagni; *triangularis coccygis* of Santorini; and *ſacro-coccygeus* of Winſlow.

COCCYGIS *curvatora*, is a thin and ſlender muſcle, derived from the inferior lateral portion of the inner ſurface of the ſacrum, and from the upper part of the os coccygis; it is fixed into the lower bones of the coccyx. It is often, moſtly or entirely, tendinous. It will bend the coccyx forwards.

Coccygis *oſſis muſculi.* Theſe are ſmall, thin, radiated muſcles, lying on the inner, or concave ſide of the os ſacrum, and neighbouring parts of the pelvis. They are four in number, two on each ſide, one placed more forward, the other more backward; for which reaſon the firſt may be termed *coccygæus anterior,* ſive *iſchio coccygæus,* and the other *coccygæus poſterior,* ſive *ſacro coccygæus.*

COCCYGIUS, in *Ancient Geography*, a hill of the Peloponneſus, in the Argolide territory. The way from Troezené to Halicé, paſſed by the foot of this hill, on which was a temple, dedicated to Jupiter; and an old temple at the bottom of the hill is ſaid to have been conſecrated to Apollo. This hill was near the river Inachus, according to Plutarch and Pauſanias, the latter of whom calls it *Coccyx.*

COCCYGRIA, in *Botany,* Bauh. Pin. See Rhus *cotinus.*

COCCYNUM Promontorium, in *Geography,* a promontory of Italy, in Magna Græcia, oppoſite to Sicily. Appian.

COCCYX, or Ossa Coccygis, in *Anatomy,* three or four ſmall portions of bone, connected with each other, and joined to the inferior extremity of the ſacrum. See Skeleton.

Coccyx, in *Ichthyology,* a name given by Ariſtotle, and other old Greek writers, to the fiſh called *cuculus,* and *lyra,* by other authors. It is a ſpecies of the *trigla,* diſtinguiſhed by Artedi by the name of the *trigla,* all over red, with a bifid ſnout, and the coverings of the gills ſtriated.

COCETUM, among the *Ancients,* a kind of drink made of honey and poppies.

COCHA, in *Ancient Geography,* a town of Arabia Deſerta. Ptolemy.

COCHABAMBA, in *Geography,* a province and juriſdiction of Peru, the new vice-royalty of La Plata, or Buenos Ayres, ſituated in a fertile valley between mountains, and watered by a river of the ſame name. The adjacent provinces are Sicaſica to the N.W.; La Paz and Cruſo to the W. and S.W.; Chayanta to the S.; and to the E. Plata and Santa Cruz de la Sierra, in S. lat. about 18°, and W. long. about 67°. The capital town is Oropeſa, and it was formerly denominated the granary of Peru. It has one gold mine.

COCHE, in *Ancient Geography,* a village of Babylonia, near Seleucia, to the S. E.

Coche, in *Geography,* a ſmall iſland in the Caribbean ſea, between the iſland of Margarita and the continent of South America. N. lat. 10° 57′. W. long. 63° 10′.

COCHECO, a north-weſt branch of Piſcataqua river, in the ſtate of New-Hampſhire, in America. It riſes in the Blue hills in Strafford county, and its mouth is 5 miles above Hilton's Point.

COCHER, a river of Germany, which runs into the Neckar near Wimpfen, in the circle of Swabia.

COCHEREL, a town of France, in the department of the Eure, famous for a victory gained by Gueſelin over the king of Navarre in 1564; 7 miles E. of Evreux.

COCHHEIM, or Kocheim, a town of Germany, in the circle of the Lower Rhine, and electorate of Treves, now belonging to the French, and chief place of a canton in the department of the Rhine and Moſelle, and diſtrict of Coblentz, ſeated on the Moſelle, formerly imperial, but engaged to the electorate of Treves in 1240 by the emperor Adolphus de Naſſau; 30 miles N.E. of Treves, and 46 N.E. of Luxemburg. The place contains 1527, and canton 5647 inhabitants. The territory includes 18 communes.

COCHIA, in the *Materia Medica,* the name of officinal pills, which are diſtinguiſhed into the greater and leſſer: the former is a compoſition of hiera picra, troches of Alhandal turpeth, diagrydium, and ſyrup of buckthorn, taken from Rhaſes, but ſeldom uſed in the preſent practice. The latter is compounded of equal quantities of bright aloes, the pureſt ſcammony, and the pulp of colocynth, made into a maſs with ſyrup of buckthorn; two drams of the diſtilled oil of cloves are added to an ounce of each of the former ingredients. Theſe pills are preſcribed to diſcuſs viſcidities, watry humours, and flatulencies.

COCHICAT, abridged from the Mexican name *Cochitenacatl,*

nacatl, in *Ornithology*, the *Pſittacus torquatus* of Gmelin, the *Ramphaſtos torquatus* of Latham. Ind., the *Tucana Mexicana torquata* of Briſſon, and the *Coloured Toucan* of Lath. Syn.; has the following ſpecific character: Above it is black, below whitiſh, its belly green, its hind part red, and its collar of the ſame colour. It frequents the ſea-ſhore, and lives on fiſh.

COCHILE, or COSCILE, in *Geography*, a river of Naples, which runs into the gulf of Tarento, between Caſſano and Roſſano, in the province of Calabria Citra.

COCHIN, a ſea-port town of Hindooſtan, on the coaſt of Malabar, formerly occupied by the Portugueſe, afterwards the chief ſettlement of the Dutch, but now in poſſeſſion of the Engliſh; it is ſituated in a country N. of Travancore, to which it gives name, and which has been chiefly reſorted to for pepper. Cochin ſtands at the N.W. of an iſland, which is about 18 Dutch miles in length, and two in breadth; to the ſouth the iſland is formed by the mouth of the river of Cali Coylang, and to the N. by that which runs from Cranganore, and ſeparates it from the iſland of Baypin. The form of the city is nearly ſemicircular, and it is about 1½ mile in circumference. Cochin, beſides the baſtions, cavalier and wall by which it is fortified, has three gates, to the W. to the E. and to the N. Its principal buildings are the church and the government-houſe. Its ſtreets are generally wide, but there are few handſome houſes. The whole country in the vicinity of Cochin abounds with lakes, which are the repoſitories of the waters that ſpring from the weſt ſide of the Gauts, and is very flat, marſhy, and inſalubrious. At Cochin there were, at the beginning of the laſt century, about 4000 Jews, deſcendants, probably, of thoſe who fled through Perſia to the coaſt of Malabar, from the perſecution of Titus. They had a ſynagogue, in which were carefully kept their records, engraven on copper-plates; ſo that they could ſhow their hiſtory from Nebuchadnezzar to the preſent time. Wolfius, cited by Kennicott (State of the printed Heb. Text, vol. ii. 532.), is of opinion, that the Hebrew MSS. of Malabar claim a conſiderable degree of confidence. N. lat. 9° 58′. E. long. 76° 2′.

COCHIN, NICHOLAS, in *Biography*, an engraver of conſiderable merit; he was born at Troyes, in Champagne, but ſettled in Paris, where he engraved a great number of plates, not unfrequently in the ſtyle of Callot, whoſe diſciple he probably was; and, like that great maſter, he moſt excelled in ſmall figures. Many of his prints are from his own compoſitions. Amongſt his other works are, part of the plates for the entry of Lewis XIV., with his queen, into Paris. This work, conſiſting of 22 prints, was publiſhed 1622. Part of the plates for a large volume in folio, of battles, plans, views of towns, &c. relative to the conqueſts of the French army under the ſame monarch, publiſhed 1645. Various ſets of ſmall prints from the Old and New Teſtament, &c. deſcribed by Strutt and Heinecken.

COCHIN, NOEL, or NATALES R., an engraver, born at Troyes, and in all probability of the ſame family with the preceding artiſt. He worked at Paris about 1670, and afterwards went to Italy, and died, as it is ſuppoſed, at Venice. We have by him many bold, but coarſe, etchings from the works of Titian, Tintorett, the Caracches, and other Italian artiſts, and, among others, ſeveral of the plates for a work, entitled, "Tabellæ, ſelectæ ac explicatæ à Carola Catherina Patina, Pariſina Academica Batavii, 1691." This work was alſo publiſhed at Venice in the ſame year, with an Italian tranſlation of the deſcriptions. The prints, however, owe their chief value to the merit of the compoſitions from which they are engraved. Strutt. Heinecken.

COCHIN, CHARLES NICHOLAS, in his youth applied himſelf to painting, but afterwards quitted the palette for the graver.

He was received into the Royal Academy of Paris in 1731, and died in 1754. His numerous prints, though ſomewhat mannered, are executed in an agreeable and ſpirited ſtyle. Amongſt his beſt works are: "The meeting of Jacob and Eſau," from Le Moine; and "Jacob and Laban," its companion, from Reſtout; both upright plates of a middle ſize. He likewiſe engraved the two ſtudies of Raffaele, for the "Alexander and Roxana," in the Crozat cabinet. Strutt. Heinecken.

COCHIN, CHARLES NICHOLAS, ſon of the preceding artiſt, was born at Paris in 1715, and, aſſiſted by the inſtructions of his father, and his mother Louiſe Madeleine Hortemels, became an engraver of conſiderable celebrity. In 1749, he travelled to Italy with the marquis de Marigny, and after his return, was, in 1752, made a member of the Royal Academy of Paris, and, in the ſequel, appointed ſecretary and hiſtorian to that ſociety.

In addition to theſe honours, he was made a knight of the order of St. Michael, and keeper of the king's drawings. Of his works, then extremely numerous, Mr. Jombent publiſhed a catalogue in 1770. He was living, according to Mr. Strutt, in 1785, when that gentleman publiſhed his dictionary. Heinecken. Strutt.

COCHIN-CHINA, in *Hiſtory* and *Geography*. The extenſive empire of China terminates on the ſouth of the 22d degree of latitude; but a tongue of land continued with it extends on its weſtern ſide as far as the ninth parallel of north latitude. This prolongation of 13 degrees in extent, has a ridge of high mountains, which, running from north to ſouth, divides the Birman empire on the weſt, from the kingdoms of Tung-quin, or Tong-quin, Cochin-china, Tſiampa, or Siampa, and Cambodia, on the eaſt. Theſe names, though uſually marked on our charts, are unknown to the natives, except Tung-quin. The other three, collectively, are called An-nan, and are diſtinguiſhed by three great diviſions. The firſt, contained between the ſouthernmoſt point, which forms the extremity in the gulf of Siam, and which lies in about the ninth degree of latitude, as far as to the twelfth degree, is called Don-nai; the ſecond, extending from hence to the fifteenth degree, Chang; and the third, between this and the ſeventeenth degree, where the kingdom of Tung-quin commences, is called Hué. On the ſea-coaſt of all theſe diviſions, are ſafe and commodious bays and harbours. The great river of Don-nai (Cambodia on the chart) is deſcribed as navigable by ſhips of the largeſt ſize to the diſtance of forty miles, where the city Sai-gong is ſituated, having a capacious and a commodious port, and an extenſive naval arſenal. In the diviſion of Chang, in latitude 13° 50′ N., is Chin-chen bay and harbour; the latter ſpacious and completely ſheltered from all winds, but only acceſſible by large veſſels at high water, on account of a bar that runs acroſs the narrow entrance between it and the outer bay. At the head of this harbour is ſituated the city of Quin-nong. The principal city in the diviſion of Hué, which bears the ſame name, is ſituated on the banks of a large river, navigable by ſhips of a conſiderable burden; but a bar of ſand runs acroſs the mouth. A little to the ſouthward of this river is the bay of Han-ſare, or, as it is uſually marked in the charts, Turon, which, for the ſecurity and conveniences it affords, is equalled by few in the eaſtern world. It is ſituated in N. lat. 16° 7′.

Cochin-china, properly ſo called, extends from about the 20th degree of north latitude to Pulo Condore, which lies in 8° 40′. It is bounded by the kingdom of Tong-quin on the N., from which it is ſeparated by the river Sungen, by the kingdom of Laos, and by a range of mountains, which divides it from Cambodia on the W.; and by that part of the eaſtern ocean, called the Chineſe ſea, on the S. and E. The kingdom is divided into 12 provinces, lying upon the ſea coaſt, and ſucceeding each other from north to ſouth. Its breadth bears no proportion to its length; as few of the provinces extend further than a degree from eaſt to weſt, and ſome leſs than 20 miles. The whole country is interſected by rivers, which, though not large, are favourable to inland commerce. The climate is healthy, as the violent heat of the ſummer-months is tempered by regular breezes from the ſea. The rainy ſeaſons are September, October, and November; when the low lands are liable to be ſuddenly overflowed by immenſe torrents of water that flow from the mountains. Theſe inundations, which happen generally once a fortnight, laſt three or four days. The frequent rains which are brought in December, January, and February, by cold northerly winds, diſtinguiſh this country by a winter different from any other in the Eaſt. The inundations, like the overflowings of the Nile in Egypt, contribute very much to fertilize this country; ſo that in many parts the land produces three crops of grain in the year. All the fruits of India are found here in the greateſt perfection, with many of thoſe of China. Aſiatic Regiſter. iii. 84.

Hiſtory of Cochin-china. This country had a ſhare in all the early revolutions of Tung-quin; it was ſubject originally to the Chineſe government, and of courſe liable to the ſame changes which China itſelf experienced. In many periods of its hiſtory, Cochin-china ſeems to have ſtood high in the eſtimation of the parties contending for rule. When the Ming had expelled the Mogul Tartars from China, the new emperor, chief of that dynaſty, ſent notice to the king of Cochin-china of his acceſſion to the throne, and cauſed ſacrifices to be offered up in honour of the ſpirits of mountains, foreſts, and rivers. Itataha, who was then ſovereign, ſent his tribute to the new monarch, from whom, in return, he received magnificent preſents. In 1373, this ſame prince made ſo many naval captures from the pirates who infeſted the ſeas, that he was enabled to preſent the emperor with ſeventy thouſand pounds weight of precious woods.

In the next century, after a long and very bloody war, the kings of Tung-quin became abſolute maſters of Cochin-china, as far as cape Aurilla, in N. lat. 12° 34′. The aborigines, called Moys, retired to the mountains that ſeparate Cochin-china from Cambodia, where they have ever ſince remained. They are ſaid to be a ſavage race of people, very black, and in their features reſembling the Caffres.

After this revolution, the Chineſe hiſtorians ſpeak but little of Cochin-china. It, however, recovered its independence, and continued to be governed, as it is at preſent, by its own kings. There is, notwithſtanding this, but little come down to us of its hiſtory, till what is given us by Mr. Barrow, which commences in the year 1774, and of which the following is a brief outline.

In the year 1774, and in the 35th year of the reign of Caung-ſhung, king of Cochin-china, an inſurrection broke out in the city Quin-nong, the capital of his kingdom. This rebellion was headed by three brothers, of whom the eldeſt, named Yin-yac, was a wealthy merchant, who carried on an extenſive commerce with China and Japan: the name of the ſecond was Long-niang, a general officer of high rank, and great command; and the third was a prieſt. Such a dangerous combination of wealth, of military power, and of influence over the minds of the people, was but feebly reſiſted on the part of the king, who had for many years ſurrendered, in a great degree, the reins of government into the hands of his generals, who were moſtly eunuchs. Other circumſtances tended to forward the views of the rebel chiefs. The impoſition of a poll-tax had created general diſcontent among the people. They ſeized upon the king, whom, with as many of his family as they could get into their hands, they put to death. The city of Sai-gong was ſuppoſed to be favourable to the cauſe of the depoſed ſovereign: an army was therefore marched againſt it, the city was taken, and 20.000 of its inhabitants put to the ſword. The uſurpers left no meaſures untried, nor ſuffered any occaſion to paſs by, which might be the means of giving them popularity. The merchant gave ſumptuous entertainments, fetes and fire-works: the general encouraged and flattered his army, and the prieſt prevailed on the clergy to announce to the multitude the decree of Tien, which had ordained theſe three worthies to be their future rulers. According to a plan laid down for the government of this extenſive country, it was determined that Yin-yac ſhould poſſeſs the two diviſions of Chang and Don-nai: Long-niang that of Hué, bordering on Tung-quin; and that the youngeſt brother ſhould be high prieſt of all Cochin-china. Thus Yin-yac placed his brother between himſelf and the Tung-quineſe, who were regarded as a very powerful people; with theſe Long-niang took occaſion to quarrel, but they were unable to cope with him. Their king, after the firſt engagement, abandoned his army, and fled to Pekin to implore the aſſiſtance of the emperor. Kien-Lung, who, from his ſucceſſes in every part of Tartary, and on the great iſland of Formoſa, had been led to believe that his troops were invincible, conceived there would be but little difficulty in driving the uſurper from Tung-quin, and in reſtoring the lawful ſovereign to his throne. For this purpoſe he ordered the viceroy of Canton to march immediately at the head of 100.000 men. Long-niang, apprized of the movements of this immenſe army, and having aſcertained their line of march, ſent out detachments to plunder and deſtroy the towns and villages, through which it muſt paſs: the country being thus laid waſte, the Chineſe army, long before it had reached the frontier of Tung-quin, was ſo diſtreſſed by the want of proviſions as to be obliged to fall back; but in their retreat they were harraſſed by the enemy to ſuch a degree, that by fatigue, famine, and ſword, half the Chineſe army was deſtroyed without a general battle being fought. The viceroy, when he was within 100 miles of Canton, offered to negociate with the uſurper, but Long-niang aſſuming the character and tone of a conqueror declared, that having been called to the throne of Tung-quin by the will of heaven and the voice of the people, he was determined to maintain his right to the laſt extremity: that he had 200,000 men in Tung-quin, and as many in Cochin-china, ready to die in his cauſe: and that he was no longer an uſurper, for he had been crowned Quang-tung, king of the united kingdoms of Tung-quin and Cochin-china. The viceroy was but ill prepared for this decided tone: yet no time muſt be loſt in deliberation. He diſpatched a courier to Pekin, giving an account of victories gained, and enemies ſubdued, although himſelf had been driven before the enemy without once daring to hazard an engagement. At the ſame time he ſpoke in high terms of commendation of his antagoniſt, and of his right to the crown for which he had been contending, and gave it as his opinion that Quang-tung ſhould be invited to the court of Pekin to do the uſual homage, and to receive the ſanction of the emperor for holding the throne of Tung-quin; ſuggeſting, alſo, that a degree of mandarinate in one of the provinces of China, conferred on the late ſovereign of that country, would be an ample indemnification for the loſs he had ſuſtained in Tung-quin. The court approved the viceroy's propoſal. The fugitive king of Tung-quin relinquiſhed his pretenſions to a crown, and accepted the degraded title of a Chineſe Mandarin: after which an invitation was diſpatched to Quang-tung to proceed to Pekin. The wary general ſent an officer as his repreſentative, who was to act the part of the new king of Tung-quin and Cochin-china. He was received at the court of Pekin with all due honours, loaded with preſents, and confirmed in his title to the united kingdoms, which were to be regarded as tributary to the emperor of China. On the return of this mock king to Hué, Quang-tung knew not how to act; but perceiving that the affair could not remain a ſecret, he cauſed his friend and the whole ſuite to be put to death, as the only means of preventing the trick which had been ſucceſsfully played on the emperor of China, from being diſcovered. This event happened in the year 1779. At the time of the rebellion in Cochin-china, there reſided at court a French miſſionary of the name of Adran, who was ſtrongly attached to the royal family, and who effected the eſcape of the queen and her ſon. By favour of the night they fled to a conſiderable diſtance from the capital, and took refuge in a foreſt. Here for ſeveral months the young king of Cochin concealed himſelf, and the remnant of his unfortunate family, in the ſhady branches of a banana-tree, where they received their daily ſuſtenance from the hands of a Chriſtian prieſt, who carried them ſupplies at the hazard of his life, till all farther ſearch was given up. As ſoon as the enemy had retired, the unfortunate fugitives made the beſt of their way to Sai gong, where the people flocked to the ſtandard of their legitimate ſovereign, whom they crowned as king of Cochin-china, under the name of his late father, Caung-ſhung. At this time there were in the port of Sai-gong an armed veſſel commanded by a Frenchman, ſeven Portugueſe merchantmen, and a conſiderable number of junks and row-boats. Theſe the king purchaſed for the purpoſe of making an attack on the uſurper's fleet, in the harbour of Quinnong. The monſoon was favourable for the project, but the reſult was not crowned with ſucceſs, and the young monarch was glad to make a haſty retreat. Though a conſiderable part of Yin-yac's fleet was diſabled or deſtroyed, it anſwered no other purpoſe than to rouſe his attention towards the ſouthern parts of the country. Caung-ſhung had ſcarcely returned to Don-nai, which he reached with difficulty, on account of the monſoon being adverſe to his return, when intelligence was received that a large army was on its march againſt him. Reſiſtance on his part being in vain, he determined to ſeek for ſafety in flight. Having collected the remains of his family, and a few faithful followers, he embarked in the river of Sai-gong, and after a ſhort voyage, arrived ſafely on a ſmall uninhabited iſland in the gulf of Siam, called Pulo Wai. Here he was joined in a ſhort time by about 1200 of his ſubjects fit to carry arms. The uſurper having diſcovered the place of his retreat was upon the point of ſending out an expedition againſt him, but Caung-ſhung, apprized of his intention, deemed it more prudent to embark for Siam, and to throw himſelf on the protection of the king of that country. He had not been long landed before he offered his aſſiſtance, and that of his people, to join his Siameſe majeſty againſt the Birmans: theſe he ſoon reduced to the neceſſity of ſuing for peace on any terms. Caung-ſhung returned to the capital of Siam, where he was received with univerſal joy, and every demonſtration of kindneſs, on the part of the king, who loaded him with preſents of gold, ſilver, and precious ſtones. He did not remain long in favour, but was obliged with his adherents to ſeek refuge again in their ſolitary iſland. Here he fortified himſelf ſecurely againſt his enemies, and in a ſhort time, learnt through his friend Adran, that the greater part of his ſubjects were ſtill attached to him, and diſſatisfied with the uſurper. He committed his ſon to the care of Adran, who embarked with his charge for Pondicherry, and from thence they ſailed to Paris, where they arrived in the year 1787. The young prince was preſented at court, and treated with every mark of reſpect. In the courſe of a few months Adran concluded a treaty between Louis XVI. and the king of Cochin, in which the former engaged to lend Caung-ſhung effectual aſſiſtance to reſtore him to his own throne. The ſcheme was, however, ſuſpended firſt by the devices of an artful woman, and afterwards completely abandoned by the French Revolution in 1789. The biſhop nevertheleſs did not deſpair of the cauſe; he, with the young prince and ſome volunteers from France, went in ſearch of the king. At the mouth of the river leading to Sai-gong they learned that the monarch had remained two years, living, like the reſt of his adherents, on the roots which they dug from the ground, but that he had at length raiſed his ſtandard in Don-nai. In the year 1790, the biſhop and his ſon joined him at Sai-gong; they were followed by a ſmall veſſel which had been taken up to convey arms and ammunition. The greater part of the firſt year was occupied in fortifying the place, in recruiting and diſciplining the army, and in collecting and equipping a fleet. In the year 1791, the rebel Quang-tung died at Hué, leaving behind him a ſon of about 12 years of age to ſucceed in the government of Tung-quin, and the northern part of Cochin-china. Caung-ſhung immediately commenced operations againſt Yin-yac; the attack was ſo wholly unexpected on the part of Yin-yac, that he and his court had gone thirty miles up the country to enjoy the pleaſure of hunting. On ſuch occaſions the ſovereign is not only attended by a few courtiers, but with numbers ſufficient to compoſe a ſmall army. They are chiefly ſoldiers, who ſurround the thickets, and having ſprung the game, which is uſually an elephant, or tyger, or buffalo, they diminiſh the diameter of the circle, till fixing the animal on a ſpot, they either kill him with their ſpears or take him priſoner: The alarm of the enemy was quickly communicated to the hunting party, and the beach was preſently lined with troops: but they were of little aſſiſtance, and the uſurper had the mortification of witneſſing the deſtruction of his fleet by that of Caung-ſhung. In the year 1793, when the Britiſh ſquadron, in its way to China, came to anchor in Turon-bay, it was known that the whole of Donnai was in poſſeſſion of the lawful ſovereign. Chang, the middle part of the country, was held by the uſurper Yin-yac; and Hué, including the country and iſlands adjacent to Turon-bay, was governed by the ſon of Quang-tung. At firſt it was ſuppoſed that our fleet had come in aid of the legitimate ſovereign, and under this idea, his opponents aſſembled a conſiderable body of troops and elephants in the vicinity of Turon, and it was not till after many days had expired, that this impreſſion was done away. The rebel, Yin-yac, did not long ſurvive the deſtruction of his fleet: he died a few months after the Britiſh left Turon bay of a diſeaſe brought on by rage and deſpair at the ſucceſs of the lawful king: by ſome, however, his death has been imputed to poiſon adminiſtered by his ſubjects already wearied with his government. He was ſucceeded by his ſon, who poſſeſſed all the vices without the talents of the father. Cruel, deceitful, and vindictive, he was univerſally hated. In the year 1796, Caung-ſhung reſolved to attack his capital by land. The young uſurper brought againſt him an army of 100,000 men; but the king completely routed it with a much inferior force, and took poſſeſſion of Quin-nong. On this occaſion an extraordinary inſtance of magnanimity is related of Caung-ſhung. When the garriſon had ſurrendered, the king, having been engaged in perſon the whole day, and worn out with fatigue, was conveyed into the citadel in a ſedan-chair; but, on paſſing the inner gate, he was fired at by a perſon on the rampart: the culprit was ſeized and brought before the king, when it was diſcovered that he was a general officer, and a relation to the uſurper. The king, according to the cuſtom of the Chineſe, when it is intended to mitigate the ſentence of death paſſed on a criminal, told him, that inſtead of ordering his head to be ſtruck off, he would allow him his choice of poiſon, a cord of ſilk, or a dagger. "If you are not afraid of me," ſaid the rebel chief, "you will inſtantly order my releaſe; and as I have ſworn never to live under your protection, or to be obedient to your laws, if you dare comply with what I aſk, I ſhall immediately repair to Hue, where my rank and character will procure me the command of an army, at the head of which I ſhall be proud to meet you." The king ordered his releaſe, and cauſed him to be eſcorted to the northern frontier; and the following year this very man was ſecond in command at the ſiege of Quin-nong where he loſt his life. The ſon of Yin-yac was completely ſubdued, and the whole country, as far as Turon-bay, ſubmitted to the arms of the lawful ſovereign. The other uſurper ſtill kept poſſeſſion of the kingdom of Tungquin, againſt which Caung-ſhung was preparing a formidable armament in the year 1800, ſince which there have been no authentic accounts, though, according to Mr. Barrow, there are grounds for believing that he has re-conquered the whole of that country. From the year 1790, in which Caung-ſhung returned to Cochin-china, to 1800, he was allowed to enjoy only two years peace; theſe, however, were probably the moſt important in his hitherto troubleſome reign. Under the auſpices of the biſhop Adran, who, in every undertaking of conſequence, was to him as an oracle, he turned his attention to the improvement of his country. He eſtabliſhed a manufactory of ſalt petre, opened roads of communication between important poſts and conſiderable towns, and planted them on each ſide with trees for the ſake of ſhade. He encouraged the cultivation of the areca nut and the betel pepper, the plantations of which had been deſtroyed by the army of the uſurper. He held out rewards for the propagation of the ſilk worm; cauſed large tracts of land to be prepared for the culture of the ſugar-cane; and eſtabliſhed manufactures for the preparation of pitch, tar, and reſin. He cauſed ſeveral thouſand matchlocks to be fabricated; he opened a mine of iron ore, and conſtructed ſmelting-furnaces. He diſtributed his land forces into regular regiments; eſtabliſhed military ſchools, where officers were inſtructed in the doctrine of projectiles and gunnery by European maſters; and Adran tranſlated into the Chineſe language a ſyſtem of military tactics for the uſe of his army. In the courſe of theſe two years he conſtructed three hundred large gun-boats, five luggers, and a frigate built upon the French plan. He cauſed a ſyſtem of naval tactics to be introduced, and had his naval officers inſtructed in the uſe of ſignals. An Engliſh gentleman, in the year 1800, ſaw a fleet of 1200 ſail, under the immediate command of this prince, weigh their anchors, and drop down the river in the higheſt order, in three ſeparate diviſions, forming into lines of battle, and going through a variety of manœuvres by ſignals as they proceeded. During this interval of peace he undertook to reform the ſyſtem of juriſprudence: he aboliſhed ſeveral ſpecies of torture, and he mitigated puniſhments that appeared to be diſproportionate to the crimes of which they were the conſequence. He eſtabliſhed public ſchools, to which parents were compelled to ſend their children at the age of four years, under certain pains and penalties. He drew up regulations for the commercial intereſts of his kingdom; cauſed bridges to be built over rivers; buoys and ſea-marks to be laid down in all the dangerous parts of the coaſts; and ſurveys to be made of the principal bays and harbours. He ſent miſſions into the mountainous diſtricts on the weſt of his kingdom, inhabited by the Laos and the Maotſe, barbarous nations whom he wiſhed to bring into a ſtate of civilization and good government. In ſhort, this monarch, by his own indefatigable application to the arts and manufactures, rouſed, by his example, the energies of his people, and ſpared no pains to regenerate his country. In leſs than ten years, from a ſingle veſſel he accumulated a fleet of 1200 ſhips, of which three were of European conſtruction. Caung-ſhung is, in the ſtricteſt ſenſe of the word, a ſoldier, and holds the name of general in far greater eſtimation than that of ſovereign: he is deſcribed as being brave without raſhneſs; and fertile in expedients, when difficulties are to be ſurmounted. He is neither diſcouraged by difficulties, nor turned aſide by obſtacles. Cautious in deciding, but, when once reſolved, prompt and vigorous to execute. In battle he is always eminently diſtinguiſhed; attentive to all the officers under his command, he ſtudiouſly avoids to mark out any individual as a favourite. He knows the name of almoſt every ſoldier, and delights in talking over with them of their adventures and exploits; he makes particular inquiries after their wives and children; and even enters with a degree of intereſt into a minute detail of their domeſtic concerns. To foreigners he is affable and condeſcending; he profeſſes a veneration for the doctrines of Chriſtianity, and tolerates all religions in his dominions. He obſerves a moſt ſcrupulous regard to the maxims of filial piety, as laid down in the works of Confucius, and humbles himſelf in the preſence of his mother, who is ſtill living, as a child before its maſter. With the works of the moſt eminent Chineſe authors he is well acquainted; for the energy of his mind is not leſs vigorous than the activity of his corporeal faculties. He is repreſented as the main-ſpring of every movement that takes place in his extenſive kingdom. To enable him the better to attend to the concerns of his government, his mode of life is regulated by a fixed plan. At ſix in the morning he riſes and goes into the cold bath; at ſeven he has a levee with his mandarins, when the letters received on the preceding day are read, on which his orders are minuted by the reſpective ſecretaries. He then proceeds to the naval arſenal, examines the works that had been performed in his abſence, and rows in his barge round the harbour, inſpecting his ſhips of war. About twelve or one he takes his breakfaſt in the dock-yard, which conſiſts of boiled rice and dried fiſh. At two he retires and ſleeps till five, when he gives audience to the naval and military officers, the heads of tribunals or public departments, and examines what they may have to propoſe. Theſe affairs generally employ his attention till midnight, when he retires to his private apartments, makes notes of the occurrences of the day, takes a light ſupper, paſſes an hour with his family, and retires to bed between two and three in the morning. We have been thus particular in drawing the character of this prince, on account of the aſcendancy which he is likely to gain in that part of the Eaſt. The ſtrength of the forces of the king in Cochin-china was, in the year 1800, as follows:

ARMY.	Men.
24 Squadrons of buffalo cavalry	6,000
16 Battalions of elephants (200 beaſts)	8,000
30 Battalions of artillery	15,000
25 Regiments of 1200 each, trained in the European manner	30,000
Infantry with match-locks, &c.	42,000
Guards trained in European tactics	12,000
Land forces	113,000
MARINE.	
Artificers in the naval arſenal	8,000
Sailors regiſtered on the ſhips in the harbour	8,000
Attached to the European built veſſels	1,200
Attached to the junks	1,600
Attached to a hundred row-galleys	8,000
Marine forces	26,800

Making in the whole, for the land and ſea-ſervice, one hundred and thirty-nine thouſand eight hundred men.

Theſe military men are active and vigorous, and not encumbered with dreſs; they wear paſte-board helmets, with taſſels of cow-tails, dyed ſcarlet; their quilted jackets and petticoats are completely Chineſe. In general, a handkerchief, tied about the head, ſomewhat in the ſhape of a turban, a looſe ſmock-frock, with a pair of drawers, conſtitute the dreſs of a ſoldier.

Manners and Cuſtoms of the Cochin-Chineſe. "As none of the houſes," ſays Mr. Barrow, "were large enough for the accommodation of our party, the governor of Turon directed a ſhed to be built, which was finiſhed in the courſe of a few hours; the roof and ſides were covered with thick cloſe mats. Within this ſhed was placed a row of little tables, with forms on each ſide. In China it is the cuſtom to cover their tables ſo completely with diſhes, or bowls, that no part of their ſurfaces can be ſeen; but the Cochin-Chineſe ſeem to have improved on the liberality of their neighbours, by not merely covering the table, but by piling the bowls in rows on each other, three or four high. Of table-linen, knives, bottles, and glaſſes, they make no uſe; but before each perſon is laid a ſpoon of potter's ware, and a pair of porcupine quills, or ſmall ſticks, like thoſe uſed by the Chineſe. The contents of the bowls are preparations of beef, pork, fowls, and fiſh, cut into ſmall pieces, mixed with vegetables, and dreſſed in ſoups and gravies, compoſed of various materials. Neither wine, nor ſpirits, nor fermented liquors of any kind, nor even water, are ſerved round during the time of eating; but when dinner is over, the Chineſe *ſeau-choo* is handed about in porcelain cups. The governor does not ſit down with ſtrangers, but uſually when he entertains ſuch, lies ſtretched on a mattraſs at the end of a room, ſmoking tobacco, or eating his areca nut, while two tall fellows agitate the air the whole time with large fans, made of the winged feathers of the Argus pheaſant. The dreſs of the Cochin-Chineſe is thus deſcribed: they go bare-legged, and generally bare-footed; their long black hair, like that of the Malays, is uſually twiſted in a knot, and fixed on the crown of the head. This, indeed, is the ancient mode in which the Chineſe wore their hair, until the Tartars, on the conqueſt of the country, compelled them to ſubmit to the ignominy of ſhaving the whole head, except a little lock of hair behind. The houſes in general conſiſt only of four mud walls, covered with thatch; and ſuch as are ſituated on low ground, or in the neighbourhood of rivers, are uſually raiſed on four poſts of wood, or pillars of ſtone, to keep out vermin, as well as inundations. The Cochin-Chineſe are, like the French, always gay and forever talking; the Chineſe always grave, and affect to be thinking; the former are open and familiar; the latter cloſe and reſerved. A Chineſe would conſider it as diſgraceful to commit any affair of importance to a woman. Women, in the eſtimation of the Cochin-Chineſe, are beſt ſuited for, and are accordingly entruſted with the chief concerns of the family. In Cochin-china the women are quite as gay and unreſtrained as the men; but it appears to be their fate to be doomed to thoſe occupations which require, if not the greateſt exertions of bodily ſtrength, at leaſt the moſt perſevering induſtry. They may be ſeen, day after day, and from morning till night, ſtanding in the midſt of pools of water, occupied in the tranſplanting of rice; all the labours of tillage, and the various employments connected with agriculture, fall to the ſhare of the female peaſantry; while thoſe in Turon, to the management of domeſtic concerns, add the ſuperintendence of all the details of commerce. They even aſſiſt in conſtructing and keeping in repair their mud-built cottages. They conduct the manufacture of coarſe earthenware veſſels; they manage the boats on rivers and in harbours; they carry their articles of produce to market; they draw the cotton-wool from the pod, ſpin it into thread, weave it into cloth, dye it of its proper colour, and make it up into dreſſes for themſelves and their families. The young men in general are compelled to enrol themſelves in the army, and ſuch as are exempt from military ſervice, employ themſelves occaſionally in fiſhing, in collecting ſwallows neſts, and the *biches de mer*, among the neighbouring iſlands, as luxuries for the uſe of their great men, but more particularly as articles of export for the China market; in felling timber, building and repairing ſhips and boats, and ſome other occupations, which however they take care ſhall not engroſs their whole time, but contrive to leave a conſiderable portion of it unemployed, or employed only in the purſuit of ſome favourite amuſement. But the activity and induſtry of the women are ſo unabating, their purſuits ſo various, and the fatigue they undergo ſo haraſſing, that the Cochin-Chineſe apply to them the ſame proverbial expreſſion which we apply to a cat, obſerving, that a woman, having nine lives, bears a great deal of killing. The men in this country, even in the common ranks of life, conſider the other ſex as deſtined for their uſe; and thoſe in the higher ſtations as ſubſervient to their pleaſures. The number of wives, or concubines, which a man may find it expedient to take, is not limited by any law; but here, as in China, the firſt in point of date claims precedence, and takes the lead in all domeſtic concerns. The terms on which the parties are united are not more eaſy, than thoſe by which they may be ſeparated; the breaking of one of their copper coins, or a pair of ſticks with which they eat their food, before proper witneſſes, is conſidered as a diſſolution of their former compact, and their act of ſeparation. In China, as we have ſeen, the men have ſedulouſly and ſucceſsfully inculcated the doctrine, that a well-bred woman ſhould never be ſeen abroad; and ſo craftily have they contrived their precepts to operate, that the ſilly women have been prevailed on to conſider a phyſical defect, which confines them to the houſe, as a faſhionable accompliſhment. In this reſpect there is a total difference with regard to the Cochin-Chineſe women; they have the free uſe of their limbs and their liberty, and, by their buſtling about with naked feet, they become unuſually large and ſpreading. The ſame cauſe, which in China has effected this total ſecluſion of the ſex from ſociety, and the abridgement of their phyſical powers, has produced in Cochin-china a diametrically oppoſite effect, by permitting them to revel uncontroled in every ſpecies of licentiouſneſs; hence they are degraded in public opinion, and conſidered as beings of an inferior nature to men. Thus ſituated, character becomes of little value either to themſelves or others; the conſequence of which is, that women of leſs delicacy, or men of more accommodating diſpoſitions, are not to be met with in any part of the world than thoſe in the environs of Turon bay; perhaps, however, the general character of the nation is not to be aſcertained from that which prevails at a ſea-port. The ſingular indulgence granted by the laws of Solon, of permitting young men to diſpoſe of their perſonal favours, for the purpoſe of enabling them to procure the articles of the firſt neceſſity for themſelves or their families, is ſanctioned by the Cochin-Chineſe, without any limitation as to age, condition, or object. Neither the huſband nor the father ſeems to have any ſcruples in abandoning the wife or the daughter to her gallant. This profligacy of character is not confined to the common people; it applies indeed more forcibly to the firſt ranks of ſociety. There is, however, but little that is prepoſſeſſing in the general appearance of the Cochin-Chineſe. The women have but ſlender pretenſions to beauty; yet the want of perſonal charms is in ſome degree compenſated by a lively and cheerful temper. Both ſexes are coarſely featured, and their colour is very dark; they have the univerſal cuſtom of chewing areca and betel, which, by reddening the lips, and blackening the teeth, gives them an appearance ſtill more unſeemly than nature intended. The dreſs of the women is by no means faſcinating. A looſe cotton frock, of a brown or blue colour, reaching down to the middle of the thigh, and a pair of black nankeen trowſers, made very wide, conſtitute in general their common clothing. With the uſe of ſtockings and ſhoes they are wholly unacquainted; but the upper ranks wear a kind of ſandals, or looſe ſlippers. As a holiday dreſs, on particular occaſions, a lady puts on three or four frocks at once, of different colours and lengths, the ſhorteſt being uppermoſt. Their long black hair is ſometimes twiſted into a knot, and fixed on the crown of the head, and ſometimes hangs looſe in flowing treſſes down the back, frequently reaching to the very ground. Short hair is not only conſidered as a mark of vulgarity, but an indication of degeneracy; the dreſs of the men has little, if any thing, to diſtinguiſh it from that of the other ſex, being chiefly confined to a jacket and a pair of trowſers. Some wear handkerchiefs tied round the head, others have hats or caps, formed for protecting their face againſt the rays of the ſun; for which purpoſe they alſo make uſe of umbrellas of ſtrong China paper, or ſcreens of leaves, or fans made of feathers. Conſonant with the appearance of their mean and ſcanty clothing, are their lowly cabins of bamboo. There is, however, ſuch a vaſt difference in the circumſtances under which an European and an inhabitant of a tropical climate are ſituated, that the former, who for the firſt time finds himſelf among the latter, will be very apt to fall into error in attempting to form a comparative eſtimate of their reſpective conditions. To the one, fuel and clothing, and cloſe and compact lodging, are eſſential, not only to his comfort, but to his exiſtence; to the other, fire is of no father uſe than a few embers to boil his rice, or to prepare an offering for his god. Cloſe, thick clothing, ſo far from being a comfort, would be to him the moſt inconvenient of all incumbrances. Even the little which he occaſionally finds it expedient to uſe, he frequently throws aſide; for where nakedneſs is no diſgrace, he can at all times, and in all places, accommodate his dreſs to his feelings and his circumſtances. In the vicinity of Turon bay, there are only a few villages, in the largeſt of which the number of houſes do not exceed 100, and theſe chiefly thatched. The cottages of Turon are in general ſnug and clean, and ſufficiently compact to protect the inhabitants from the heat of the ſun at one ſeaſon, and the heavy rains at the other. There ſeems to be no want in the market of either cotton or ſilk ſtuffs for clothing; and the country produces a great variety and abundance of articles, which contribute to the ſuſtenance of the multitude, as well as to the luxuries of the higher orders of the people. Almoſt every kind of domeſtic animal, except ſheep, appears to be very plentiful. In Cochin-china they have bullocks, goats, ſwine, buffaloes, elephants, camels, and horſes. In the woods are found the wild boar, tiger, and rhinoceros, with plenty of deer; they account the fleſh of the elephant a great dainty, and their poultry is excellent. They pay little attention to the breeding of bullocks, as the tillage of their land is performed by buffaloes, and their fleſh is not eſteemed as food. The ſea, as well as the land, is a never-failing ſource of ſuſtenance to thoſe who dwell on the coaſt. Moſt of the general marine worms, diſtinguiſhed by the name of *molluſca*, are uſed as articles of food by the Cochin-Chineſe. All the gelatinous ſubſtances derived from the ſea, whether animal or vegetable, are conſidered by them the moſt nutritious of all aliments; and, on this principle, various kinds of ſea-weeds, particularly the *fuci* and *ulvæ*, are included in their liſt of edible plants. The Cochin-Chineſe collect likewiſe many of the ſmall ſucculent, or fleſhy plants, which are uſually produced on ſalt and ſandy marſhes, which they either boil in their ſoups, or eat in a raw ſtate, to give ſapidity to their rice, which with them is the grand ſupport of exiſtence. In Cochin-china they are almoſt certain of two plentiful crops of rice every year, one of which is reaped in April, the other in October. Fruits of various kinds, as oranges, bananas, figs, pine-apples, pomegranates, and others of inferior note, are abundantly produced in all parts of the country. They have very fine yams, and plenty of ſweet potatoes. Their ſmall breed of cattle does not appear to furniſh them with much milk, but of this article they make a ſparing uſe, even with regard to their young children. Children, till the age of ſeven or eight years, go entirely naked, and their food ſeems to conſiſt chiefly of rice, ſugar-cane, and water-melons. The maſs of the people in Cochin-china, like the common Chineſe, have but two meals in the day, one about nine or ten in the morning, and the other about ſun-ſet; and theſe are uſually taken in the dry ſeaſon, before the doors of their cottages, upon mats ſpread in the open air.

Amuſements. The Cochin-Chineſe are very fond of theatrical amuſements; the actors are buſily engaged in their performances the whole day, proceeding, apparently, with as much ardour when there are few or even no ſpectators preſent, as when there are many. Being hired for the day, a crowded or a thin audience makes but little difference to the performers, all their concern being the receit of their pay on the finiſhing of their labour. One of theſe exhibitions has been deſcribed by Mr. Barrow. "In the farther diviſion of the buildings," ſays he, "a party of comedians was engaged in the midſt of an hiſtorical drama when we entered; but on our being ſeated they broke off, and coming forward made before us an obeiſance of nine genuflexions and proſtrations, after which they returned to their labours, keeping up an inceſſant noiſe and buſtle during our ſtay. The horrible craſh of the gongs, kettle-drums, rattles, trumpets and ſqualling flutes, were ſo ſtunning and oppreſſive, that nothing but the novelty of the ſcene could have detained us for a moment. The moſt entertaining part of the exhibition was a ſort of interlude, performed by three young women, for the amuſement as it ſhould ſeem of the principal actreſs, who ſit as a ſpectator in the character of ſome ancient queen; whilſt an old eunuch, very whimſically dreſſed, played his antic tricks, like a buffoon, in an harlequin entertainment. The dialogue was light and comic, and occaſionally interrupted by cheerful airs, which concluded with a common chorus. Theſe airs, rude and unpoliſhed as they were, appeared to be regular compoſitions, and were ſung in exactly meaſured time. The voices of the women were ſhrill and warbling, but ſome of their cadences were not without melody, and the inſtruments at each pauſe gave a few ſhort flouriſhes, till overpowered by the deafening gong. At each repetition of the chorus, the three Cochin-Chineſe graces diſplayed their fine ſlender ſhapes in the mazy dance, in which, however, the feet were the leaſt concerned. By different geſtures of the head, body, and arms, they aſſumed a variety of figures, and all their motions were exactly adapted to the meaſure of the muſic. No entrance money is ever expected in the theatre of China, or Cochin-china. The actors are either hired to play at private entertainments, at a fixed ſum for the day; or they exhibit before the public in a temporary ſhed entirely expoſed in front. On ſuch occaſions, inſtead of cheering the performers with empty plaudits, the audience throw among them pieces of copper money.” At Cochin-china football with a bladder; leaping over an horizontal pole, and other acts of agility are practiſed. The men amuſe themſelves in fighting cocks, and young boys, in imitation of their elders, train quails, ſmall birds, and even graſshoppers to tear each other in pieces; and in every corner of the ſtreets gameſters may be ſeen playing at cards, or throwing of dice. But what will moſt aſtoniſh an European, is the ſight of a party of young men keeping up a ſhuttlecock in the air, by ſtriking it with the ſoles of the feet. Nothing indeed can exceed the activity and energy of the men in Cochin-china; but, active as they are, in the uſe of their feet, their manual dexterity is not leſs remarkable. Jugglers and conjurors, and poſture-makers, are continually exerciſing their reſpective arts for the amuſement of the crowd, and for their own advantage; and thoſe who do not openly practiſe juggling as a profeſſion, are equally as expert in the art of picking pockets. They are all, from the higheſt to the loweſt, moſt importunate beggars, craving without the leaſt ceremony, for every thing that may ſuit their fancy; they are neither ſatisfied with a ſimple denial, nor even with obtaining what they aſk, but generally become more urgent in their demands, in proportion to the liberality of the giver, and what they cannot obtain by begging, they uſually endeavour to procure by ſtealing.

Arts, Manufactures, &c. That particular branch of the arts in which the Cochin-Chineſe may be ſaid to excel at the preſent day, is naval architecture, for which they are not a little indebted to the ſize and quality of their timber. Their row-gallies for pleaſure are remarkably fine veſſels, from 50 to 80 feet in length, and they are ſometimes compoſed of five ſingle planks, each extending from one extremity to the other. The edge is mortiſed, kept tight by wooden pins, and bound firm by twiſted fibres of bamboo, without either ribs or any kind of timbers. At the ſtem and ſtern they are raiſed to a conſiderable height, and are curiouſly carved into monſtrous figures of dragons and ſerpents, ornamented with gilding and painting. A number of poles, bearing flags and ſtreamers, pikes ornamented with tufts of cows' tails painted red, lanterns and umbrellas, and other inſignia, denoting the rank of the paſſenger, are erected at each end of the boat. The veſſels that are employed in the coaſting trade, the fiſhing craft, and thoſe which collect ſwallows-neſts among the iſlands, are of various deſcriptions: many of them covered with ſheds of matting, under which whole families conſtantly reſide. Their foreign traders are built on the ſame plan as the Chineſe junks; the form and conſtruction of which are entitled to but little reſpect, except from the antiquity of the invention. As theſe veſſels were never intended for ſhips of war, ſecurity rather than ſpeed has always been the object of the owner. And as no great capitals are employed in trade, and the merchant is both owner and navigator, a limited tonnage is ſufficient for his own merchandize; the veſſel is therefore divided into diſtinct compartments, ſo that one ſhip may ſeparately accommodate many merchants. The bulk heads, by which the diviſions are formed, conſiſt of planks two inches thick, and ſo well caulked and ſecured as to be completely water tight. A ſhip thus fortified with croſs-bulk heads, may ſtrike on a rock, and yet ſuſtain no ſerious injury; a leak ſpringing in one diviſion of the whole will not be attended with any damage to the articles placed in another; and by the ſhip being ſo well bound together, ſhe is firm and ſtrong enough to ſuſtain a more than ordinary ſhock. In the neighbourhood of Turon are ſeveral plantations of ſugar and tobacco. The juice of the former having undergone a partial refinement, is exported to China in cakes, which in colour, thickneſs, and poroſity, reſemble the honeycomb; the latter is conſumed in the country, as all degrees, of every age and ſex, indulge in the habit of ſmoaking. The face of the country exhibits but feeble marks of tillage, and arts and manufactures are evidently in a languiſhing ſtate. The cottages contain little furniture, and that little is of rude conſtruction, as if intended only for temporary uſe. The matting that covers the floor is ingeniouſly woven in different colours. Their domeſtic utenſils conſiſt chiefly of an earthen ſtove, an iron pot to boil rice, a pan ſomewhat in the ſhape of a watch-glaſs, to fry their vegetables in oil, and a few porcelain cups or bowls. Their veſſels of caſt iron are equal in quality to thoſe of the Chineſe, but their earthen ware is very inferior. They work in metal with a tolerable degree of neatneſs, and their articles of fillagree are equal to thoſe of the Chineſe. In fact both the one and the other poſſeſs quick and comprehenſive talents, and under proper encouragement are already in that advanced ſtage to make a very rapid progreſs in the arts, ſciences, and manufactures. Theſe, however, do not appear to be in a ſtate of progreſſive improvement: but under every diſadvantage their ingenuity occaſionally breaks forth in a ſurpriſing manner. There is in all oriental governments a radical defect, which no advantages of ſoil or climate, or other favourable circumſtances can compenſate, and which muſt for ever operate againſt their attaining the character and condition of a great and happy people. This defect ariſes from the want of a permanent ſecurity to property.

The ſituation of Cochin-china is well adapted to commerce; its vicinity to China, Tunquin, Japan, Cambodia, Siam, the Malay coaſt, the Philippines, Borneo, the Moluccas, &c. renders the intercourſe with all theſe countries eaſy and expeditious, the commodious harbours formed on the coaſt, particularly that of Turon, afford a ſafe retreat for ſhips of any burthen, during the moſt tempeſtuous ſeaſons of the year. No country in the Eaſt produces richer, or a greater variety of articles proper for carrying on an advantageous commerce; ſuch as cinnamon, pepper, cardamoms, ſilk, cotton, ſugar, Agula-wood, Japan-wood, ivory, &c. Gold is obtained almoſt pure from the mines; and gold in duſt has been brought at different periods from the mountains, and bartered by the rude inhabitants for rice, cloths, and iron. From them alſo the Agula and Calamboe woods are procured, together with quantities of wax, honey, and ivory. Silver mines have been alſo lately diſcovered; and both gold and ſilver are uſed in ingots, as in China. The commodities, for which there is the greateſt demand at Cochin-china, are ſalt-petre, ſulphur, lead, fine cloths, and barred or flowered chints. Pearls, amber, and coral were formerly in great requeſt. The principal exports of this country are ſilks, ſugar, which is excellently purified by a proceſs deſcribed by Sir George Staunton, ebony, and Calamboe wood, edible birds' neſts, which are found in great plenty on the iſlands that are ſituated near the coaſts of Cochin-china, and which are eſteemed a luxury in China, gold in duſt or bars, and copper, and porcelain, tranſported thither from China and Japan. It has been ſuggeſted that a commercial connection with Cochin-china might prove very beneficial to this country. The drain of ſpecie from the company's ſettlements in India, is become a matter of ſuch ſerious import, that any plan for reſtraining and counteracting this growing evil demands attention; and it has been thought that a ſettlement in Cochin-china would conduce to this important and deſirable purpoſe, as well as be productive of many other advantages; the productions of Cochin-china, which are in great demand among the Chineſe, might with eaſe be brought to centre with us, if we had a ſettlement and a confirmed influence in the country. Purchaſed with the ſtaples of India and of Europe, Turon would become the emporium for them, where our ſhips bound to Canton, from which it is only five days ſail, might call and receive them. It would prove a ſaving of ſo much ſpecie to Great Britain or India, as the value of the commodities amounted to in China. In a few years, there is reaſon to believe, a very conſiderable inveſtment might be provided. A ſettlement in Cochin-china would give us a ſuperior advantage both to the Dutch and the Spaniards, not only as its ſituation is nearer, but as the Chineſe are more accuſtomed to reſort thither. Colonies of Chineſe have, from time to time, emigrated from the parent country, and fixed their abode in different parts of Cochin-china. Theſe have a correſpondence in every ſea-port of the empire; and by their means, teas, china-ware, and various other articles, that are the objects of our commerce with China, might be imported in junks to our own ſettlements, equally good in quality, and cheaper, as the Chineſe are exempted from the exorbitant duties levied on foreigners. Some of the beſt workmen might be encouraged to ſettle in Cochin-china, and under proper direction, manufactures might be carried on to as great a degree of perfection as in China itſelf. The intercourſe between Japan and Cochin-china might be renewed, and we might participate in a trade for many years monopolized by the Dutch. An advantageous trade might be carried on with the Philippine iſlands, and goods for Madras and Bengal, introduced among them by means of the junks, for the conſumption of Spaniſh America. The Siameſe and Cambodians would bring the produce of their reſpective countries, and barter or ſell it for ſuch articles as they wanted from Cochin-china, and among them a ſale might probably be found for quantities of Bengal cloths. The gold mines of this country, of which we have already taken notice, would promote and enrich ſuch an eſtabliſhment in Cochin-china, the expediency and utility of which have now been ſuggeſted. Beſides the commercial advantages likely to reſult from ſuch a ſettlement, it would be attended with others of a political nature. Turon-bay would not only afford a ſecure retreat to our Indiamen, in caſe of loſing their paſſage to China, but from thence we might intercept the fleets of any hoſtile power, either going to, or returning from that country. We ſhould thus become formidable neighbours to the Dutch, and to the Spaniards, and in the event of a war with either of them, attack, with advantage, their moſt valuable ſettlements.

The Japaneſe is the only current money in Cochin-china: it is paid or received by weight; the money of the country, which is of copper, is as large as our common counters, of a round figure, and has a hole in the middle, by which it may be ſtrung in the ſame manner as beads. Three hundred pieces are put on one ſide, and 300 on another, which paſs in Cochin-china for a thouſand; becauſe in 600 there are found 10 times 60, which make a century among almoſt all the people of the Eaſt. In this country merchants are liable to be much deceived with regard to the value of money; becauſe the pieces are unequal in figure and quality, and their value is regulated by a few characters that are ſtamped upon them, which are not eaſily aſcertained; accordingly merchants, without the aſſiſtance of honeſt and ſkilful people, are liable to great impoſition, more eſpecially as the traders of Cochin-china value themſelves on being able to cheat an European.

The Language and Religion of the Cochin-Chineſe. The Cochin-Chineſe have effectually preſerved the written characters of the Chineſe language, but the ſpoken language has undergone a very conſiderable change, which is not ſurpriſing, ſince the inhabitants of the northern and ſouthern provinces of China are unintelligible to each other; though it has been altered, it does not appear to have received any improvement. By a compariſon of a ſhort catalogue of Chineſe words, taken from Mr. Barrow's excellent work on Cochin-china, with their ſynonyms, in the Cochin-chineſe language, an idea may be formed how far the two ſpoken languages reſemble or differ from each other.

Engliſh.	Chineſe.	Cochin Chineſe.
The earth,	tee,	dia.
The air,	kee,	bloci.
Fire,	ho,	whoa.
The ſea,	hai,	bœ.
A river,	ho,	jeang.
A mountain,	ſhan,	noui.
The ſun,	jee-to,	mat bloci, eye of heaven.
The moon,	yue,	blang.
The ſtars,	ſing,	ſao.
The clouds,	yun,	moo.
Thunder,	luie,	no-ſang.
Lightning,	ſhan-tein,	choap.
The wind,	fung,	jeo.
The day,	jee, or tien,	ngai.
The night,	ye, or van-ſhang,	teng.
The ſky, or heaven,	tien,	tien.
The eaſt,	tung,	doo.
Weſt,	ſee,	tai.
North,	pee,	pak.
South,	nan,	nang.
Man,	jin,	dan-ou.
Woman,	ſoo-gin,	dan-ba.
A quadruped,	ſhoo,	kang.
A bird,	kin,	ching.
A fiſh,	eu,	ka.
A tree,	ſhoo,	kai.
One,	ye,	mot.
Two,	ul,	hai.
Three,	ſan,	teng.
Four,	ſoo,	bon.
Five,	ou,	lang.
Six,	leu,	lak.
Seven,	tchee,	bai.
Eight,	pa,	tang.
Nine,	tcheu,	chin.
Ten,	ſhee,	taap.
Eleven,	ſhee-ye,	moei-mot.

Engliſh.

Engliſh.	Chineſe.	Cochin Chineſe.
Twelve,	ſhee-ul,	moei-hai.
Twenty,	ul-ſhee,	hai-moei.
Thirty,	ſan-ſhee,	teng-moei.
Thirty-one,	ſan-ſhee-ye,	teng-moei-mot.
Thirty-two,	ſan-ſhee-ul,	teng-moei-hai.
One hundred,	pe,	klang.
One thouſand,	tſien,	ngkin.
Ten thouſand,	van,	muon.

The Cochin-Chineſe have introduced the conſonants *b, d, r,* which they pronounce without the leaſt difficulty, though a Chineſe cannot by any exertion articulate a ſyllable into which one of theſe enters. In the conſtruction of phraſes, there is alſo a conſiderable difference between the two languages. In forming the plural of the perſonal pronouns, the Chineſe make uſe of the ſyllable muen, *many*, as,

ngo,	ne,	ta,
I,	thou,	he,
ngo-muen,	ne-muen,	ta-muen,
we,	ye,	they,

But the Cochin-Chineſe employ the ſyllable chung, *all*, as,

tooi,	bai,	no,
I,	thou,	he,
chung-tooi,	chung-bai,	chung-no,
we,	ye,	they.

To the Cochin-Chineſe, "we found leſs difficulties," ſays Mr. Barrow, "in making ourſelves intelligible, than we had to encounter with the grave and ſolemn Chineſe, whoſe dignity would be thought to ſuffer debaſement by their condeſcending to employ the pencil in delineating objects, notwithſtanding its alliance with their mode of writing; or by attempting to indicate, by ſigns and geſtures, ſuch ideas as are capable of being interchanged without the aid of language. This was by no means the caſe with the Cochin-Chineſe, who always ſeemed anxious to enter into our views, and to facilitate a mutual underſtanding."

The *religion* of the Cochin-Chineſe, like that of almoſt all the oriental nations, is a modification of the doctrine of Budha, but more ſimple, and leſs diſguiſed with the myſteries and machinery of oracular worſhip, than that which is practiſed popularly in China. From a ſentiment of gratitude to the benevolent and bountiful ſpirit, the Cochin-Chineſe manifeſt their piety, by offering to the image of the protecting deity the firſtlings of their living flocks, and of the fruits of the earth. The firſt ears of rice, the firſt cup of ſugar, or whatever the nature of the produce may be, is taken to the ſhrine which contains the ſacred image, and is there depoſited with becoming reverence, as an humble acknowledgment of the divine goodneſs. Mr. Barrow was preſent at an offering of this kind, which he thus deſcribes: "I obſerved a perſon in a long coloured robe reaching to the ground, his head bare and cloſely ſhaved, marching with a kind of meaſured ſtep, and followed by a few of the peaſantry. On arriving at the foot of the tree, they all halted, juſt at the head of the main trunk (for it was a ſpecies of banian tree, called *dea* in Cochin-china, whoſe branches take root and become ſtems). I obſerved a large cage of latticed work, with a pair of folding doors, fixed within two boughs, and partly hidden by the foliage. Within was a wooden figure of Budha, of the ſame corpulent ſhape, and in the uſual ſitting poſture as he is repreſented in the temples of China. A little boy, attending on the prieſt, ſtood cloſe before him, with a burning coal on a brazen diſh. One of the peaſants carried a ladder of bamboo, which he placed againſt the tree, and another mounting it, depoſited in the cage before the idol, two baſons of rice, a cup of ſugar, and one of ſalt. The prieſt in the meantime, with arms extended, and eyes turned towards heaven, muttering ſomething in a low tone of voice, when the man who had carried the ladder fell on his knees, and nine times proſtrated his body to the ground, according to the cuſtom of the Chineſe. Several women and children remained at a diſtance, as if forbidden to approach too near; though as prieſteſſes are ſaid to be common in this country, it is not probable there was any reſtriction on account of the ſex." The Cochin-Chineſe are extremely ſuperſtitious, and their devotional exerciſes, like thoſe of the Chineſe, are more frequently performed with a view of averting an ideal evil, than with the hope of acquiring a poſitive good; or, in other words, the evil ſpirit is more dreaded than the good one is revered. In various parts of the country are erected large wooden pillars, not only for the purpoſe of marking the ſpot where ſome great calamity may have happened, but as a propitiation to the evil ſpirit, by whoſe influence it is ſuppoſed to have been occaſioned. So, when an infant dies, the parents are ſuppoſed to have incurred the diſpleaſure of ſome malignant ſpirit, which they endeavour to appeaſe by offerings that they imagine to be moſt acceptable to the angry divinity. Beſides the ſpontaneous offering, which individuals conceive it neceſſary to make on various occaſions, there is a yearly contribution levied by government, for the purpoſe of ſupporting a number of monaſteries, in which the prieſts invoke the deity for the public welfare. This contribution conſiſts of produce in kind, as rice, fruits, ſugar, &c.; in lieu of which, in towns, are collected money, metals, and clothing. The prieſts here, as in China, are reckoned the beſt phyſicians, but their art lies more in charms and facinations, than in the judicious application of ſanative drugs.

COCHINEAL, *Coccus cacti*, Linn. See Coccus *Cacti*. The ſubſtance known in commerce by the name of cochineal, which is the moſt precious of all our dyeing drugs, affording the ſcarlet crimſon, and many other valuable dyes, and from which the fineſt carmine is generally prepared, is in the form of hemiſpherical ſhrivelled grains, about an eighth of an inch long, of a deep reddiſh-purple colour, and covered more or leſs with a white down: they are very light, and eaſily rubbed to powder between the fingers. The Spaniſh merchants diſtinguiſh at leaſt two kinds, the beſt, or domeſticated, called *grana fina*, or fine grain, and the wild, or *grana ſylveſtra*; of theſe, the latter is not more than half the ſize of the former, and is covered with a much longer down; on which account it always bears a much lower price in the market.

The cochineal inſect is a native of Mexico, and was in common uſe among the inhabitants as a dyeing drug when the Spaniards firſt came into the country; ſince that period its uſe has become more and more general, not only in Europe, but in various parts of Aſia, and, as almoſt the whole of this valuable commodity is ſtill raiſed in Mexico, Peru, and the adjoining Spaniſh ſettlements, it becomes every year an object of more ſedulous cultivation than before.

The beſt and fineſt cochineal, and, indeed, by far the greateſt proportion of that conſumed in Europe, is brought to us from Mexico. The principal diſtricts where it is bred are Oaxaca, Tlaſcala, Chulula, Neuva Gallicia, and Chiapa, in New Spain, but it is in Oaxaca that the greateſt quantities are produced, where the cultivation of this little inſect has long given employment and been an object of commerce to the native Mexicans. According to Ulloa it is likewiſe produced at Hambatia, Loja, and Tucuman in Peru. It has been introduced into St. Domingo, and the Braſils alſo.

The wild cochineal (grana ſylveſtra) feeds upon moſt of the ſpecies of cacti that are natives of Mexico, requires no particular care or attendance, and may be gathered ſix times in the year, there being ſo many generations of this inſect in a twelvemonth: the time of collecting the cochineal is juſt before the female produces its young, as the animal periſhes immediately afterwards. The cultivated cochineal (grana fina), called alſo *Meſtique* from a Mexican province of that name, is the product of ſlow and progreſſive improvement in the breed of the wild cochineal, and is found only in the gardens and plantations of Mexico, where, provided with its choiceſt food and ſheltered from the inclemencies of the ſeaſons, it attains nearly double its original ſize. This feeds only on one ſpecies of cactus, the cochenilifer or nopal, and produces only three broods in the year. Its management is ſimple, but requires inceſſant attention. At the third annual gathering of cochineal, a certain number of females are left adhering to branches of the nopal, which are then broken off and kept carefully under cover during the rainy ſeaſon; when this is over, the ſtock of cochineal, thus preſerved by each cultivator, is diſtributed over the whole plantation of nopals, where they ſoon multiply with great rapidity. In the ſpace of two months, the firſt crop is gathered by detaching the inſects with a blunt knife, after which they are put into bags, and dipped in hot water to kill them, and finally dried in the ſun, by which they loſe about two-thirds of their weight. This kind is alſo much more abundant in colouring matter, in which, indeed, its ſuperiority over all other kinds conſiſts; ſince, from the experiments of the French academicians, the grana ſylveſtra of Mexico, and the cochineal of St. Domingo, afforded colours equal in brilliancy, though not in quantity, to the meſtique or grana fina. The cochineal of Braſil alſo, according to Bancroft, is not inferior in quality to the fine grain of Mexico, though it contains only half the quantity of colouring matter. The proportion of colouring matter contained in equal portions of the cultivated cochineal, of the wild cochineal of Mexico, and of an inferior kind from St. Domingo, is, according to Berthollet, as eighteen, eleven, and eight.

In time of peace, the cochineal of Mexico is almoſt excluſively ſent from Vera Cruz to Cadiz, whence it is diffuſed all over Europe; but in time of war a contraband trade is carried on to various parts of America and the Weſt Indies, whence this country is chiefly ſupplied.

The quantities of fine cochineal imported into Spain in the years 1788, 1789, and 1790, amounted to 11,000 bags, weighing 200 lb. each, and making together 2,200,000 lb. weight; and between the 1ſt of January, 1791, and the 1ſt of October in the ſame year, the importations had exceeded 2000 bags. From accurate calculations it appears that the average quantity of fine cochineal, annually conſumed in Europe, amounts to about 3000 bags, or 600,000 lb. weight, of which 1200 bags, or 240,000 lb. may be conſidered as the preſent annual conſumption of Great Britain: a greater quantity comes, indeed, into the kingdom, but the ſurplus is again exported to other countries. The attention of the Eaſt India company has been lately directed to the production of this inſect, though hitherto with but partial ſucceſs. It is very ſmall, not very abundant in colouring matter, and inferior in quality to that of New Spain. It is uſed only for the coarſeſt goods, and ſold from 3*s.* 6*d.* to 5*s.* per pound. From 8 to 10,000 lb. are annually brought to this country. See Coccus Cacti.

Cochineal retains ſome traces of its original form, even in its dried ſtate; and though Europe for a long time conſidered it as the ſeeds of an Indian plant, it is eaſy to ſelect from a parcel ſome inſects in which the round or convex back, with ſmall tranſverſal furrows and flat belly, are readily diſcovered. Its external or commercial characters differ conſiderably; it is diſtinguiſhed by the dealers chiefly by its colour and ſize. 1. The large black, or deep purple, of bright hue, is preferred to all others. Its value decreaſes with its ſize and luſtre. 2. The large ſilver grey, though held in leſs eſtimation here, is, in general, equal to the former. It is preferred by the German buyers, to whom it is ſold ſomewhat lower than the preceding, and from which it differs only in the leſs removal of that white farinaceous powder with which the inſects, in their natural ſtate, are covered. 3. The ſmall white or ſilvery cochineal is held in little eſtimation, and ſold at very inferior prices. Cochineal duſt is ſometimes found in the market, and alſo the ſmall, or mutilated grains, ſeparated by the ſieve from the larger, and known by the name of *Granilla*. All theſe kinds are liable to adulteration with various ſubſtances, but more eſpecially with a paſte, which is ſometimes managed ſo dexterouſly as to deceive the beſt judges, without very particular examination.

The uſe of cochineal was known to the Mexicans before the invaſion of the Spaniards. It was the beauty of its colour, as diſplayed in their furniture, ornaments, and cotton cloth, which firſt directed the attention of their conquerors towards this precious inſect. From the reports made to the Spaniſh miniſtry on this ſubject, orders were iſſued to Cortes, in the year 1523, to take meaſures for multiplying this valuable commodity, and conſiderable quantities, raiſed by the induſtry of the natives, were ſoon afterwards ſent to Spain. Although it was for ſome time ſuppoſed to be the berry or ſeed of a vegetable; it was at length, however, aſcertained that theſe grains were the females of a particular ſpecies of inſect, called by naturaliſts "Coccus cacti," and of the ſame genus as the "kermes" (Coccus ilicis, Linn.). See Coccus.

It is probable that alum was the only mordant uſed for fixing the cochineal dye for ſome time after its introduction into Europe. The Mexicans alſo employed the ſame ſubſtance, as appears from the teſtimony of the Spaniſh hiſtorian, Herrara. The colour afforded by cochineal with the aluminous mordants is crimſon, and, indeed, previous to the diſcovery of the uſe of tin, this ſeems to have been the only colour analogous to ſcarlet that was known. Drebbel, or, as ſome ſay, Kuſter, or Keffler, a German chemiſt, firſt diſcovered the effect of the ſolution of tin in exalting the cochineal dye. He brought his ſecret to London about the year 1643; and the firſt eſtabliſhment for dyeing ſcarlet in this country appears to have been at Bow, whence it obtained, for a long time, the name of the Bow-dye. The proceſs was known in Holland ſoon after the diſcovery was made, and in France alſo, where it was practiſed by the famous Gobelins, who received information from a Flemiſh painter, to whom it had been communicated by Kuſter himſelf. For the details of this operation, and the ſucceſſive improvements down to the preſent time, we refer our readers to the article Scarlet-*Dye*.

Cochineal, when thoroughly dry, if kept in a dry place, and in cloſe packages, may be preſerved many years without alteration. Hellot tried ſome 130 years old, and found it equal in quality to the freſh inſects.

The colouring matter of cochineal may be extricated either by water or alcohol. The alcoholic ſolution is of a deep crimſon colour, and, on evaporation, leaves a tranſparent reſiduum of a deep red, which has the appearance of a reſin, and which affords by diſtillation the products of animal ſubſtances. The aqueous ſolution or decoction of cochineal is of a crimſon colour, bordering on purple, when viewed by tranſmitted lights; and this, if evaporated ſlowly to the conſiſtence of an extract, and then digeſted in alcohol, communicates to this menſtruum a colour ſimilar to the preceding ſpirituous ſolution, a reſiduum of the colour of wine-lees being left behind. This affords, by deſtructive diſtillation, the products of animal ſubſtances.

The aqueous decoction of cochineal, if mixed with a little ſulphuric acid, aſſumes a red colour, inclining to yellowiſh, or orange hue, and a ſmall quantity of a fine red precipitate is thrown down. Muriatic acid produces nearly the ſame change of colour, but occaſions no precipitate. A ſolution of tartar, and, indeed, all acids, change the cochineal decoction to a yellowiſh red, and a ſmall quantity of a pale red precipitate is ſlowly depoſited: the ſupernatant liquor is yellow, but on the addition of a little alkali it becomes purple, the precipitate being at the ſame time re-diſſolved. Alum brightens the colour of the infuſion and gives it a redder hue; a crimſon precipitate is depoſited, and the ſupernatant liquor retains a ſimilar tinge. A mixture of alum and tartar produces a brighter and more lively colour, inclining to yellow; and a precipitate is thrown down, but much paler, and leſs in quantity than where alum alone is uſed. Nitro-muriate of tin throws down a crimſon ſediment in conſiderable abundance, not a particle of colouring matter remaining in the liquor.

On adding a ſolution of tartar, and afterwards of tin, to the infuſion of cochineal, a roſe-coloured precipitate is formed more quickly than in the preceding experiment. The ſupernatant liquor retains a tinge of yellow.

Cochineal, boiled with half its weight of tartar, affords a decoction more inclining to red, and not ſo deep as when boiled with water only. With the ſolution of tin, however, it affords a more abundant precipitate, and of a more intenſe colour. The extraction of the colouring particles of cochineal, therefore, is favoured by the action of tartar, though the liquor appears much paler than the ſimple aqueous ſolution.

The ſulphate of iron forms a brown coloured purple, or browniſh violet precipitate; and the ſupernatant liquor is of a dilute yellowiſh brown. The ſulphate of zinc forms a deep purple, or deep violet; and the acetate of lead a purple-violet precipitate, leſs deep than the preceding; the liquor in both caſes being perfectly colourleſs.

The ſulphate of copper changes the colour of the decoction to violet, and a ſmall ſediment of the ſame colour ſlowly ſubſides.

Berthollet remarks a diſtinctive character in the colouring matter of cochineal, compared with that of madder, treated with the ſame re-agents. Both ſpecies of colouring matter acquire a yellow colour from acids; but if the particles of cochineal be ſeparated by a ſubſtance, which precipitates them from the acid liquor they are diſſolved in, they re-appear with their natural colour little changed, whilſt thoſe of madder retain a yellow or fawn-coloured hue. On this account the ſolutions of tin, which retain a great exceſs of acid, and are ſo eminently uſeful in exalting the colour of cochineal, are uſed with little ſucceſs with madder; probably as Mr. Berthollet ſuppoſes, becauſe the combination of the oxide of tin with the colouring matter of madder, retains a larger portion of acid than it does when combined with the colouring matter of cochineal.

We have before obſerved, that the natural colour of cochineal is crimſon, and that, till the diſcovery of the uſe of the ſolution of tin, the colour now called ſcarlet was unknown. The production of this colour was aſcribed to the nitro-muriate of tin only, and more eſpecially to the action of the nitrous acid of that ſolution, with little or no reference to the agency of the tartar, which was always employed in the operation. We are indebted to Bancroft for the correction of this error, and for a ſeries of experiments on the action of other metallic and earthy ſolutions, with the colouring matter of cochineal on woollen.

From theſe experiments it appears, that cochineal, with the nitro-muriate of tin, or common dyers' ſpirits, produced a crimſon only, but with the addition of tartar a good ſcarlet.

Cochineal, with a ſolution of tin in muriatic acid, dyed a beautiful crimſon, and with a ſolution of that metal, by a mixture of tartar and muriatic acid, a beautiful ſcarlet.

Cochineal, with tin calcined by the long continued action of ſulphuric acid, dyed a ſalmon colour, and, with a recent ſolution of tin, a reddiſh ſalmon colour, inclining a little to the crimſon. A ſolution of tin, in equal parts of nitric and ſulphuric acids mixed, afforded a ſimilar colour.

Tin, diſſolved by the pure acid of tartar, dyed with cochineal a very beautiful ſcarlet, inclining a little to the aurora.

Tin very readily diſſolves by pure citric acid, and even by lemon juice; and the ſolution, newly made, dyes with cochineal a moſt beautiful ſcarlet, inclining, like the preceding, a little to the aurora. The citric acid with tin acts, at leaſt as efficaciouſly as that of tartar, in yellowing the cochineal crimſon; nothing, ſays Dr. Bancroft, can exceed the beauty of ſcarlet dyed with the citrate of tin.

The ſolution of tin in vinegar afforded a ſcarlet inclining a little to the crimſon.

The phoſphate of tin produced an aurora, and the fluate of tin a very good ſcarlet.

With other baſes cochineal gave the following colours to woollen:

With nitro-muriate of platina, a red, and of gold a reddiſh brown.

With nitrate of ſilver a dull red, and with muriate of ſilver a lively reddiſh orange.

With the acetate of lead, a purple, inclining to violet; and with nitrate of lead, a delicate lively colour, between the red and cinnamon, but inclining moſt to the former.

With the ſulphate, nitrate, muriate, and acetate of iron, cochineal produces a dark-violet, and even a full black, when employed in ſufficient quantity.

All the preparations of copper appear to debaſe the colouring matter of cochineal, as do thoſe of mercury in a ſtill greater degree; moſt of theſe, whilſt they degrade the colour, ſeem to annihilate a portion of it.

With the nitrate and muriate of zinc, and various ſolutions of biſmuth, cochineal produces different ſhades of lilac. Cobalt and nickel alſo afford various ſhades of lilac and purple. The ſulphate of manganeſe an orange, and the nitrate of manganeſe a colour reſembling a madder red.

It has been before obſerved, that, with the aluminous mordants, cochineal affords its natural colour, or crimſon. Dr. Bancroft has alſo examined the effects of other earthy ſolutions.

Lime-water, with cochineal, dyes a purple, which took but ſlowly, and required long boiling.

Sulphate of lime a full dark red, and nitrate of lime a lively red, approaching to ſcarlet, and muriate of lime a purple.

The ſolutions of barytes and of magneſia, afforded various ſhades of lilac, and even the ſolution of ſilex in cauſtic alkali, precipitated by the addition of an acid, affords a full rich pleaſing purple, which proved ſufficiently durable.

The foregoing experiments repeated on ſilk gave leſs advantageous reſults. Cochineal, indeed, with the aluminous baſis, dyes the crimſon colour as well and as durably on ſilk as on wool. The modes of producing this are well known, and will be treated of hereafter; but in general, with the other earthy and metallic baſes, cochineal produced ſimilar but much paler colours than on wool.

The little diſpoſition manifeſted by the colouring matter of cochineal to unite with cotton, and the celebrated experiment of Mr. Dufay to illuſtrate this, are well known. He cauſed a piece of cloth to be manufactured with a woollen web and cotton woof, and having ſubjected it to the ordinary proceſs of dyeing ſcarlet, found that the wool had taken a moſt beautiful ſcarlet, whilſt the cotton remained perfectly white. Subſequent experiments have ſhown that this effect ariſes not from the total want of affinity between the colouring particles of cochineal united to tin, and the fibres of cotton, but from a ſtriking and powerful difference in the force with which the colouring matter is attracted by the two ſubſtances. When cotton *alone* is ſubjected to the ſame proceſs, it takes a ſcarlet colour more ſlowly indeed, and paler than that imbibed by woollen, yet ſufficient to prove its diſpoſition to ſuch union, when not counteracted by more powerful affinities. When cotton and wool, however, are *jointly* ſubjected to the operation of ſcarlet dyeing, the latter, by its ſtrong attraction, draws, and excluſively appropriates to itſelf, all the colouring matter in the veſſel before the cotton has had time to engage any part of it. It is owing to this weaker attraction between the fibres of cotton and the ſcarlet dye, that this latter is ſo much leſs permanent on cotton than on wool; and it is alſo from this want of ſufficient attraction that the cochineal colour is found to take moſt beneficially on cotton, when the baſis has firſt been applied ſeparately.

Cochineal is ſometimes uſed by calico printers in topical dyeing, but more frequently in the preparation of thoſe colours for the pencil, which are deſcribed under the article COLOUR-*making*.

The mordants uſed for cochineal are thoſe employed with madder. The acetate of iron, or iron liquor for black, diluted ſolutions for various ſhades of purple or lilac, and mixtures of the acetates of iron and alumine for chocolates, blooms, &c. &c.

With the common aluminous mordant, printed and rinſed off the ſame as for madder red, cochineal affords a bright and beautiful crimſon. It is, however, much leſs fixed than madder, and cannot ſupport repeated waſhing and expoſure. It is applied chiefly on fine cloth and delicate muſlins, when the ſolidity of the colour is oftentimes an object of leſs conſideration than its beauty. An addition of one-tenth, or fifteenth, of galls to the cochineal, gives it greater ſtability, but this permanency is gained at the expence of its luſtre. The fine crimſon diſappears, and the colour approaches more to the red or middle hue. An advantage attending the uſe of cochineal, is its little effect on the white or unprinted part of the cloth, which acquires no ſtain in the dyeing, but what is completely removed by ſimple waſhing, or, in ſome particular caſes, by very gentle branning. From two to three ounces of cochineal, according to the fulneſs of the pattern, are ſufficient for a piece of light ground. The pale delicate crimſon grounds, with white objects, require from four to five ounces. It muſt be finely ground, and incloſed in a linen or cotton bag, ſuſpended in the dye-copper, from whence it can be occaſionally taken and ſqueezed or wrung, for the more complete extraction of the colour.

In dyeing with cochineal, the value of this drug renders every precaution for economizing its uſe indiſpenſably neceſſary, and a conſiderable ſaving is made by diminiſhing as much as poſſible the quantity of the dye liquor. It is well known, that colouring matter of any kind, held in ſolution in the dye-copper, can only be exhauſted to a certain degree, even by freſh and undyed goods; there is a certain point at which the affinity of the water for colouring matter becomes equal to that of the ſtrongeſt mordants, and all that is thus retained may be conſidered as totally loſt, except when freſh portions of colouring matter are added to the already exhauſted liquor, and the operation of dyeing again renewed, in which caſe the loſs is inverſely as the number of ſucceſſive operations performed in the ſame liquor. In dyeing with cochineal, therefore, no more water ſhould be uſed than is barely ſufficient to cover the goods when preſſed down cloſe into the copper, with a ſtick as they come over the winch, and three ſucceſſive dyeings, at leaſt, ſhould be paſſed through the ſame liquor before it is let off, and the copper repleniſhed with freſh water. Long continued heat has a tendency to injure the cochineal crimſon, and incline it too much to the purple hue; each dyeing, therefore, ſhould be withdrawn ſhortly after it has attained the boiling point. The firſt ſets may be boiled three minutes; the ſecond, one; the third ſet may be kept five or ſix minutes at the boil, if it conſiſts of darker colours, ſuch as chocolates, dark purples, &c.; but if crimſons, the colour, without boiling, will incline very much to the purple hue, and be much inferior to the firſt, and even to the ſecond ſets. On this account it is proper, when the work will admit of it, to dye the pale crimſon grounds firſt, follow after with the ſtronger light grounds, and, laſtly, with the darker colours above-mentioned.

The uſe of tin veſſels in dyeing ſcarlet or woollen, (where the acid ſolutions uſed in that operation render them indiſpenſably neceſſary) has induced many calico printers to employ them in dyeing cotton, where no acid ſolution is preſent, and where the good effects of tin may be ſuppoſed not to apply. It is certain, however, that the hue of the pale and delicate crimſon grounds produced in a tin veſſel is much ſuperior to that produced in copper, and the cauſe of this difference is ſatisfactorily explained by the experiments of Mr. Thomſon. From theſe experiments, which will be more fully detailed in another part of this work, it appears that the colouring matter of cochineal poſſeſſes very diſtinct acid properties.

Turnings of pure ſoft iron digeſted in a ſtrong decoction of cochineal were diſſolved, with diſengagement of hydrogen gas. The ſolution, at firſt purple, gradually acquired a more intenſe colour, approaching to black. Expoſed to the atmoſphere, it gradually abſorbed oxigen, and let fall a black precipitate. It communicated to cloth a dark grey or purple colour, which was not removed by waſhing. With tin the decoction of cochineal formed a beautiful crimſon ſolution, and, with copper, a dull crimſon inclining to purple; both theſe ſolutions imparted their colour to cloth, which rinſing did not remove. Hence it appears that the difference in the colours, produced in a tin and in a copper veſſel, ariſe from the action of the colouring matter on the ſubſtance of the veſſel itſelf.

The colouring matter of cochineal alſo acts powerfully on the earths and metallic oxides, or on its own combinations with them or cloth. A piece of calico impregnated with a weak aluminous mordant, and dyed in a ſtrong decoction of cochineal, takes at firſt a dye which is, however, ſpeedily removed, and the mordant itſelf ſoon after carried off the cloth. The ſame takes place with the dilute ſolutions of iron. In dyeing with cochineal, therefore, in the way preſcribed above, ſome care is neceſſary in the management of thoſe goods, on which weak as well as ſtrong mordants are applied, leſt with the treatment neceſſary to bring up the latter to their proper ſtrength and fulneſs, the former be totally deſtroyed.

The beautiful pigment carmine, uſed chiefly in miniature and water-colour painting, and ſometimes under the name of rouge, to freſhen the cheeks of pallid or faded beauty, is alſo a preparation of cochineal. It is a light, ſoft, velvety powder, of a moſt rich and magnificent ſcarlet, inclining a little to crimſon. It was formerly made from kermes, whence its preſent name is derived.

The preparation of carmine, notwithſtanding the numerous proceſſes detailed in various works, ſtill remains one of thoſe ſecrets which are confined to the laboratories of a few. Its conſtitution, indeed, and the general nature of the proceſs for obtaining it, are well known; but excellence in colours of this kind often depending on particular hue, ariſing from minute but important conditions in the preparation, approved proceſſes are guarded with religious care, confined to the workſhops that gave them birth, in which myſtery and prejudice are deſpotic.

We ſubjoin the following formula without vouching for its merit; it is, however, at leaſt, as good as any other publiſhed.

Pour two quarts of fine clear river water into a clean copper pan, and, when boiling, add two ounces of the beſt grain cochineal, finely ground and ſifted. Boil ſix minutes, ſtirring carefully the whole time. Add ſixty grains of fine Roman alum in powder, and boil three minutes longer, after which withdraw it from the fire and let it cool a little. Decant off the liquor carefully from the grounds, and ſtrain through a ſilk ſieve fine enough to retain the undiſſolved grains. Pour it into well-glazed porcelain diſhes and ſuffer it to remain undiſturbed three or four days, after which time again decant the red liquor into other diſhes from off the ſediment which has formed, and which, dried in the ſhade and free from duſt, forms the fine carmine. Another depoſition takes place at the end of a few days from the decanted liquor, which forms a good carmine of ſecond quality, and there ſtill remains colouring matter ſufficient in the remaining liquor to afford a rich lake.

The following proceſs, not very different from the former, has been recommended; and, if carefully purſued, will yield a pigment greatly ſuperior to the carmine that is generally met with. Into a fourteen-gallon boiler of well-tinned copper put ten gallons of diſtilled or very clear rain water (ſpring water will not anſwer the purpoſe). When the water boils, ſprinkle in, by degrees, a pound of fine cochineal, previouſly ground in a clean ſtone mortar to a moderately fine powder; keep up a gentle ebullition for about half an hour, and then add three ounces and a half of cryſtallized carbonat of ſoda; in a minute or two afterwards draw the fire, and then add to the liquor an ounce and a half of Roman alum, very finely pulverized; ſtir the maſs with a clean ſtick till the alum is diſſolved, then leave it to ſettle for 25 minutes, and afterwards draw off the clear liquor with a glaſs ſyphon, and ſeparate the reſt of the fluid from the ſediment by ſtraining it through a cloſe linen cloth. Replace the clear liquor in the boiler, and ſtir in the whites of two eggs, previouſly well beaten with a quart of warm water; then light the fire again and heat the liquor till it begins to boil, at which time the albumen of the eggs will coagulate and combine with the earth of the alum and the fineſt part of the colouring matter; this ſediment is the *carmine*, and being ſeparated by filtration, and well waſhed on the filter with diſtilled water, it is to be ſpread very thin on an earthen plate, and ſlowly dried in a ſtove; after which it is fit for uſe. The fineſt part of the colouring matter of the cochineal being thus ſeparated, the reſidue may be employed in the preparation of *red lake* in the following manner: Add two pounds of pearlaſh to the red liquor from which the carmine was precipitated, and return it into the boiler together with the dregs of the cochineal, and boil the whole gently for about half an hour; then draw the fire, and, after the ſediment has ſubſided, drain off all the clear liquor into clean earthenware veſſels. Then pour upon the ſediment a ſecond alkaline ley, prepared by diſſolving a pound of pearlaſh in two gallons of water, and boil this alſo upon the dregs for half an hour; by which proceſs the whole of the colouring matter will be exhauſted. Separate by filtration the liquor from the dregs, and return both the alkaline ſolutions into the copper. When this bath is as hot as the hand can bear, add, by degrees, three pounds of finely pulverized Roman alum, obſerving not to add a ſecond portion till the efferveſcence from the firſt has entirely ſubſided. When the whole of the alum has been put in, raiſe the fire till the liquor ſimmers, and continue it at this temperature for about five minutes, at which time, if a little is taken out and put into a wine glaſs, it will be found to conſiſt of a coloured ſediment diffuſed through a clear liquor; after ſtanding quiet a while the greater part of the clear ſupernatant liquor may be poured off, and the reſidue being placed on the filter, will there depoſit the coloured lake, which, after being accurately waſhed with clear rain water, may be covered with a cloth, and allowed to remain for a few days till it is half dry: it is now to be ſeparated from the filter, to be made up in ſmall lumps, and placed in a ſtove to dry. By this management a pound of good Mexican cochineal will afford one ounce and a half of carmine, and about a pound and a quarter of red lake.

If the colour is required to incline ſomewhat towards ſcarlet, this may be effected by grinding along with the cochineal from a quarter to half an ounce of the beſt annotto.

The French add to the infuſion of cochineal a ſmall proportion of *autour*, a bark containing yellow colouring matter, and alſo of *chouan*, a greeniſh yellow ſeed, both from the Levant. They ſerve to brighten the hue of the carmine, and incline it more to ſcarlet. Carmine has a ſlight taſte, eaſily recognized as that of cochineal. It is ſparingly ſoluble in water, to which it communicates its own colour. Mixed up with water it works ſtiffly with the pencil and affords a poor colour. Ammonia diſſolves it inſtantly, forming with it a deep tranſparent crimſon-coloured ſolution, inclining much to purple. This is the teſt of its purity, for the inferior or adulterated carmine is inſoluble, and falls to the bottom. The painters generally grind or mix it with ammonia for the deep rich reds, and its ſolutions in that alkali afford moſt beautiful pink or roſe colours.

Carmine appears to be a lake in which the colouring principle predominates very much over the baſis; hence its ſolubility in ammonia, which the true or perfect lakes do not poſſeſs.

COCHINO, in *Geography*, a town of European Turkey, in the iſland of Lemnos. N. lat. 39° 57′. E. long. 25° 22′.

COCHITOTOL, in *Ornithology*, the name given by Fernandez to the bird ſuppoſed by Buffon to be the female orange promerops, the *promerops barbadenſis* of Briſſon, the *avis paradiſiaca Americana elegantiſſima* of Seba, and a variety of the *upupa aurantia* of Gmelin. See Upupa.

COCHLEA, in *Anatomy*, a part of the labyrinth of the ear, which reſembles a ſnail ſhell. See Ear.

Cochlea, in *Conchology*, an obſolete term, often applied by old writers to univalve ſhells of the ſpiral kind, and thoſe chiefly of the nerita and helix genera, and ſometimes the trochi, and even turbo.

Cochlea is alſo a ſpecies of Madrepora, which ſee.

Cochlea, in *Mechanics*, one of the five mechanical powers; otherwiſe called the screw, which ſee.

It is thus denominated, from the reſemblance a ſcrew bears to the ſpiral ſhell of a ſnail, which the Latins call *cochlea*.

COCHLEARIA, in *Botany*, (ſo called from the form of the leaves, which, being ſlightly hollowed, reſemble an old-faſhioned ſpoon.) Linn. Gen. 803. Schreb. 1079. Willd. 1228. Juſſ. 240. Vent. 3. 109. Tourn. 101. (Cranſon; Encyc.) Claſs and order, *tetradynamia ſiliculoſa*. Nat. Ord. *Siliquoſæ*, Linn. *Cruciferæ*, Juſſ. Vent.

Gen. Ch. *Cal.* Four-leaved; leaves egg-ſhaped, concave, open, caducous. *Cor.* Petals four, equal, egg-ſhaped, twice the ſize of the calyx, open. *Stam.* ſix, awl-ſhaped, the length of the calyx; anthers obtuſe, compreſſed. *Piſt.* Germ ſuperior, heart-ſhaped, or oval; ſtyle very ſhort, permanent; ſtigma obtuſe. *Peric.* Silicle heart-ſhaped, gibbous, turgid, ſomewhat emarginate, tipped with the permanent ſtyle, rugged, two-celled.

Eſſ. Ch. Silicle gibbous, rugged; valves gibbous, obtuſe. Seeds ſeveral.

Sp. 1. C. *officinalis*. Linn. Sp. Pl. 1. Mart. 1. Lam. 1. Willd. 1. Flor. Dan. tab. 135. Lam. Ill. tab. 558. fig. 1. Woodv. Med. Bot. tab. 29. Eng. Bot. 551. (C. folio ſubrotundo; Bauh. Pin. Tourn. 215. C. batava; Lob. Ic. 293. Naſturtium; Hall. Helv. n. 503.) Common ſcurvy-graſs. "Root-leaves roundiſh; ſtem ones oblong, ſomewhat ſinuated; fruit globular." *β*. Minor rotundifolia noſtras; Rai. Syn. 303. *γ*. C. groenlandica; With. not Linn. C. rotundifolia; Dill. in Rai. Syn. 302. *Root* annual or biennial, white, rather thick, elongated, with hairy fibres; whole herb ſmooth, ſomewhat fleſhy, very various in ſize. *Stems* angular, branched in a corymboſe manner; leafy. *Root-leaves* on long petioles, roundiſh, kidney-ſhaped, ſomewhat toothed or repand; ſtem-leaves alternate, ſeſſile, embracing the ſtem, angular or ſinuated. *Flowers* white, in terminal corymbs, which are afterwards lengthened into racemes; bractes none; calyx obtuſe, ſpreading, concave; petals inverſely egg-ſhaped, entire. *Silicles* globular, not emarginate, but little rugged, ſlightly veined, crowned with a ſhort ſtyle. *Seeds*, five or ſix in each cell. Common on the ſea-coaſts of Europe, and not unfrequent in mountainous countries, far inland. On mountains it is generally ſmaller; but in the rocky wood above Bolton Abbey, in Craven, Yorkſhire, eighty miles from the ſea, it grows as luxuriantly as on the coaſt. It has a warm, acrid, bitter taſte; and a pungent, rather unpleaſant, ſmell when bruiſed. Its active matter is extracted by maceration, both in water and ſpirits; but its principal virtue reſides in an eſſential oil, ſeparable in a very ſmall quantity, by diſtillation in water. It has long been conſidered as the moſt effectual of all the antiſcorbutic plants; and is, therefore, moſt liberally provided by the benevolent author of nature, on the coaſts of high latitudes, where the ſcurvy is moſt prevalent. Foſter found it alſo in great abundance in the iſlands of the South ſea. A remarkably volatile and pungent ſpirit, known by the name of *ſpiritus antiſcorbuticus, ſive mixtura ſimplex antiſcorbutica dranizii*, is prepared from it, which has been found an uſeful remedy in paralytic affections, and other diſeaſes that require an active ſtimulus. But as an antiſcorbutic, the expreſſed juice, or the plant itſelf, eaten in a ſallad with water-creſſes and brook-lime, is the moſt beneficial. 2. C. *anglica*. Linn. Sp. Pl. 2. Mart. 3. Lam. 3. Flor. Dan. tab. 329. Eng. Bot. tab. 552. (C. folio ſinuato; Bauh. Pin. 110. Tourn. 215. Rai. Syn. 303. C. britannica; Dod. Pempt. 594. Ger. Amen. 401.) Engliſh ſcurvy-graſs. "Root-leaves egg-ſhaped, entire; ſtem-leaves lanceolate, toothed; ſilicles elliptical, reticularly veined." *Root* annual or biennial. *Herb* ſmooth, ſomewhat fleſhy, variable in the form and ſize of its leaves, generally ſmaller than the preceding. *Root-leaves* on long petioles, rarely a little toothed or repand; ſtem ones embracing the ſtem, ſcarcely ſinuated. Flowers like thoſe of C. officinalis. *Silicle* twice the ſize, turgid, ſometimes almoſt globular, crowned with a longiſh ſtyle. A native of England on muddy ſea-ſhores. 3. C. *danica*. Linn. Sp. Pl. 4. Mart. 2. Lam. 2. Flor. Dan. 190. Eng. Bot. 696. (C. aremorica; Tourn. 215. Barrel. icon. 1205. fig. 1. C. repens et minor erecta; Bauh. Pin. 53. Thlaſpi hederaceum; J. Bauh. 2. p. 933. Lob. ic. 615.) "Leaves all deltoid, and petioled; ſilicles elliptical, reticularly veined." *Root* annual or biennial, ſmaller than either of the preceding. *Stems* about five inches long, ſeveral, ſeldom branched, partly decumbent, ſtriated, reddiſh, ſmooth. *Leaves* nearly equal in ſize, uniform, three or rarely five-lobed, ſomewhat toothed, reſembling thoſe of ivy. *Flowers* white, ſmall, in rather ſhort corymbs. *Silicle* quite elliptical, leſs turgid, crowned with a ſhorter ſtyle. *Seeds* about ſix in each cell. A native of the ſea coaſts of Denmark and Sweden. In England leſs common. Firſt diſcovered by Lawſon in Walney iſland, Lancaſhire, afterwards by Llwyd in Angleſea, and is probably to be found in other parts of the weſtern coaſt. We have obſerved it abundantly at Blackpool. Mr. Crowe detected it in ſalt marſhes at Wells in Norfolk, and Mr. D. Turner, and Mr. Sowerby in ſeveral parts of the ſouthern coaſt, from Portland iſland to the Land's End. 4. C. *groenlandica*. Linn. Sp. Pl. 4. Mart. 4. Lam. 4. Willd. 4. "Leaves kidney-ſhaped, fleſhy, quite entire." *Root-leaves* very ſmall, convex underneath, veinleſs, on long petioles. 5. C. *ſibirica*. Willd. 5. "Leaves heart-ſhaped, gaſh-toothed." *Stem* erect, a foot high, ſimple, ſtriated, ſmooth. *Leaves* alternate, on long petioles, obtuſe, four lines long, and as many broad, deeply toothed; teeth obtuſe; upper petioles the length of the leaves; lower ones four times as long. *Flowers* white, in racemes. *Silicles* ſmall, lanceolate, one or two ſeeded. A native of Siberia. 6. C. *acaulis*. Willd. 6. Desfont. Atl. 2. p. 69. "Stemleſs; leaves cordate-kidney ſhaped; ſcapes filiform, one-flowered, quite ſimple." Whole plant ſcarcely half an inch high, growing in tufts, ſmooth. *Leaves* ſmall, petioled, ſomewhat fleſhy, ſmooth. *Scapes* about the length of the leaves. *Flowers* blue or white, the ſize of thoſe of C. officinalis: border of the petals entire, inverſely egg-ſhaped. *Silicle* inflated, thick, oblong, many-ſeeded; ſtyle very ſhort. A native of Portugal and Morocco. 7. C. *ſaxatilis*. Lam. 6. (Myagrum ſaxatile; Linn. Sp. Pl. Mart. Willd. Thlaſpi alpinum majus et minus; Bauh. Pin. 107. T. alpinum myagroides; Pon. Bald. 185. Cluſ. Hiſt. 338. Alyſſum; Hall. Helv. n. 490. Allion. ped. n. 887.) "Lower leaves petioled, ovate-oblong, ſlightly ſerrated; upper ones nearly ſeſſile, tongue-ſhaped; ſilicle globular." Lam. *Root* perennial. *Stem* ſix or ſeven inches high, very ſlender, weak, ſmooth, reddiſh at its baſe, branched near the top. *Root-leaves* ſpreading on the ground. A native of rocky ground on the ſouthern coaſt of France, and on the mountains of Switzerland and Italy. 8. C. *auriculata*. Lam. 7. "Leaves oblong, arrow-ſhaped at the baſe, auricled, embracing the ſtem; racemes long, looſe, ſimple." Entirely ſmooth. *Stem* ſix or ſeven inches high, branched at the baſe, ſlender, weak. *Leaves* larger than thoſe of C. ſaxatilis; root-leaves ſpatula-ſhaped, entire, narrowed into petioles; ſtem ones oblong, generally obtuſe, enlarged and furniſhed with ſome angular teeth near the ſummit, embracing the ſtem; arrow-ſhaped and auricled at the baſe. *Flowers* white. *Silicles* oval-globular, crowned with the very ſhort ſtyle. Found by La Marck on uncultivated ground in Auvergne. 9. C. *draba*. Linn. Sp. Pl. 8. Mart. 8. Lam. 8. Willd. 11. Jacq. Auſt. 4. tab. 315. (Lepidium humile, incanum arvenſe; Tourn. 216. Draba umbellata, ſive major capitulis donata; Bauh. Pin. Moriſ. Hiſt. 2. tab. 21. fig. 1. bad. Arabis ſive draba et naſturtium babylonicum; Lob. ic. 224.) "Leaves lanceolate, embracing the ſtem, toothed." *Root* perennial, ſtriking deep. *Stems* ſeveral, about a foot high, ſtriated, leafy, almoſt ſimple, annual. *Leaves* diſtantly toothed, ſlightly pubeſcent on both ſides, pale green or hoary, with two acute auricles at the baſe. *Flowers* white, ſmall, in ſeveral ſhort racemes, which form a terminal panicled corymb. *Silicle* inflated, heart-ſhaped, ſmooth, with a ſingle ſeed in each cell. A native of Italy, Auſtria, and the ſouth of France. 10. C. *glaſtifolia*. Linn. Sp. Pl. 7. Mart. 7. Lam. 9. Willd. 10. (C. altiſſima, glaſtifolio; Tourn. 215. Lepidium glaſtifolium; Bauh. Pin. Moriſ. Hiſt. 2 tab. 2. fig. 3.) "Stem-leaves cordate-arrow-ſhaped, embracing the ſtem." The habit of a turritis. *Root* biennial. *Stem* from three to five feet high, erect, leafy, cylindrical, ſmooth, with a few ſhort branches. *Lower leaves* oblong, narrowed into a petiole. *Flowers* white, ſmall; in ſhort, alternate racemes, which form an elongated terminal panicle. *Silicles* globular. *Seeds* numerous. A native of Germany, about Ratiſbon. The whole plant is eſteemed deterſive, diuretic, lithontriptic, and antiſcorbutic. 11. C. *armoracia*. Linn. Sp. Pl. 6. Mart. 6. Lam. 10. Willd. 8. Woodv. Med. Bot. tab. 150. (C. folio cubitali; Tourn. 215. Raphanus ruſticanus; Bauh. Pin. 96.) Horſe radiſh. "Root-leaves oblong, crenate; ſtem ones lanceolate, gaſhed or entire." Dr. Smith. *Root* perennial, ſpindle-ſhaped, long, very durable, acrid. *Stems* about two feet high, erect, corymbous, leafy. *Root-leaves* petioled, very large, ſometimes pinnatifid, veined; ſtem ones ſeſſile. *Flowers* white. *Silicle* elliptical, with a very ſhort ſtyle and ſhort ſtigma. *Fruit* often abortive. A native of England and other parts of Europe, in moiſt ground, and on the banks of rivulets. The uſe of its ſcraped root in warm pickles, and as a poignant condiment to various kinds of animal food, is well known. It has alſo acquired much reputation as a medicine, and is a powerful ſtimulant, whether externally or internally employed. *Externally* it readily inflames the ſkin, and if its application be long continued, produces bliſters. In this reſpect it is uſed with advantage in caſes of palſy and rheumatiſm. One dram of the root infuſed in a cloſe veſſel with four ounces of water for two hours, and made into a ſyrup with double its weight of ſugar, taken *internally*, in the quantity of a tea-ſpoonful or two, and ſwallowed leiſurely, or at leaſt two or three times repeated, has been found to be ſuddenly effectual in relieving that kind of hoarſeneſs which proceeds from an interrupted ſecretion of mucus. Infuſed in water, and taken into the ſtomach, it proves ſtimulant to the nervous ſyſtem, and is on that account uſeful in palſy and chronic rheumatiſm, whether ariſing from ſcurvy or other cauſes. This infuſion, taken with a large draught of warm water, is a ready emetic, either by itſelf, or to aſſiſt the operation of other emetics. The root cut, without bruiſing, into very ſmall pieces, and ſwallowed without chewing, may be taken to the quantity of a table-ſpoonful; and, according to Bergius, has been found very uſeful in arthritic caſes; which, however, Dr. Cullen ſuppoſes to have been of the rheumatic kind. Its matter, like that of other ſiliquoſe plants, paſſes readily to the kidneys, and thus proving a powerful diuretic, is uſeful in dropſy, by promoting both urine and perſpiration. It has alſo long been known as an active antiſcorbutic. It is extremely pungent both to the taſte and ſmell, but nevertheleſs contains a ſecret juice, which ſometimes exudes in little drops upon the ſurface. Its pungent matter is very volatile, being totally diſſipated in drying, and carried off in evaporation or diſtillation by water and rectified ſpirit. It impregnates both water and ſpirit, by infuſion or diſtillation, very richly, with its active matter. In diſtillation with water, it alſo yields a ſmall quantity of eſſential oil, exceedingly penetrating and pungent. See Cullen's Materia Medica, vol. ii. p. 169.; and Woodville's Medical Botany, vol. iii. p. 407. An infuſion of it in cold milk is ſaid, by Dr. Withering, to be one of the ſafeſt and beſt coſmetics. 12. C. *macrocarpa*, Willd. 9. Waldſtein and Kitabel, pl. Hung. "Root-leaves cordate-egg-ſhaped, crenate; ſtem ones lanceolate, cartilaginouſly toothed; ſilicles elliptical, inflated." Nearly allied to the preceding ſpecies. A native of Hungary in moiſt ground.

COCHLEARIA *coronopus*, Linn. &c. See CORONOPUS *ruelii*.

COCHLEARIA, in *Gardening*, comprehends a plant of the top-rooted eſculent kind, the horſe-radiſh (C. *armoracia*) which has a creeping perennial root, the leaves very large, varying much, the flowering ſtem a foot or eighteen inches in height, and the flowers white, in looſe panicles, appearing in May.

Method of Culture. In the culture of this plant there is little difficulty, as it is readily effected by planting ſuch cuttings of the roots as contain buds or eyes. Thoſe made from the tops, and which have the heads or crowns of the plants to them, are the beſt. The off-ſets and ſide-ſhoots may likewiſe be employed for the purpoſe, as is moſtly the caſe with market-gardeners. They ſhould be about an inch or two in length. As theſe plants require to be put into the ground to a great depth, in order that they may form long fine roots, the earth ſhould either be dug over before the cuttings are placed in, or trenched to the depth of fifteen or twenty inches at the time, according to the method of planting that is made uſe of, and in either mode the ground be well looſened, and broken down fully to the above depth.

The ſorts of ground moſt adapted to the growth of theſe roots are thoſe of the more light deep kinds; but they will ſucceed tolerably on almoſt any. When the land has been trenched over in the above manner, the uſual mode of planting is by means of the dibble; but there is another practice which is ſometimes followed, which is that of trenching in the ſets, or placing them in the earth at the time it is dug over to the full depth of the looſened mould.

But in the firſt method, after the ground has been prepared, a line is ſtretched acroſs, beginning at the end, and holes made to the depth of fifteen or twenty inches along it, by means of a long ſharp iron dibble, at the diſtance of nine inches from each other, a ſet or cutting being dropped into each hole, and the mould cloſed upon it. The line ſhould then be moved forward to the diſtance of twenty inches or two feet, and another row put in in the ſame manner, proceeding in the ſame way till the whole of the ground is planted over.

In performing the work in the latter mode, the ground ſhould be made light and looſe, beginning at one end of the piece, and opening a trench two ſpades wide, and one ſpade deep, digging the bottom; then a row of cuttings ſhould be ſet along the middle of the bottom nine inches diſtant, inſerting them to their tops in the earth; then digging the next trench the ſame width and depth, turning the earth into the firſt upon the row of plants, breaking all large clods, and levelling the top. After this, proceed to the ſecond trench, planting it in the ſame way, performing the whole of the work in a ſimilar manner, and then levelling the ſurface by the rake.

The moſt proper ſeaſon, or time of the year for this work, is in the autumn for the dryer ſorts of land, and in the early ſpring, as in February, or beginning of the following month, for ſuch as are of a moiſt quality.

In theſe methods of planting, in order that no time may be loſt, the ground may be ſown the firſt year with ſpinach, radiſhes, or any ſlight-rooting crop, that comes off early in the ſummer, to allow of the plants being kept clean afterwards by hoeing; which is all the culture they require in bringing the roots to a proper ſize for uſe.

Sometimes it is the caſe, eſpecially where the land is ſuitable for them, that the plants make ſuch progreſs as to have roots large enough for uſe in the courſe of a few months; but if not much wanted, they are better to remain a twelvemonth, or two or three years, as by ſuch delay they are much larger and finer.

In reſpect to taking up the roots for uſe, the beſt method is to open a trench two ſpades wide, cloſe on the ſide of the firſt row of plants, and fully as deep as the ſtool or bottom of the roots, without diſturbing them; then with a large knife or ſharp ſpade to cut off all the ſhoots, large and ſmall, of each ſtool cloſe and level, from whence they riſe, leaving the old or parent ſtools in the earth; and after having taken up all the plants of the firſt trench, proceeding to the next row in the ſame manner, turning the earth of it into the firſt, and cutting off all the ſhoots as before, taking up the whole in the ſame way as wanted. By this means the remaining undiſturbed ſtools continue to ſend up a freſh ſupply of ſhoots in ſucceſſion for many years; but after the two firſt years the ſtools begin to ſpread at bottom, and ſend up many ſmall ſhoots between and in the rows; all of which intervening ſmall ſpawn ſhould be annually drawn up in the beginning of ſummer, to render the principal ſhoots large and fine. And though the ſtools of theſe roots endure many years, in time they become weak or worn out, as well as the ſoil; conſequently, in ſix or ſeven years, when the ſhoots become weak and ſmall, a freſh plantation ſhould be made in ſome other place. In order to have fine roots it is better, however, to do it every three or four years.

Theſe roots are much uſed for culinary purpoſes when ſcraped very fine, eſpecially for fiſh, and ſome other ſorts of food.

Whenever more of the roots are taken up at a time than are wanted, they may be preſerved in their juicy ſtate for ſome time, by putting them in a little dry ſand.

Cochlearia, in *Ancient Geography*, a place in the iſland of Sardinia, between Ullia and Portus Luquidonis, according to the Itinerary of Antonine.

Cochlearia, in *Ornithology*, a ſpecies of *Cancroma*, which ſee.

COCHLITES, in *Natural Hiſtory*, a term comprehending ſeveral kinds of foſſil ſhells found lodged in the Britiſh ſtrata, and reſembling ſnails and periwinkles.

COCHLIUSA, an iſland of Aſia Minor in the Mediterranean ſea, ſituated on the coaſt of Lycia.

COCHRYNNA, a river of Thrace, in the environs of the Chalcidic territory.

COCINTUM, a town of Italy in Brutium, near the eaſtern coaſt, at a ſmall diſtance to the weſt of the promontory of the ſame name.

COCK, Matthew, and Jerome, in *Biography*, two brothers, painters of Antwerp, who flouriſhed about 1551. Matthew is ſaid by Van Mander, to have been one of the firſt artiſts amongſt the Flemings, who painted landſcape in a good ſtyle. However, his pictures, though finiſhed, are hard, and much reſemble thoſe of old Breugel.

Jerome, his brother, though poſſeſſed of no ſmall ſhare of ability, gave himſelf up to engraving, and publiſhing many excellent prints, though in the old dry manner, after the works of Matthew Cock, old Breugel, and Francis Florio, as well as from the pictures of the beſt maſters of Italy, where he long reſided; beſides which, he gave to the world many intereſting collections of antiquities, topography, &c. He died in 1570, many years after the death of Matthew his brother. Baldinucci. Heinecken.

Cock, *of a Muſket*, in *Gunnery*, the part of the lock which ſuſtains the two ſmall pieces of iron called jaws, between which the flint is fixed.

To cock a muſket, piſtol, &c. is to fix the cock in ſuch a manner as to have it ready for an inſtant diſcharge.

Cock, in *Ichthyology*, a ſmall fiſh that is ſometimes very common on the ſhore of Cornwall; the *labrus coquus* of Gmelin, purple, and obſcurely cæruleous, yellow underneath, with a rounded tail.

Cock, *Phaſianus gallus* of Linnæus, in *Ornithology*, the name of the male of gallinaceous birds; the ſpecific character of which is, that it has a compreſſed caruncle on its top, and a double one on its cheek; that its ears are naked, and that its tail is compreſſed and riſing. For the hiſtory and varieties of this bird, ſee Phasianus *Gallus*. For its uſes in domeſtic economy, ſee Eggs, Hatching, Hen, and Poultry.

In the choice of a *dunghill-cock*, he ſhould be of a large body, very long from the head to the rump, thick in the girth, the neck long, looſe, and high; the comb, wattles, and throat large; the eyes round and large, and anſwerable to the colour of his plume or main, as grey with grey, yellow with yellow, and ſo of the reſt; his beak ſhould be ſtrong and hooked; and his main or neck-feathers very long and gloſſy, covering his neck and ſhoulders; the legs ſhould be ſtrait, and of a long beam, with very large and long ſpurs, a little bending; the colour ſhould be black, yellow, or browniſh; the claws ſhould be long and ſtrong; the tail long, bending back, and covering the whole body; the wings very ſtrong; and the general colour ſhould be reddiſh. The cock is a heavy bird, and his gait is compoſed and ſlow. His wings are very ſhort, and hence he ſeldom flies, and the violence of his efforts is ſometimes indicated by his ſcreams. He crows either in the night or day, but not regularly at certain hours, and his note is very different from that of the female. He ſcrapes the ground to ſeek his food, and ſwallows, with the grains, ſmall pebbles, which ſerve to aſſiſt digeſtion. He drinks, by taking a little water into his bill, and raiſing his head at each draught. He moſt frequently ſleeps with one foot in the air, and his head covered by the wing on the ſame ſide. The thigh on which the body reſts is commonly more fleſhy than the other; and it is ſaid that our epicures well know how to diſtinguiſh them. In its natural ſituation, the body is nearly parallel to the ground, as is alſo the bill; the neck riſes vertically, the forehead is ornamented with a red fleſhy comb, and the under part with a double pendant of the ſame colour, which, ſays Buffon, is neither fleſh nor membrane, but of a peculiar nature, different from every thing elſe. In both ſexes the noſtrils are ſituated on either ſide of the upper mandible, and the ears on either ſide of the head, and below each ear is ſpread a white piece of ſkin. The feet have commonly four toes, ſometimes five, but always three of them placed behind. The feathers riſe by pairs from each ſhaft. The tail is nearly ſtraight, but admits of a ſmall elevation and depreſſion. The male is diſtinguiſhed by having the two feathers in the middle of the tail much longer than the reſt and bent into an arch; the feathers of the tail and rump are alſo long and narrow, and the feet are armed with ſpurs. A good cock has eyes ſparkling with fire, boldneſs in his demeanour, and freedom in his motions, and diſplays force in all his proportions. He is ſo ſingularly ſalacious, that though he ought not to be allowed more than 12 or 15 hens (Columella recommends, indeed, that they ſhould not exceed five); yet if he had 50 a day, he would not, it is ſaid by Aldrovandus, neglect one of them. However, in this caſe it is not certain that he would fecundate the eggs of the female. Ardent in his paſſion, the firſt thing he does after he is diſcharged from his rooſt in the morning is to tread his hens; and if he is for ſome time deprived of his family, he makes his addreſſes to the firſt female he meets, though of a very different ſpecies, and even courts the firſt male that occurs. The firſt fact is mentioned by Ariſtotle; the ſecond is proved by an obſervation of Edwards, and may be inferred from a law mentioned by Plutarch, in his treatiſe on the queſtion "Whether brutes reaſon," which enacted, that a cock convicted of this unnatural act, ſhould be burnt alive. The cock is extremely watchful of his females, and manifeſts great inquietude and anxiety; he hardly ever loſes ſight of them; he leads and defends them, and threatens them with his menaces; he collects them together when they ſtraggle, and never eats till he has the pleaſure of ſeeing them feeding around him. The different inflexions of his voice, accompanied by various ſignificant geſtures, are a kind of language that ſerves to communicate his ſentiments. When he loſes them he expreſſes grief. Although he is no leſs jealous than amorous, he does not abuſe his wives, but directs his rage againſt his rivals. Large as is his family, it is obſerved that he has a favourite female to whom he manifeſts peculiar attention. It was known as long ago as the time of Ariſtotle, (vid. de partibus animalium, lib. iv. 5.) that the cock had organs of generation concealed within his body. The bulk of theſe varies in different ſpecies, and in different animals of the ſame ſpecies, at different times; but whatever be their ſize, they are very important in the animal economy, as is evinced by the fecundation of eggs, and the wonderful changes reſulting from their extirpation. This operation is commonly performed when the bird is three or four months old. After emaſculation it grows plumper, and its fleſh becomes more juicy and delicate, and when ſubjected to a chemical analyſis, yields different products from thoſe which it would have afforded before caſtration. The extract of the lean of a capon is ſomewhat leſs than the 40th part of its total weight; whereas it amounts to 1-12th in a pullet, and rather more than 1-7th in a cock. Beſides, the extract of cock's fleſh is very dry, while it is difficult to ſeparate the humidity from that of a capon (Mem. Acad. Roy. Scienc. an. 1730, p. 231.) The capon is no longer liable to moult; his note is altered, his voice broken and ſeldom heard; he is treated roughly by the cocks, with diſdain by the females; and deprived of all the appetites which he naturally poſſeſſed, he is not only excluded from the ſociety of his equals, but extruded, as it were, from his ſpecies. To eat, ſleep, and fatten, are in this ſtate its principal objects. However, he may even now be taught to rear and tend young chickens. For this purpoſe the capon muſt be kept ſome days in a dark place, only bringing it out at regular hours to feed, and accuſtoming it gradually to the ſight and company of a few ſtout chickens; for theſe it will ſoon acquire a fondneſs, and will lead them with as much affection and aſſiduity as their mother. It will conduct even a greater number than a hen; for its wings ſpread and afford more ſpacious ſhelter; and the hen, freed from its ſolicitude and toil, will ſoon begin again to lay.

Some have practiſed another method of teaching a capon to clutch a brood of chickens, more cruel, but no leſs effectual than the former; which is that of rendering him very tame ſo as to feed from one's hand: and then, about evening, plucking the feathers off his breaſt, and rubbing the bare ſkin with nettles; the chickens are then put to him, and preſently run under his breaſt and belly, and probably by rubbing his bare ſkin gently with their heads, allay the pain which the ſtinging of the nettles had occaſioned. This is repeated for two or three nights, till the capon contracts an affection for the chickens, which have given him relief, and takes them under his protection. A capon accuſtomed to this ſervice will repeat it to one brood after another.

Thus the capon, though condemned to ſterility, will ſtill contribute indirectly to the preſervation and multiplication of its ſpecies. Another operation performed on the cock is, after cutting the comb as uſual, to ſubſtitute in its ſtead one of the young ſpurs which has juſt begun to ſhoot; thus engrafted, it gradually ſtrikes root into the fleſh, thence extracts its nouriſhment, and often grows more luxuriantly than it would have done in its natural ſituation.

Chickens are not hatched with that creſt, and thoſe reddiſh membranes which diſtinguiſh them from other birds. Theſe parts do not begin to unfold themſelves for the firſt month, after they have left the ſhell; at two months the young cocks crow, and fight with one another; but it is commonly after an interval of five or ſix months that they manifeſt any paſſion for the hens, and that theſe begin to lay. In both ſexes the complete time of their growth is a year or 15 months. This period of their growth would imply that the ordinary extent of their life does not exceed ſeven or eight years, if the ſame proportion ſubſiſted in birds as in quadrupeds. But this has been obſerved to be much longer. Some have limited their age to 10 years; others have extended it in their domeſtic condition to 20 years; and in a ſtate of abſolute liberty to 30 years. But as cocks and hens are bred for profit, the hens and capons that are deſtined for the table, ſeldom enjoy above one year's exiſtence, and moſt of them have only one ſeaſon. Thoſe which are ſelected for the multiplication of the ſpecies become ſoon exhauſted, and none are permitted to arrive at their natural period; ſo that cocks are ſeldom or never known to die of age.

Cock, *of the Game*, or *Game Cock*, *Phaſianus gallus*, of Linnæus: *Phaſianus gallinaceus* of Ray, Willughby, and other ornithologiſts.

The Engliſh game-cock is vulgarly imagined to be the offſpring of the domeſticated fowl and the pheaſant: this idea is, however, not at all aſſented to by ornithologiſts, or the amateurs of the art of cocking. On more ſure grounds its origin is referred to the wild cock of India, found not unfrequently on the continent of India, and the iſles St. Jago, Pulocondore, Timor, Philippine and Molucca iſlands, Sumatra, Java, New Guinea, Tinian, and the iſles of the South Seas. At Sumatra and Java they are noticed as being particularly large. Latham has obſerved that they breed moſt freely in warmer ſituations; in very cold regions, though they live and thrive, they ceaſe to multiply.

According to Mr. Pegge, in the "Archæologia," vol. iii. No. 19, the art of cock-fighting is referred to the Greeks.

Jacobus Palmerius, a writer cited by Mr. Pegge, pretends that the traces of this diverſion may be diſcovered among the barbarians of Aſia, as early as the reign of Crœſus, king of Lydia, A. M. 3426, and 558 years before Chriſt. But the learned antiquary apprehends, that the fact to which this writer refers, furniſhes no evidence that quails, uſed among the ancients and moderns for fighting, as well as cocks, were fitted for the purpoſe of amuſement at ſo early a period. Pliny, however, informs us, (N. H. l. x. c. 21.) that at Pergamus, a city of Aſia, there was an annual exhibition of cock-fighting. But we derive no information from his account, when or where this practice commenced, or for what purpoſe, whether civil or religious, it was introduced. The Dardanii, a people of Troas, had on their coins the repreſentation of two cocks fighting; but as theſe coins are of a late date, the antiquity of this ſpecies of diverſion among the Dardanians cannot be inferred from them. Mr. Pegge ſuggeſts that, perhaps, it might have been introduced among them, and alſo at Pergamus, from Athens, where an annual feſtival, under the title of 'Αλεκτρυόνων ἀγὼν, was inſtituted by Themiſtocles, after the concluſion of the Perſian war. When this famous general was leading the Athenian army againſt the Perſians, he ſaw ſome cocks fighting, and took occaſion from this circumſtance to animate his troops by obſerving to them;

"Theſe animals fight not for the gods of their country, nor for the monuments of their anceſtors, nor for glory, nor for freedom, nor for their children, but for the ſake of victory, and that one may not yield to the other;" and from this topic he inſpirited the Athenians. (Vid. Ælian, Var. Hiſt. ii. c. 28.) If we can excuſe the barbarity of this inſtitution, it may be conſidered in ſome degree as commendable, becauſe it was an act of perpetual gratitude to the benevolent deity that preſented him with an occaſion of haranguing his ſoldiers with ſuch effect as to induce them ſucceſsfully to engage their enemies in battle, or at leaſt, as a permanent encouragement to his nation. As to the barbarity of the inſtitution, Ælian remarks, that cruelty and every kind of debauchery were ſo generally interwoven with the religious obſervances and ceremonies of theſe polite Athenians, that they would be but little ſhocked and offended by it on this account; or, however, not more ſo than the more ignorant barbarians of the oppoſite coaſt of Aſia, the Pergamenians or Dardanians. We may further obſerve, that the cock, on account of his vigilance, was ſacred to Apollo, Mercury, and Æſculapius; and for the ſame quality, in conjunction with his magnanimous and daring ſpirit, he was appropriated likewiſe to Mars. This was extremely oppoſite to the purpoſe and intention of the "Spectaculum," or public ſhow, exhibited by Themiſtocles; as theſe creatures, called by Columella "rixoſæ aves," were ſuppoſed to be more addicted to fighting than any others. The ſcene of engagement, however, or in modern phraſe, the "pit," was the theatre; and the ſport laſted one day. But others, as well as Themiſtocles, have taken the advantage of the fight of cock-fighting, and deduced from this circumſtance an argument for the incitement and encouragement of military valour. Socrates endeavoured in the ſame way to inſpire Iphicrates with courage. (Diog. Laert. ii. § 30) Chryſippus alſo, in his book "De Juſtitia," ſays, "our valour is raiſed by the example of cocks." Lucian likewiſe (de Gymnas. ii. p. 295), introduces Solon, the great Athenian legiſlator, as addreſſing Anacharſis to the ſame purpoſe. Muſonius alſo, cited by Stobæus (Serm. 29), deduced the ſame kind of inſtruction from the battling of quails and cocks; and we are informed that the young men were obliged to attend the exhibitions of the theatre, in order to avail themſelves of this inſtruction. It further appears, that the other Greeks, as well as the Athenians, held a good fighting breed of cocks in high eſtimation, and often amuſed themſelves with this diverſion. We learn from Pliny (ubi ſupra), and Columella (viii. c. 2.), that the iſlanders of Delos were great lovers of this ſport; and Tanagra, a city of Bœotia, the iſle of Rhodes, Chalcis in Eubœa, and the country of Media, were famous for their generous and magnanimous race of chicken. The kingdom of Perſia was probably included in the laſt, from whence this kind of poultry was firſt brought into Greece; and if a judgment may be formed of the reſt from the fowls of Rhodes and Media, the excellency of the broods at that time conſiſted in their weight and bulk (as the fowls of that country were heavy and large), and ſuch as our ſportſmen call "ſhake-bags" or "turn-pokes." At Alexandria, in Egypt, they had a breed of hens, called Μονοστροι, which produced the beſt fighting-cocks. Upon the whole, it ſhould ſeem, that at firſt cock-fighting was partly a religious and partly a political inſtitution at Athens; and was there continued for the purpoſe of cheriſhing valour in the minds of their youth; but it was afterwards perverted, both here and in other parts of Greece, to a common paſtime, without any moral, political, or religious intention; as it is now practiſed among us.

The Romans, who were prone to imitate the Greeks, followed their example in this kind of diverſion, without any good or laudable motives. Signior Haym (cited by Mr. Pegge,) thinks, that the Romans borrowed the paſtime from Dardanus, in Aſia; but it is needleſs to trace their derivation of it to ſuch a diſtance, more eſpecially as it was generally followed in Greece, and was not introduced among the Romans at a very early period. From a paſſage that occurs in Columella, (ubi ſupra) it appears probable that the Romans did not uſe the ſport of cock-fighting in his time; and he moreover ſpeaks of it in terms of ignominy, as an expenſive amuſement, unbecoming the frugal houſeholder, and as often attended with the ruin of the perſons that purſued it. The Romans ſeem to have been more acquainted with quails as fighting birds than with cocks. At length, however, they paired cocks, as well as quails, for fighting. The firſt cauſe of contention between the two brothers, Baſſianus and Geta, the ſons of the emperor Septimius Severus, happened, according to Herodian, (iii. § 33) in their youth, about the fighting of their quails and cocks; and, as they had often accompanied their father into Greece, they had probably ſeen and learned this paſtime there. It might naturally have been expected that, after the introduction of Chriſtianity into the Roman empire, when the bloody ſcenes of the amphitheatre were diſcarded, this barbarous and inhuman diverſion, which had a tendency towards cheriſhing ferocity and implacability in the minds of men, would have been reſtrained and gradually annihilated. Beſides, this paſtime has been the bane and ruin of thouſands here, as well as of thoſe "laniſtæ avium," cock-feeders, mentioned by Columella, whoſe patrimonial fortunes were entirely diſſipated and conſumed by it.

The cock is not only a very uſeful animal, but ſo ſtately in his figure, and magnificent in his plumage, that Pliny ſpeaks in high terms of his government among his own kind, and Ariſtophanes compares him to the king of Perſia. Such alſo is his tenderneſs to his brood, that he will ſcratch and provide for them with an aſſiduity almoſt equal to that of the hen; and ſuch is his generoſity, that, on finding a hoard of meat, he will chuckle the hens together, and without touching one morſel himſelf, will relinquiſh the whole to them. The cock was called *the bird*, κατ, εξοχην, by many of the ancients; he was highly eſteemed in ſome countries, and, in others, was even held ſacred; inſomuch that one cannot forbear regretting, that a creature ſo noble and ſo uſeful ſhould be ſo cruelly treated. It affords, however, ſome ſatisfaction, that the Αλεκτρυοφονια, if ſuch a word be allowed, or the maſſacre of Shrove-Tueſday, is now declining, and this circumſtance encourages the hope, that, in a few years, it will be totally diſuſed; but the cock-pit ſtill continues a reproach to the humanity of Engliſhmen, and to the benign religion which they profeſs.

This ſpecies of paſtime was probably brought into England by the Romans, but the preciſe period of its introduction has not been aſcertained. The bird was here before Cæſar's arrival; but Mr. Pegge, in his Reſearches, has found no notice of his fighting before the time of William Fitz-Stephen, who wrote the life of archbiſhop Becket, ſome time in the reign of king Henry II. William deſcribes the cocking as a ſport of ſchool-boys on Shrove-Tueſday, called "Carnilevaria." The theatre was the ſchool, and the maſter was the director of the ſport. From this time, the diverſion, however abſurd and barbarous, has continued amongſt us; it was followed, though diſapproved and prohibited, 39 Edw. III.; alſo in the reign of Henry VIII.; and A. D. 1569. By ſome it has been called "a royal diverſion;" and much encouraged both by Henry VIII. and

James I; but it was forbidden by one of the acts of Oliver Cromwell, March 31, 1654.

There are no documents that we are acquainted with to inform us in what ſtate the art of fighting cocks exiſted to the reign of king Henry VIII. who, it is ſuppoſed, founded the celebrated national cock-pit at Weſtminſter, afterwards renewed and encouraged by Charles II. whoſe pile cocks, the introduction of this monarch, are in high eſtimation among numerous breeders at this day. From that period annual mains have been fought at the royal cockpit in Weſtminſter to the preſent time.

The inſtitutors of this eſtabliſhment enacted certain laws for the better regulation of theſe ſports, the leading features of which, as belonging to this art, we ſhall here briefly deſcribe.

There are three kinds of mains at preſent in uſe with cockers; the *long main*, which in general continues for a week, ſeldom or never longer; the *ſhort main*, of a day or two, (both regulated by the ſame laws); and the *Welch main*: in the long main the cocks are generally the property of a joint ſubſcription, or of only two individuals, and the cocks thus collected are choſen for the main, according to their weights, thoſe being preferred, as a medium weight, from three pounds eight ounces to four pounds ten ounces, giving or taking an ounce on either ſide, though they are generally matched to a drachm weight. The cocks, which form the bye-battles in the main, become the objects of ſeparate bettings, and are ſubject to the ſame weights and regulations. Cocks, whoſe weights are above four pounds eight ounces, are termed ſhake-bags or turn-outs, and are ſeldom matched againſt each other by weight.

The ſhort main laſts only for a day or two, the cocks being fewer in number, or the numbers are doubled for each day. The Welch main is generally fought for a purſe, a gold cup, a fat hog, or ſome other prize; in this main all the fowls are reſtricted to a certain weight, *viz.* about four pounds four ounces: theſe are matched againſt each other, as ſhall be agreed upon, the winners again taking the winners, till they are reduced to a pair; then the winner of the laſt battle gains the prize.

Beſides this there is alſo to be noticed the battle-royal, which conſiſts in any number of fowls being put down together on the pit, and the laſt ſurviving fowl gains the prize.

Thoſe ſpecies of fighting, called the battle-royal and the Welch main, are known no where in the world, as Mr. Pegge conceives, (ubi ſupra), but in this country; neither in China, where this ſpecies of diverſion is very prevalent, nor in Perſia, nor in Malacca, nor among the ſavage tribes of America.

The battle of the main always begins with fighting the lighteſt cocks; it is fair to feed them in any way you pleaſe after they are weighed; and thoſe which, proportionately to their bulk, had been previouſly moſt reduced, or brought down, now have the opportunity of being fed and brought up again, thereby gaining upon the weight of their opponents; for the lighteſt cocks are found to be the firſt prepared by the artifices that are uſed to bring them to their wind and action.

The following articles are obſerved by the members of the cock-pit royal, for regulating the mains. "Articles of agreement, made the day of , one thouſand eight hundred and , between : Firſt, the ſaid parties have agreed, that each of them ſhall produce, ſhew, and weigh, at the , on the day of , beginning at the hour of in the morning, cocks, none to be leſs than 3lb. 8oz., nor more than 4lb. 10 oz., and as many of each party's cocks that come within one ounce of each other, ſhall fight for a battle, that is each cock, in as equal diviſions as the battles can be divided into ſix pits, or days play, at the cock-pit beforementioned; and the party's cocks that win the greateſt number of battles, matched out of the number before ſpecified, ſhall be entitled to the ſum of , odd battle money, and the ſum to be ſtaked into the hands of Mr. before any cocks are pitted, by both parties. And we further agree, to produce, ſhew, and weigh, on the ſaid weighing days, cocks for bye battles, ſubject to the ſame weight as the cocks that fight in the main, and theſe to be added to the number of cocks unmatched; and as many of them as come within one ounce of each other, ſhall fight for a battle; the number of cocks ſo matched, to be equally divided as will permit of, and added to each day's play with the main cocks; and it is alſo agreed, that the balance of the battle money ſhall be paid at the end of each day's play. It is alſo further agreed, for the cocks to fight in ſilver ſpurs, and with fair hackles; and to be ſubject to all the uſual rules of cock-fighting, as practiſed at the cock-pit royal, Weſtminſter; and the profits ariſing from the ſpectators, to be equally divided between both parties, after all charges are paid that uſually happen on thoſe occaſions. Witneſs our hands, day of 18 ."

It is underſtood on all occaſions, that battles for 5 *l.* and upwards muſt be fought in ſilver ſpurs, unleſs the contrary is expreſsly agreed upon, for this reaſon, that the battle is not ſo ſoon ended in ſilver, and the fowl has more opportunity of diſplaying his powers than in ſteel ſpurs. The ſetters to of the cocks are not permitted, by the general laws of cocking, to take up their fowls after they are put down upon the pit, unleſs either of the fowls touch the ſide of the pit, or are entangled in each other, or in the mat; in either caſe they may be handled and brought to the centre of the pit; if the fowl is thrown on his back with his legs upwards, and not touching the pit, it is lawful to turn him only; but it is not allowed, on any pretence, to remove feathers, &c. from the beak or eyes during the fight.

If either, or both cocks, through blindneſs, or any other cauſe, ceaſe to fight, "the law is told," that is, a perſon counts twice twenty, when they may be handled and ſet to again; this telling of the law is repeated as long as both cocks fight; but ten only is counted at each interval after the firſt, previouſly to their being put together; either ceaſing to peck, is told out by a perſon counting diſtinctly and audibly twice twenty, they are then ſet to beak to beak; if he now refuſes to fight, ten is told, and, "once refuſed," announced; if he continues to refuſe, ten more, "twice refuſed," and ſo on till he has refuſed ten different times, when he loſes the battle; this is termed the *long law*. If a cock reſumes his fighting at any period during the counting, in that caſe, in counting again, to begin the tens till the refuſals make ten following each other. Should both be diſabled, and refuſe to fight, *before* the long law begins counting, it is a drawn battle, and neither wins; and ſhould both refuſe fighting during the telling of the long law, it is that cock's battle which fought laſt; but ſhould he die before the law is told out, he loſes the battle, notwithſtanding the other did not fight within the law.

If any one deſires to ſtop this telling him out, he may *pound him*, that is, he bets the cock will be beaten ten pounds to five ſhillings; in this caſe he muſt lay down his hat, handkerchief, glove, or ſomething upon the pit, as a token of the challenge. When the *ſhort law* is told by a perſon, diſtinctly counting *twice twenty*, and afterwards repeating the words, *will any one take it?* three times; if no one accepts the challenge during this ſhort law, the cock is beaten. It is neceſſary, when any one takes the poundage or bet, that he declares it, and alſo lays down ſomething on the pit as ſurety; when the cock muſt fight till death, and ſometimes moſt unexpectedly he recovers and wins.

Having deſcribed the natural origin of this race of birds, the hiſtory of the ſport, and its laws and regulations, we now proceed to conſider the general form and properties of the fighting cock, when in his greateſt perfection, according to the ideas we at preſent entertain.

The general outline of the fineſt cock, taken as a whole, nearly approaches that of a lengthened cone, excluding the legs and tail, the apex of the cone being the head, and the baſe the vent and belly; under ſuch external form, may exiſt the beſt properties of the cock; in deſcribing the beauties of particular parts, the head ſhould be ſmall, the beak ſtrong and pointed, the neck long, and at the ſame time ſtrong, the girth of the ſhoulders, cheſt, and body, broad, feeling broad to the graſp, and tapering again to the rump. The thighs and legs large and ſtrong, and rather long than ſhort; and it is conſidered a good point if he brings them cloſe up to his body, when held in the hands, inſtead of letting them hang looſely down.

The feathers, to amateurs, alſo afford a good criterion of judging of the ſoundneſs of the bird; where theſe lie cloſe to the ſkin, and compacted together, and feel ſhort and ſtiff to the touch, and ſhining and gloſſy in their exterior; ſuch is deemed a ſound feathered bird.

The colours moſt admired are the *reds* and the *duck-wings*; by the red, among cockers, is underſtood a cock with a *hackle* (that is, the feathers of the head and neck) red, and with the hackle generally correſpond the colours of the rump or *ſaddle*.

The *red cock* varies with a black breaſt and *ginger* wing, that is, of a gingerbread or tawny colour, and again with a black-breaſt and a dark wing; ſuch are *dark reds*.

The colour of the wing, as uſed among the amateurs in cocking, is ſometimes taken from the whole wing; as, where the wing is altogether of a ginger-red, excepting the flight, or primary feathers, which are dark, or a part of the wing, as in the duck wings, hereafter to be deſcribed.

The *light-reds*, are thoſe whoſe breaſts are wholly red, or red ſpotted with black, or black ſtreaked with red, and theſe receive their names according to theſe circumſtances, as, *ginger-breaſted*, *ſpotted-breaſted ſtreaky breaſted*, &c.

The *duck wing* cock derives this name from a bar of ſteel-blue acroſs the greater coverts, like the faſcia acroſs the wild duck's wing; in this caſe it is obſerved, that the ſecondaries are exteriorly white, the hackle alſo white or pale-yellow, or cream-colour, as are the ſaddle-feathers, which correſpond, as we have before noticed, with the hackle.

In diſcriminating the individuals of this breed, it is farther uſual to deſcribe the colours of the breaſt and the ſhoulders; the breaſt may be *black*, or *ſpotted*, or *ſtreaked*; the ſhoulders may be *tawny*, or *dark red*, or *birchen*, that is, of the colour of the twigs of a birch broom, or *ſilver-ſhouldered*, being nearly white.

The *yellow cock* is merely a variety of the duck-wing, from which it differs only in having the ſecondary feathers, or thoſe next the flight, dark, inſtead of white, which is not of unfrequent occurrence; the blue bar in theſe cocks is ſometimes ſeen to vary to a light-brown.

The next colour to be noticed is the *dun*; theſe cocks are in reality of a lead, or ſlate colour, and may be wholly ſo, or duck-wings, with the breaſt, flight, and tail, dun; or a *yellow-dun*, that is, a yellow cock with a dun flight, breaſt, and tail; by flight-feathers are underſtood the primaries, or firſt and ſtrongeſt feathers of the wing; the *red duns* are red cocks with a dun breaſt, flight, and tail.

Black cocks are ſo coloured, ſome wholly ſo, others with birchen or brazen ſhoulders, which are almoſt the only varieties of this cock.

White cocks are either wholly white, termed *ſmocks*, or with red ſhoulders, which are termed *piles*; when theſe are ſtreaked with any colour in the hackle, breaſt, rump, or tail, they are then termed *ſtreaky-piles*.

If the pile-cocks have a mixture of dun (that is, lead colour on the breaſt and ſhoulders), they are called *dun-piles*; another variety of this fowl is the *cuckoo*, which is deemed rare, that is, a white fowl with the feathers variegated promiſcuouſly, or rather barred with black and yellow.

The *ſpangled fowl* is particularly rare; it is a red fowl, with the feathers tipt with white, or ſometimes white and black.

There is ſtill another breed of cocks we have to mention, called *hen-cocks*, from their feathers being ſhort, reſembling thoſe of a hen; their colour is generally brown, or ſpeckled, they are allowed to fight as well as any other, and to be as good game; we are totally unacquainted from whence originates this breed; in fighting, it frequently happens that they have an advantage, in being miſtaken by their antagoniſt cock for a hen, and frequently from this are enabled to get the firſt blow.

When any coloured fowl has the ſhoulder mixed with black, ſuch cock is denominated *beezy ſhouldered*, a term whoſe origin we are not acquainted with, probably from the French word *bis*, black, or duſky.

The legs, as forming part of the deſcription and character of the cock, ſhould alſo be noticed. Theſe are either yellow, blue, white, olive, or dark green, willow, or light-green, black, or carp-legged, a mixture of black and yellow; the beaks in general correſpond with the colour of the legs.

The eyes are alſo an object of attention, being a point of deſcription in the match-pile; the red, or ferret-eye (the *iris* being red); the pale-yellow, or daw-eye; the dark-brown, or ſloe-eye.

Other qualities of the cock remain to be conſidered, as they conſtitute important properties in the battle; theſe properties conſiſt in the ſpecific weight of the cock, in regard to his bulk, as a large cock may not only feel light in hand, but weigh light in the ſcale, his bone and fleſh being of a lighter quality, while others, though much leſs, ſhall outweigh him; and ſuch are commonly diſtinguiſhed by the phraſe, *lumpy cocks*, while the others are termed *corky*, or light, like cork, which is of more value in the match, as the larger cock has the advantage.

The conſtitution, or rather healthy condition, of the cock is alſo neceſſary to be known; this is more readily aſcertained than would be imagined; firſt, by the feather, as we have before ſtated, being ſound, and difficult to be drawn out, ſhort, ſmooth, hard, and ſhining; his crowing with a ſhrill and clear voice; his looking red in the face; if white, or pale, in that part, or if he pants much, and turns blackiſh after exerciſe, it is preſumed, with tolerable certainty, that he is diſeaſed and unſound; that he is unfit for the *pens* or the battle.

The next conſideration in the fighting cock is the ſpur; to hit well with the ſpur is as neceſſary as to have courage, or any other good quality, as without this all the other qualities may be thrown away; this, however, is not known from any exterior indication, but by actual trial, and is not confined to any particular colour or breed. The piles often are obſerved to carry a fatal ſpur, without having ſo much game as the other breeds, eſpecially if the battle be of long duration.

And next of the game, or blood of the fowl; for by this term is indicated his courage, or rather his endurance of the battle; this property is ſo extraordinary in ſome of theſe animals, that they fight obſtinately to the laſt, and by this means, though apparently beaten, gain the battle.

Action in fighting, to be excellent, ſhould be rapid, but without hurrying; quick, but cautious; to *break well* with their adverſary, that is, on the firſt onſet to throw off, or parry the blow, and then to hit; for if they ſtrike and hit together at the onſet, it is not unuſual to ſee the thigh or wing broken, or the ſpur paſs through the body of one or both. It is of conſequence alſo, that in the early part of the battle, they ſhould ſtrike without laying hold, and keep a diſtance, as laying hold in the beginning of the battle is almoſt uſeleſs, but not ſo when the firſt efforts are paſt, and they become a little weary.

It is uſual for the cock to aim at the head with the beak, but his ſtroke is known to be more fatal when he lays hold of the point of the wing, as in this caſe the ſpur enters ſome part of the body or the wing, and diſables the fowl more certainly.

A cock is ſaid to fight *well at the foot*, when he has obtained an advantage, and follows it up till he has killed his adverſary, never ſuffering him to riſe after being once down.

On *Breeding*. A well-tried breed of cocks being obtained from actual obſervation of their powers are to be uſed as the ſtock to breed from, and it ſhould be obſerved that it has been found injurious to breed from two old fowls; on one ſide or the other they ſhould be young, and three or four hens are fully ſufficient for one cock, and the hens ſhould be all of one breed, and if the colours are ſomewhat alike ſo much the better, as they unite the more kindly.

The breeding-place ſhould be well aired, and kept entirely free from other poultry; clear water, graſs, gravel, and lime rubbiſh, an occaſional change of food, as barley, oats, potatoes boiled, and ſometimes a little meat, and toaſt and beer, are alſo to be recommended.

The hen-houſe ſhould be perfectly dry and clean, and the *rooſt* with perches rather low, as otherwiſe the heavy fowls jar their feet in coming down and occaſion them to ſwell and become crippled.

The *perches* ſhould be carefully made of the proper ſize for the graſp of the foot, not being too large or too ſmall, as in the former caſe the hind claw is brought forward, and he becomes what is called duck-clawed, and in the latter the breaſt-bone becomes crooked.

There are ſeveral injurious things to the health of the fowls, which ſhould be carefully kept away from their breeding place, as any thing which tends to ſoil the water they drink; the keeping of pigs, ducks, or allowing them acceſs to coal aſhes, or any ſoapſuds, are found by experience to produce the roop; geeſe and turkies are injurious to fowls, by continually fighting and battering them, and ſhould not be allowed to be near them.

The neſts of the hens may be about a foot and a half from the ground, made in an earthen pan or diſh of a proper ſize, and clean ſtraw, rubbed up ſo as to render it ſoft. Hay is found by experience to be injurious to the eggs, and to more readily produce vermin; and its faint ſmell ſeems alſo not to ſuit them.

There ſhould be neſts for every hen, and even their number ſhould be rather more than leſs than the number of hens, as otherwiſe they are apt to fight and diſturb one another from the neſts, and break the eggs.

One egg ſhould be always left in the neſt for them to lay to, and that ſhould be marked, that it may be eaſily known. Alſo the eggs as they are laid ſhould be removed from the neſt and marked with the date of their being laid, and the hen laying them, and be placed in a box of bran, and now and then, if laid on the ſide, be turned over; they are, however, conſidered beſt placed with the ſmall end downwards, as it has been found by experience that they keep better in this poſition, and the following reaſon is alleged for this effect, the ſhape of the ſhell, which is a reverſed cone, forms a ſupport to the yolk, and prevents its deſcending to the ſhell.

When a hen begins to cluck or be brooding, no more of her eggs ſhould be ſaved, as from this time her eggs are apt to become imperfect, are frequently without yolks, and often without ſhells: beſides, cockers have a notion that the fowl bred from a clucking hen will not ſhow the ſame game and bottom as thoſe produced by her firſt eggs.

If two clutches are wanted from any hen in one ſeaſon, it is effected more certainly by putting her firſt clutch of eggs under a dunghill hen, and putting the game hen under a coop where the other hens are about her, till her heat is over, when ſhe may be ſet at liberty; whereas by removing her, ſhe is forgotten, and when brought back to the other hens fighting enſues.

The next or ſecond clutch ſhe might be allowed to ſit upon herſelf.

When a cock takes a diſlike to any brooding or other hen, ſhe ſhould be removed, as he would otherwiſe injure or deſtroy her.

About 12 eggs form a proper clutch, as the hen cannot well cover more. When the firſt chickens are hatched, they may be taken away and placed in a baſket with flannel or wool by the fire-ſide, and be fed with crumbs of bread, and chopped eggs, boiled hard, till the reſt are hatched; then they ſhould be placed with the hen at night, as ſhe otherwiſe might take a diſlike and kill them.

The eggs being all hatched, at leaſt, thoſe that are ſound and good, the hen and chickens ſhould be conveyed into ſome dry place, where cats or vermin of any kind cannot get at them. The hen ſhould be cooped to prevent her from wandering from the brood, and getting into wet and dirty places.

The chickens are beſt fed with crumbs of bread and hard boiled eggs chopped up with it, and this is occaſionally changed with advantage for groats or grits, wheat, chopped raw meat, or new cheeſe and curds, till they are able to eat barley, as they are apt in a ſhort time to cloy with any one kind of food, to pine and die. They ſhould have clean water, at leaſt once a day, and it ſhould be placed out of the ſun. About the end of the third or fourth week it is well to ſet the hen at liberty with her chickens, taking care that ſhe is not annoyed by other hens.

One advantage attends bringing them up under the dunghill hen, which is, that ſhe is leſs quarrelſome or ſubject to be diſturbed by other hens.

It is a falſe notion of old times, that the chickens brought up under a dunghill hen will partake of her properties, which is well known by experienced breeders to be untrue.

It is adviſable, when the chickens are at an age that their ſexes can be diſtinguiſhed, as at about ſix weeks or two months old, to ſelect thoſe intended to be kept and to deſtroy the reſt, as the ſurvivors thrive better, and it prevents the brood from being too much diſtributed, for it is better to purchaſe fowls for the ſpit than to keep theſe to the injury of the reſt, unleſs where the ſole object in breeding them is the table.

In about four months it is uſual for them to begin to crow, and this is the right time to cut their combs, as cutting them early is thought to prevent their fighting together, and they alſo loſe leſs blood than if cut later, when the difficulty of ſtopping it is greater, as it is neceſſary then to uſe the cautery, or a ſtyptic, for the cautery cannot be conveniently applied between the two ſurfaces or lobes of the comb. In about a few weeks after this, or when they are ſent to their walks, their gills and deaf ears may be taken off, by which term is underſtood a looſe fleſhy whitiſh caruncle behind the ear. Some cut the comb cloſe, called the "low comb;" others leave an arched portion which is termed the "high comb."

About this period of the life of the young fowl, a diſaſter frequently happens which ſhould be carefully guarded againſt; which is, that they will, without any apparent cauſe, fight and deſtroy each other, and this we think we have obſerved to happen more frequently after rain than at other times; perhaps from their being wetted, ſoiled, and disfigured, they may appear ſtrange to each other, and thus are led to begin fighting; at leaſt this is the moſt probable reaſon that has occurred to us.

If this happens before they can with propriety be ſeparated for different walks, it will be found neceſſary to purſue a certain meaſure to prevent their fighting; this is uſually accompliſhed by ſeparating them after fighting and keeping them for ſome time without food; another diſcipline to prevent this evil conſiſts in holding the weakeſt in your hand, while the ſtrongeſt ſpurs and pecks him till he cries out, or by beating him with a glove or handkerchief, he will afterwards be ſatisfied with being ſubordinate for a long time; otherwiſe they are ever fighting and picking or peeling the ſkin from the ſkull often in a way that they never recover from, and ſuch are called peel-pates, and are not allowed in a main.

This ſtate of diſcipline and ſubordination will be promoted by the preſence of the old cock among them, who will ſo interfere in their battles as to awe them to a more peaceable demeanour, and this the more effectually if all the hens are removed.

They ſhould now, before they are ſent to their walks, be marked, and a regular regiſter be kept of them. The marks are generally made in the eyelid, noſtril, or connecting membrane of the toes by cutting a notch in one or more of them; and are deſcribed as right, left, or both eyes or noſtrils out or in right or left feet.

Having premiſed thus far in raiſing them, it is now our buſineſs to ſpeak of the moſt appropriate walk, which is often among experienced cockers even in ſome reſpects not ſufficiently attended to. Farm-houſes are not always good walks for the reaſon above-mentioned, that the game chickens get battered by other fowls. Poor cottages, where they are generally walked, have this diſadvantage, that they have not ſufficient food; a clear air—good food—pure water, and perfect ſecluſion from other fowls are the beſt requiſites on a walk of this kind; at any rate it is proper before they are taken up for fighting that they ſhould be ſeen, and ſuch as want it be fed, or, as it is called, hand-fed.

At about a twelvemonth old they are termed *ſtags*, and at two years old they are called *cocks*. It may be deſirable to try the breed while they are yet ſtags, in which caſe the leaſt valuable are ſelected; ſuch for inſtance as are ſhorter-legged than the reſt, or are in any reſpect deficient in their make; from theſe trials we may be led to preſume upon the courage and action of the reſt of the brood, and for this purpoſe the ſtag may be fought againſt a cock of the ſame weight, to aſcertain his qualities.

Short ſilver ſpurs, in theſe trial-battles, are better than ſteel ones, as they are not ſo immediately deſtructive; and a ſtag that beats a cock of equal weight muſt have undeniable good qualities, even though he afterwards wins no other battle.

At two years old he becomes a cock, as we have obſerved, and is then fit for fighting in the main, or ſingle battles. It ſtill remains, however, ere we bring him on the ſtage, to deſcribe the regimen requiſite to give him the greateſt proſpect of advantage, and a ſucceſsful iſſue to the conteſt; as a well-prepared fowl will have the advantage of a ſuperior one that is ill-fed, or not prepared.

The fowl is ſuppoſed to come from his walk in good condition; in which caſe, he will be too fat for fighting, and will have no wind till he is reduced. To effect this, abſtinence from food and medicine are required for ſeven or eight days, before he can be brought to the pit, at leaſt, ſuch is the regimen purſued by our firſt feeders, and is pretty generally as follows: His tail and ſpurs being cut ſhort, he is put into his pens, and the firſt day receives no food; ſecond, he has his phyſic, conſiſting of cream of tartar or jalap, or both united, in the doſe of about five grains of each; or if it be a very fat and large fowl, the doſe may be increaſed to ten grains of cream of tartar. Theſe are given him mixed in freſh butter; this generally purges briſkly, and ſcours out the inteſtines. Immediately after the phyſic is given him, and before it affects him, he is placed on looſe ſtraw or a graſs plat with another cock, and allowed to ſpar with him. The hots, or muffles, being previouſly tied on their ſhort ſpurs. In this way he is exerciſed till he is a little weary; he is then returned to his pens. Before putting him up it is neceſſary to examine his mouth to ſee if he has been pecked or wounded in the inſide, as ſuch wound is apt to canker. To prevent this, it is waſhed with a little vinegar and brandy: he now is allowed his warm meſs to work off his phyſic. This is a diet made of warm ale or ſweet wort, and bread in it, with a little ſugar-candy; or bread and milk and ſugar-candy, a large tea cup full.

He is then ſhut up cloſe till the next morning, or about 24 hours. If the weather is cold, the room ſhould be made warm, or a blanket placed over the pen: if in warm weather he may be clipped out for fighting; but if the weather be cold this is beſt left till the time of fighting. The windows of the room ſhould alſo be darkened, excepting at feeding times.

Early on the following morning, that is, about the third day, his pen muſt be cleaned out from the effects of the phyſic, &c. and clean dry ſtraw be given him; his feet alſo ſhould be waſhed and wiped clean before he is returned to his pen: if his feet feel cold his pen ſhould be made warmer.

He is next to be allowed ſome cock-bread, that is, a ſort of bread made of ingredients in the following proportions: About three pounds of fine flour and two eggs, and four whites of eggs, and a little yeaſt; this is kneaded with a ſufficiency of water for a proper conſiſtence, and is ſent to the oven and well baked: ſome add, as a great ſecret, a ſmall number of aniſeeds, or a little cinnamon; of this bread, as much as would fill a tea cup, cut into pieces, is given him twice that day; and no water is then given him whatever, as it is conceived highly injurious at the early part of the feeding.

On the fourth day, early in the morning, he ſhould receive half a tea cup full of good barley and a little water, in which a toaſt has been ſteeped ſome time. Having eaten this, clean his pen, let him be ſupplied with clean ſtraw, and let his pen be uncovered for about an hour, while he ſcratches and picks the ſtraw. Some think it highly advantageous to prepare the barley for them, by beating and bruiſing it, and thus to take away the ſharp points of the barley, and the huſky ſhell or covering, which is then blown away.

In the afternoon, the ſame quantity of barley may be repeated, but no water.

On the fifth, or next day, he may have the bread as before, but three portions of it, and no water.

On the ſixth, or weighing day, very early in the morning, give him the bread, as before: he is then to be weighed, and afterwards a good feed of barley and water ſhould be given. Some hold it a valuable ſecret to give them fleſh, as ſheep's heart, for this and the ſucceeding day, chopped ſmall, and mixed with the other food.

On the ſeventh day, or day before fighting, early in the morning, let him have the ſame feed of barley; in the afternoon bread and the white of an egg boiled hard, and a little water.

On the eighth, or day of fighting, he may have a little barley, as about 40 grains; ſome recommend it to be previouſly ſteeped in port wine, which, we are not aſſured, is at all uſeful. If, at any period of the feeding, the food ſhould remain in his crop, no more ſhould be given him till it is removed, which a bit of apple or cheeſe will aſſiſt in digeſting: and ſhould the fowl dung looſe or purge, when not required, it may be counteracted, by giving him a little hemp ſeed, which ſome ſteep in brandy. A little wheat or millet-ſeed may alſo be added to his food. Repeated trials have taught us that about 2 oz. may be taken away, or ſuperadded to the weight of a fowl for one day, by the above means without injury: about eight is as much as he ſhould ever gain or loſe in the whole.

He is next cut out for fighting, that is, his wings rounded, the hackle and ſaddle feathers cut ſhorter, the feathers about the vent cut cloſe off, and the curly feathers of the tail, leaving only the vane or fan, which is ſhortened about one half. The ſpurs are now placed on his legs, and he is fitted for the battle: in placing his ſpurs on, they ſhould not be tied too tight, leaſt he be cramped, or too ſlack, leaſt they get looſe; for ſhould they come off, or even break, during the battle, they are not allowed to be replaced. The point of the ſpur ſhould be carefully obſerved to be neither to the outſide or inſide of the hock or heel, but exactly behind, and in a line with it; the hunckle or hock is taken as a guide for its direction, following that of the natural ſpur.

There remains for us to make one remark more to render theſe matters clear, which is, that, although eight days are found to be a ſufficient time to prepare a fowl for battle, yet, in a main, ten days are commonly taken for the purpoſe, purſuing a ſimilar treatment to the foregoing. The cocks are weighed on the eighth, and the lighteſt begin fighting on the tenth day, ſo that the larger cocks, which are to fight in the latter part of the main, and have been conſiderably reduced, are brought up again by a greater proportion of food than the medium quantity we have deſcribed, and which ought alſo to be adminiſtered oftener in the day. The ſucceſs of the main often depending upon the proper management of the latter fowls, much muſt be left to the ſkill and judgment of the feeder, who ought to be intimately acquainted with the nature and conſtitution of the fowl, that he may be enabled to bring him to the battle in the beſt poſſible health and condition, neither diſtreſſed by medicine or abſtinence, before he is weighed, nor rendered inactive by overfeeding afterwards, as, in either caſe, he has not a fair chance for his life.

Such is the art of cocking; if, by unveiling its myſteries and ſtripping it of diſguiſe, the purſuit becomes leſs alluring and ſeductive to the votaries of the cock-pit, we may have contributed to remove a temptation, the indulgence of which does not appear conducive to the improvement of the morals of mankind. However, it ſhould not be concealed that, conſidered as an art, for maintaining the genuine propenſities of a noble animal; it is entitled to the reſpect of naturaliſts.

"Cock-fighting," ſays Mr. Pegge, "is an heatheniſh mode of diverſion from the firſt; and at this day ought certainly to be confined to thoſe barbarous nations abovementioned; the Chineſe, Perſians, Malayans, and the ſtill more ſavage Americans, whoſe irrational and ſanguinary practices ought, in no caſe, to be objects of imitation to more civilized Europeans."

Cock, in *Mechanics. Figs.* 3 and 4, *Pl.* XIV. *Mechanics*, repreſent two of Handaſyd and Rudder's patent corked plug-cocks, of which A is the end to he driven into the caſk, and B the ſpout, as in common; C *fig.* 3, is the plug, which has a triangular, or other ſhaped top, and is to he turned by a key, *fig.* 1, which has a ſimilar hole in it. To the part D, a hollow cylinder of braſs, *fig.* 2, is ſoldered; it has a hole in its top, correſponding with the key; in order to keep the plug down in its place, a ſmall ſpiral ſpring, E, is applied, the lower end of which acts on a collar in the plug, *fig.* 3, and the upper end againſt the top of the braſs cylinder, *fig.* 2; at the bottom of the cock at F, the plug does not paſs quite through the cock, but there is a hole at the bottom to pour in oil to the plug of the cock, which hole is then cloſed by a ſcrew.

Figs. 4 and 5, ſhow the application of the ſpring to a common cock, the plug of which is to be turned by a crutch or handle; the plug, *fig.* 5, is ſomewhat longer than the cock, and a ſpring, E, of two turns, is applied, ſo as to act between the bottom of the cock and the head of ſcrew F, ſcrewed into the plug; another part of this patent applies to the putting of a collar of cork round in a groove, G, *fig.* 5, in the plug, as a farther ſecurity againſt leakage.

In 1797, Mr. Joſeph Bramah took out a patent for various improvements in cocks, one of which is ſhown in *figs.* 6 and 7; the plug, *fig.* 6, is hollow, and has a hole, A, in its ſide; the end, B, is ſquare, to put on the handle D, by which it is turned; the cock unſcrews at E, *fig.* 7, for putting the plug in and out, and the ſquare end, B, of the plug comes through a hole in the end of the cock. The end, F, is inſerted into the caſk, and the water is brought to the inſide of the plug, *fig.* 6; it is plain, that when the plug is turned, ſo that the hole, A, correſponds with the hole through the ſpout G, *fig.* 7, the cock is open, and ſhut when they do not coincide, owing to the plug being turned part round; the advantage of this cock is, that the preſſure of the water always tends to puſh the plug farther into it, and by that means keeps it water-tight.

Fig. 8 is another cock, poſſeſſing the ſame advantages, for which Mr. Bramah took out a patent in 1783; A B is a cylindric braſs tube, the end, A, of which is ſcrewed into the veſſel, and the other end has a ſtuffing-box in it, for the poliſhed rod, D, to paſs through; one end of this rod has a knob, E, to move it by, and the other has a plug, F, on it, which fits into the conical end of the tube A B. The operation of opening the cock is puſhing the knob E, which opens the valve or plug, F, and permits the water to run out at the ſpout G. The ſtuffing box conſiſts of a plate, *a*, with a hole through it, laid upon a ſhoulder near the end of the tube A B; and the end of the tube beyond that is ſcrew-tapped, into which is ſcrewed a plug, *b*, which has alſo a hole through it for the rod, D, to paſs through, and the part which projects beyond the tube is ſquare, for the convenience of turning it by a winch; between this plate, *a*, and the plug, *b*, a ſmall quantity of hemp, tow, &c. is put round the rod, and by ſcrewing the plug, *b*, tight, it is made to embrace the rod ſo cloſely, as to prevent any water getting through.

Fig. 9 is the common ball-cock; the plug, A, of this cock is held in by a ſcrew or rivet, in the common manner; it has a copper rod, B, faſtened to it, to the other end of which a globular ball, D, of thin copper plate is ſoldered, which, by its buoyancy, gradually ſhuts the cock as the water riſes in the veſſel, and prevents its running over; and as the water in the veſſel is drawn, and again ſinks, the cock opens to let in more water.

Figs. 10, 11, 12, 13, 14, and 15, exhibit the ſliding or ſluice cock, common in breweries, diſtilleries, &c. A A (*figs.* 14 and 15), is a frame, whoſe internal edges are nicely poliſhed; on each ſide of this frame a caſt-iron plate, B (*figs.* 15 and 13), is ſcrewed, which has a piece of pipe and a flaunch to connect it with the pipes which bring and carry away the liquor; in the cavity formed by the frame, A, *fig.* 15, a ſlider, D (*figs.* 15 and 12), is introduced, one face of which is well poliſhed to make it fit cloſe to one of the ſide-plates B, and it is farther preſſed up by two ſteel ſprings, *a, a*, ſcrewed to the back of the ſlider D, and acting againſt one of the ſide plates B; to the ſlider, D, a well poliſhed rod, E, is attached, and paſſes through a ſtuffing box, F (*figs.* 15 and 11) ſimilar to the one above deſcribed; to the other end of the rod, E, a rack, G, (*figs.* 15 and 10) is faſtened, which works into a pinion L, (*fig.* 10) in the frame H, (*figs.* 10 and 15) ſupported by two uprights, I, I, ſcrewed to the upper flaunches of the ſide plates, B (*figs.* 13 and 15). When the ſlider, D, is down, as in *fig.* 15, the hole through the ſide plate, B, is covered, and the liquor aſſiſts the ſprings, *a, a*, in preſſing the ſlider cloſe to the plate, and keeping it tight; but when the pinion, L, is turned by a winch, the ſlider is drawn up, and opens a paſſage for the liquor.

COCK, *in a watch or clock.* See BALANCE.

COCK *of a dial*, the pin, ſtyle, or gnomon. See GNOMON.

COCK *boats*, ſmall boats uſed in rivers, or near the ſhore, which are of no ſervice at ſea, becauſe too tender, weak, and ſmall.

COCK, *black*, black grous or game. See TETRAO *tetrix*.

COCK, *bloody-heeled.* See HEELER.

COCK, *caſtrated.* See CAPON, COCK *ſupra*, and POULTRY.

COCK, *gor*, GOR-*cock*, is the moor cock, or red grous, TETRAO *ſcoticus*

COCK, *grubbing of a.* See GRUBBING.

COCK, *high bearing*, is a term uſed with reſpect to fighting cocks; denoting one larger than the cock he fights. As a *low-bearing cock* is one overmatched for height.

COCK, *hybrid*, hybrid grous. See TETRAO *hybrida*.

COCK, *Indian*, the origin of our common poultry found wild in India. The Curaſſow bird, CRAX *alector*, has been called improperly the Indian cock, being an inhabitant of South America.

COCK *of the rock*, or *rock manakin*. See PIPRA *rupicola*.

COCK *of the wood*, or *mountain*. See TETRAO *urogallus*.

COCK-*paddle*, in *Ichthyology*, a name by which the common lump-ſucker is known.

COCK-*throppled*, a name given by dealers in horſes to one whoſe wind-pipe is ſmall, and bends like a bow when he bridles his head. See HORSE and HUNTER.

COCK, *wood*, wood-cock. See SCOLOPAX *ruſticola*.

COCK-*water* is a ſtream of water brought in a trough, through a long pole, in order to waſh out the ſand of the tin-ore into the launder, while it is bruiſing in the coffer of a ſtamping-mill.

COCKS, aboard a ſhip, are little ſquare pieces of braſs, with holes in them, and put into wooden ſhivers to keep them from ſplitting and galling by the pins of the blocks in which they move.

COCKADE, in French, *cocarde*, in *Military Language*, a ribbon worn in the hat. As a military mark it ſucceeded the ſcarf, which was formerly worn by the officers and ſoldiers belonging to the different nations of Europe, the principal of which, in reſpect of this mark, are diſtinguiſhed in the following manner: Both in the Britiſh army and navy, the officers wear cockades of black ſilk ribbons, the non-commiſſioned officers, private ſoldiers, and marines, black hair ones. The French cockades are made of light blue, pink, and white ribbons, mixed together, and are called *tricolor*, or three-coloured. The Spaniſh cockade is red; the Pruſſian black; the Auſtrian black; the Ruſſian green, and ſo forth. Under the old government of France, officers were not permitted to wear a cockade, unleſs they were dreſſed in regimentals. There are certain old regiments in the Pruſſian ſervice, of which neither the officers nor men wear cockades. In this country the cockade, till of late years, was worn by military men of all ranks and deſcriptions, both with regimentals and without them. But, for reaſons beſt known to thoſe who have the regulation of ſuch matters, a military man, when out of regimentals, is not at preſent diſtinguiſhed or known from any other perſon.

COCKATOO, in *Ornithology*, a family of the pſittacus, or parrot tribe, *Brachyuri, cauda æquali* of Gmelin, or thoſe having the tail ſhort, and equal at the end. There are nine ſpecies of the cockatoo kind; namely, the Crowned, Black, Bankſian, Funereal, New South Wales, White, Red-vented, Molucca, and Yellow-creſted. See PSITTACUS.

COCKATOON, a name given by ſome writers to the white cockatoo, PSITTACUS *ſulphureus*.

COCKBURN, CATHARINE, in *Biography*, a lady of conſiderable literary attainments, was born in London in 1679. She was the daughter of captain Trotter, a native of Scotland, and commander in the navy, in the reign of Charles II., who died while his daughter was very young, leaving the family in narrow circumſtances. In her own language, in writing, and in French, Miſs Trotter was principally her own inſtructor; but ſhe obtained ſome aid in acquiring the elements of the Latin tongue, and the firſt principles of logic; of the latter ſhe drew up an abſtract for her own uſe. She gave very early evidences of a poetic turn; and when ſhe was but a mere child, ſurpriſed her friends with ſome extemporary verſes on an incident that happened in the ſtreet. She was educated in the principles of Proteſtantiſm, from which, however, ſhe was eſtranged, by her intimacy with ſome Roman catholic families. Conſiderable pains were taken to bring her back to the religion in which ſhe had been brought up, but without effect. When ſhe was only 17, ſhe wrote a tragedy, entitled "Agnes de Caſtro," which was well received by the public, and acted with conſiderable applauſe at the theatre royal. Two years after ſhe compoſed another tragedy, entitled "Fatal Friendſhip," which was repreſented at the theatre in Lincolns Inn Fields, and obtained for the author a conſiderable ſhare of celebrity. This play is regarded as the moſt perfect of her dramatic performances. About this period ſhe wrote ſeveral other poetical pieces, ſome of which were intended for, and introduced on the Engliſh ſtage. Her genius, and the powers of her mind, were not confined to poetry; ſhe was devoted to metaphyſical ſtudies, and was a great admirer of the "Eſſay on the Human Underſtanding." When ſhe was but 22 years of age, ſhe vindicated the principles of Locke, againſt an attack made upon them by Dr. Thomas Burnet. To this work ſhe did not affix her name, as well from an apprehenſion that the public might be prejudiced againſt a metaphyſical treatiſe written by a woman, as from a ſort of dread of being known to Mr. Locke as his defender. In an anonymous addreſs to that great man, ſhe ſtyles her work "a bold and unlicenſed undertaking;" and declares, that though ſhe ventures to publiſh her defence of Mr. Locke, yet it was "not without much apprehenſion and awe of his diſpleaſure." Her name was not long concealed, and Mr. Locke wrote her a very kind letter of thanks; and through his relation, Mr. King, afterwards lord chancellor, he made her a preſent of ſome books. She was ſtill a Roman catholic, and is ſaid to have injured her health, by the frequent abſtinence and faſtings enjoined by that church. She was, however, no bigot, and exhibited the utmoſt liberality to thoſe who held different religious tenets; and, upon a full inveſtigation of the queſtion, ſhe returned to the communion of the church of England, from which ſhe never afterwards departed. This change occurred in 1707, and in the following year ſhe married Mr. Cockburn, a clergyman, who had taken orders; but his ſcruples concerning the oath of abjuration, required at the acceſſion of George I., obliged him to reſign his employment as a clergyman, and to undertake the laborious office of aſſiſtant to a ſchool. He now found much difficulty in maintaining his family; but Mrs. Cockburn applied herſelf with great aſſiduity to the important duties of wife and mother. In the year 1726, ſhe again became the defender of Mr. Locke, whoſe opinion with regard to the reſurrection of the ſame body, had been controverted by Dr. Holdſworth. About this period Mr. Cockburn had overcome thoſe ſcruples which drove him from the church, and was invited to take the office of miniſter to an epiſcopal congregation at Aberdeen. Mrs. Cockburn wrote "Remarks upon ſome Writers in the Controverſy concerning the foundation of Moral Duty and Moral Obligation," which were publiſhed in the "Hiſtory of the Works of the Learned." She next drew up a confutation of Dr. Rutherford's "Eſſay on the Nature and Obligation of Virtue," in vindication of the contrary principles and reaſonings enforced in the writings of the late Dr. Clarke. This was publiſhed by Dr. Warburton, to whom ſhe had ſent it in MS. and who wrote a preface on the occaſion, in which he ſays, that "it contains all the clearneſs of expreſſion, the ſtrength of reaſon, the preciſion of logic, and attachment to truth, which make books of this nature really uſeful to the common cauſe of virtue and religion." The merit of this performance, the vivacity, acuteneſs, and ſtrength which were diſplayed in it, in the diſcuſſion of ſome of the moſt intricate and abſtruſe queſtions, excited the curioſity of the public reſpecting the concealed author. Her friends now ſet on foot a ſubſcription to publiſh all her works, in which ſhe readily concurred, but ſhe did not live long enough to diſcharge the office of editor; this was afterwards undertaken and executed by Dr. Birch. She died on the 11th of May, 1749, in the 71ſt year of her age, having ſurvived her huſband only about four months. In early life Mrs. Cockburn was celebrated for beauty, as well as for her genius, and other accompliſhments. Her figure was not prepoſſeſſing, but ſhe was diſtinguiſhed by the unuſual vivacity of her eyes, and the delicacy of her complexion. She was ſtrictly virtuous, benevolent, and generous, as far as her ſtraitened circumſtances would admit. In the year 1751, her works were publiſhed in two vols. 8vo. by Dr. Birch, who ſays of the author, that "her abilities as a writer, and the merit of her works, will not have full juſtice done them, without a due attention to the peculiar circumſtances in which they were produced; her early youth, when ſhe wrote ſome; her very advanced age, and ill ſtate of health, when ſhe drew up others; the uneaſy ſituation of her fortune during the whole of life; and an interval of nearly 20 years in the vigour of it, ſpent in the care of a family, without the leaſt leiſure for reading or contemplation. After which, with a mind ſo long diverted and encumbered, reſuming her ſtudies, ſhe inſtantly recovered its entire powers, and in the hours of relaxation from her domeſtic employments, purſued, to their utmoſt limits, ſome of the deepeſt inquiries of which the human mind is capable." Birch. Biog. Brit.

Cockburn *iſlands*, in *Geography*, a group of ſmall iſlands that lie off the N.E. coaſt of New Holland, S.W. of Cape Grenville, which lies in S. lat. 11° 58′, W. long. 217° 38′.

COCKBURNE, a townſhip of America, in the northern part of New Hampſhire, and the county of Grafton, on the E. bank of Connecticut river, S. of Colebrooke.

Cockburne, William, in *Biography*, an ingenious and learned phyſician, flouriſhed the latter part of the 17th and beginning of the laſt centuries. He was for ſome years phyſician to the royal navy, where he acquired a knowledge of the ſcurvy, and other diſeaſes incident to ſailors. Quitting the navy, he came to London, where he ſoon diſtinguiſhed himſelf by his ſuperior ſkill and abilities, and was thence aſſociated with the college of phyſicians, made a fellow of the royal ſociety, and phyſician to king William. His works are a "Treatiſe on Sea Diſeaſes, explaining their Nature, Cauſes, and Cure, to which is added an Eſſay on Bleeding in Fevers." This book has been frequently re-printed, and was early tranſlated into the German and French languages. The principal cauſe of ſcurvy is the diet, to which ſailors are neceſſarily confined in long voyages. Medicine can do little in the cure, which can only be effected by a diet of freſh proviſion, and taking the ſick on ſhore. Fevers are to be cured by emetics and purges, and not by ſudorifics, which, by waſting the fluids, occaſion coſtiveneſs, to which ſailors are much inclined, from feeding on biſcuit. He defends the uſe of the Peruvian bark, which many at that time denied. "Profluvia Ventri," 1702, 8vo., afterwards tranſlated and publiſhed in 1721, under the title of "A Cure of Looſeneſſes." "The Symptoms, Nature, Cauſes, and Cure of Gonorrhœa," London, 1713, 8vo. That it may exiſt, he contends, without any taint of the venereal diſeaſe. The cure is to be effected by giving firſt purges, and afterwards terebinthinate medicines. "Œconomia Corporis Humani," London, 1695, 8vo. Neither the pulſe nor urine, he ſays, afford any certain indices of the ſtate of fever: neither is perſpiration burſting out ſpontaneouſly, often critical; it is ſtill leſs ſo when excited by warm medicines and drink. This work was much noticed in its time; but more accurate treatiſes on the ſubject have occaſioned it to fall into neglect. Haller. Bib. Med. Eloy. Dict. Hiſt.

COCK-CHAFFER, in *Entomology*, the *ſcarabæus melolontha* of Linnæus, and *melolontha vulgaris* of Fabricius. The colour is teſtaceous brown, with the thorax hairy; tail inflected, and a triangular white ſpot at each inciſure of the abdomen.

Inhabits the northern parts of Europe, and is highly injurious to agriculture. The larva is ſoft and grey, with the head and legs protected by a ſhelly covering of a yellow brown colour. While in the larva ſtate, which continues for the ſpace of three years, it devours the roots of graſs, corn, and other vegetables. This miſchievous creature ſubſiſts alſo on the leaves and tender buds of trees, and is from that circumſtance denominated the *tree-beetle*. They are eagerly ſought after, and devoured by crows, rooks, and other birds, as well as animals: it is the larva of this inſect that is ſo frequently turned up in ploughing, and in queſt of which the crows are often ſeen following the track of the plough-ſhares.

COCKER, a river of England, which runs into the Derwent at Cockermouth.

COCKERINGS, an exaction or tribute in Ireland, now reduced to chief rents.

COCKERMOUTH, in *Geography*, a borough town of Cumberland in England, derives its name from its ſituation at the mouth of the river Cocker, which ſeparates it into two parts, and then falls into the Derwent, near the weſtern extremity of the town. The ſtreets are ſpacious, but irregularly built; yet many of the houſes are neat, eſpecially thoſe on the acclivity towards the caſtle. The moot-hall, market-houſe, and ſhambles, have an ancient gloomy appearance, and, like moſt public buildings in the northern towns, prove a conſiderable obſtruction to paſſengers, from being ſituated in the midſt of a principal ſtreet. The church, which is ſpacious, but has no aiſles, was rebuilt of free-ſtone in the year 1711, with the exception of the ancient tower. Several ſchools have been founded by ſubſcriptions and bequeſts: and a diſpenſary for the relief of the indigent poor was eſtabliſhed in 1793, to the benefit of which ſeveral thouſand perſons have been admitted. The ruins of the caſtle occupy the ſummit of an artificial mount, raiſed on a precipice above the Derwent, near its confluence with the Cocker. It appears to have been a fortreſs of great ſtrength and extent, of a ſquare form, and guarded by ſquare towers: the compaſs of the wall meaſuring almoſt ſix hundred yards. It was anciently the baronial manſion of the lords of Allerdale; and is generally affirmed to have been built within a few years after the conqueſt, by Waldeof, the firſt of thoſe lords. Cockermouth was anciently a hamlet to Brigham, but was conſtituted a diſtinct pariſh in the reign of Edward III. It has only enjoyed the privilege of repreſentation in parliament ſince the year 1640, except one return made 23 Edward I. The right of election is in the inhabitants having burgage tenure, whoſe number is 165. The parts of the town, on each ſide of the Cocker, are connected by a bridge of one arch: on the north ſide is an artificial eminence, called Toot-hill, reſembling the large barrows found in many parts of England. The hills on the oppoſite ſide of the Derwent, in this neighbourhood, are of a kind of calcareous ſtone, almoſt wholly compoſed of ſhells of the anomia genus. Cockermouth is 305 miles N. from London; has a weekly market on Mondays: the population under the late return was nearly 3000, the number of houſes 433. The chief manufactures are hats, common woollen cloths, ſhalloons, checks, and coarſe linens. Hutchinſon's Hiſt. of Cumberland.

COCKERMOUTH, a town of America, in Grafton county, New Hampſhire, about 15 miles N.E. of Dartmouth college. It was incorporated in 1766, and in 1775 contained 118 inhabitants, and in 1790, 373.

COCKET, or COCQUET, a ſeal belonging to the king's cuſtom-houſe.

COCKET, or *Cocquet*, is a ſcroll of parchment, ſealed and delivered by the officers of the cuſtom-houſe to the merchants, upon entering their goods; certifying that the goods were cuſtomed. It likewiſe gives name to an office appointed for this purpoſe.

The ſame word is alſo uſed in the ſtatute of bread and ale, 15 Hen. III. in which is mentioned *cocket-bread*, among ſeveral other kinds; it ſeems to have been hard ſea-biſcuit, which, perhaps, had then ſome cocket, mark, or ſeal; or elſe was ſo called from its being deſigned for the uſe of the cockſwains or ſeamen.

COCKING *Cloth*, a device for the catching of pheaſants. It conſiſts of a piece of coarſe canvas, about an ell ſquare, dipped in a tan-pit to colour it; and kept ſtretched by two ſticks, placed from corner to corner, diagonal-wiſe; a hole being left to peep through. The ſportſman then, being provided with a ſhort gun, carries the cloth before him at arm's-end; under cover of which, he may approach his game as near as he pleaſes: when near enough, he puts the noſle of his gun through the hole, and ſhoots.

COCKLE, in *Botany*. See AGROSTEMMA *githago*, and LOLIUM *temulentum*. See alſo DARNEL-*graſs*.

COCKLE, in *Conchology*. See CARDIUM. Many foſſil ſhells, known under this name, are found lodged in the Britiſh ſtrata; *e. g.* within the ſoil of Norfolk, in the lime-ſtone ſtrata of Derbyſhire, in the free-ſtone quarries upon King's down, near Bath, &c.

COCKLE-*ſtairs*. See STAIRS.

COCKLE-*ſhell Bay*, in *Geography*, a bay on the eaſt coaſt of the iſland of St. Chriſtopher. N. lat. 17° 22′. W. long. 62° 22′.

COCK-KNEE STONE. See ECHINUS.

COCKPIT, a ſort of theatre, whereon game-cocks fight their battles. The cockpit is uſually a houſe or hovel, covered over: they fight on the clod, or green ſod; which is generally marked out round, and encompaſſed with ſeats, one above another. See COCK *of the Game*.

COCKPIT, in a man of war, is a place on the lower floor, or deck, abaft the main-capſtan, lying between the platform and the ſteward's room; where are ſubdiviſions or partitions, for the purſer, the ſurgeon, and his mates.

COCK-*roach*, in *Entomology*. See BLATTA *orientalis*.

COCKROAD, a contrivance for the taking of woodcocks. This bird lies cloſe by day, under ſome hedge, or near the root of an old tree, to peck for worms under dry leaves, and will ſcarce ſtir out, unleſs diſturbed; as not ſeeing his way ſo well in the morning; towards the evening he takes wing to ſeek for water, flying generally low; and when he finds any thoroughfare in a wood, he ventures through it.

To take them, therefore, they plant nets in ſuch places; or, for want of ſuch places ready to their hands, they cut roads through woods, thickets, groves, &c.

Theſe roads they uſually make thirty-five, or forty feet broad, perfectly ſtraight and clear; and to two oppoſite trees they tie the net, which has a ſtone faſtened to each corner. Then, having a ſtand, or a place to lie concealed in, at a proper diſtance, with a ſtake near the ſame, to faſten the lines of the net to; when they perceive the game flying up the road, they unwind the lines from off the ſtake; upon which, the ſtones drawing it down, the birds are entangled in the ſame.

COCK'S-*comb*, in *Botany*. See CELOSIA *criſtata*, C. *margaritacea*, C. *coccinea*, and RHINANTHUS *criſta galli*.

COCK'S-*foot graſs*. See DACTYLIS.

COCK'S-*head*. See HEDYSARUM *onobrychis*.

COCKSON, THOMAS, in *Biography*, an engraver, in all probability an Engliſhman, by whom we have a great many portraits, executed with the graver in a neat, but rather a ſtiff manner. Amongſt other prints by him are the following: King James I. ſitting in parliament, a large print; king Charles I. ſitting in parliament, likewiſe a large print;

the princeſs Elizabeth, daughter of James I.; Samuel Daniel, dated 1609; Concini, Marquis d'Ancre, 1617, &c. Strutt Heinecken.

COCKSWAIN, Cockson, or Coxen, an officer on board a man of war, who hath the care of the boat or ſloop, and all things belonging to it. He is always to be ready with his boat's gang or crew, and to man the boat on all occaſions. He ſits in the ſtern of the boat and ſteers; and hath a whiſtle to call and encourage his men.

COCLES, Publius Horatius, in *Biography*, a celebrated Roman, deſcended from one of the Horatii who fought againſt the Curiatii. In the year of the city 247, he oppoſed the whole army of Porſenna, king of the Etruſcans, at the head of a wooden bridge acroſs the Tiber, which joined the Janiculum to the city. When the bridge was deſtroyed, Cocles, though wounded by the darts of the enemy, leaped into the Tiber, and ſwam with all his armour on his back. A brazen ſtatue was raiſed to him in the temple of Vulcan, by the conſul Publicola, for his great ſervices. He had the uſe of only one eye, as the name Cocles ſignifies. Livy. Val. Max. Virgil.

Cocoa *Iſlands, Great and Little,* in *Geography*, a group of iſlands, ſo called from their being clothed with cocoa-nut trees of unuſual luxuriance, and ſituated in the Indian ocean, to the north of the Andaman iſlands, about N. lat. 14° 20'. E. long. 93°. Theſe iſlands are ſmall, flat, and ſwampy; they are uninhabited, and deſtitute of good water. In ſteering between the Southern Cocoa, and the north end of the iſland of Andaman, Port Cornwallis opens on the eaſt ſide of the latter.

Cocoa-*nut Iſland*, or Cocos, a ſmall iſland at the entrance of Carteret's harbour, on the S. E. coaſt of New Ireland. Between this iſland and Leigh's or Laig iſland, there is ſhoal water, and each of them forms an entrance into the harbour; the S. E. or weather entrance is formed by Leigh's iſland, in which is a rock appearing above water, called by Capt. Carteret "Booby rock:" the paſſage is between the rock and the iſland, nor is the rock dangerous, there being deep water cloſe to it. The N. W. or lee entrance, is formed by Cocoa-nut iſland, and this is the beſt, becauſe it has good anchorage, the water in the other being too deep. Capt. Carteret entered the harbour by the S. E. paſſage, and went out of it by the N. W. At the S. E. end of the harbour there is a large cove, which is ſecure from all winds, and fit to haul a ſhip into. Into this cove a river ſeemed to empty itſelf. In the N. W. part of the harbour, there is another cove, fit for a ſhip to haul into, ſupplying good water, and very convenient both for wooding and watering. The higheſt part of the iſland of Cocos is not above 75 toiſes above the level of the ſea, and is formed of calcareous ſtones. This iſland is terminated on the S. E. and N. W. by the ſame kind of ſtones. It is covered by large trees, which always preſerve their verdure. The iſland produces fig-trees and vines of different ſpecies in great abundance; but cocoa-nuts are ſcarce. Cocos and Laig abound with inſects of various forms and colours.

Cocoa-*nut*, in *Botany*. See Cocos.

Cocoa-*plum*. See Chrysobalanus.

Cocoa-*point*, in *Geography*, a cape on the coaſt of the iſland of Tinian.

COCOI, in *Ornithology*, a beautiful bird of the ardea or heron tribe, the blue heron of Albin and other Engliſh writers. This ſpecies inhabits Braſil and Cayenne; its length is about three feet, and it is ſpecifically diſtinguiſhed by having the hind head, pendent creſt, and back cinereous; neck beneath ſpotted with black, and the ſides of the head black. This is the *ſoco* of Buffon, and *ardea cayanenſis criſtata* of Briſſon.

COCOMARICOPAS, in *Geography*, a kind of ſavages in Spaniſh North America, who live near the banks of the river Colorado, and who are dextrous in ſwimming acroſs, holding in the left hand a piece of wood, which ſupports their arms and burthen, and ſteering with the right; while the women, ſupported by a kind of petticoat of baſket work, upon which they place their children, paſs in like manner.

COCONATO, a town of Italy, in the principality of Piedmont; 4 miles S. of Creſcentio.

COCONOR. See Kokonor.

COCOON. See Silk.

COCORTO, a town of Aſia, in the country of Thibet; 50 miles S. S. W. of Tchontori.

COCOS, in *Botany*, (according to Caſpar Bauhin, the fruit is called by the Portugueſe *coco*, or *coquen*, from the three holes at the end of the ſhell, which give it the appearance of a monkey's head.) Linn. Gen. 1223. Schreb. 1692. Juſſ. 38. Vent. 2. 128. (Coccos; Gært. 21. Cocotier; Encyc.) Claſs and order, *monœcia hexandria*. Nat. Ord. *Palmæ;* Linn. Juſſ. Vent. Male and female flowers on the ſame ſpadix. *Cal.* Spathe univerſal, one-valved, ſpadix branched. *Males.* *Perianth* three-leaved; leaves almoſt trigonous, ſmall, acute, concave, coloured. (ſix-leaved; Gært.) *Cor.* Petals three, egg-ſhaped, acute, ſpreading (none; Gært.) *Stam.* Filaments ſix, the length of the corolla; arrow-ſhaped. *Piſt.* Germ ſcarcely viſible, abortive; ſtyles three, ſhort; ſtigma obſolete. *Females.* *Perianth* three-leaved; leaves roundiſh, concave, converging, coloured, permanent. *Cor.* Petals three, reſembling the leaves of the calyx, permanent. *Piſt.* Germ ſuperior, roundiſh or egg-ſhaped, (three-celled; Gært.); ſtyle none; ſtigmas three. *Peric.* Drupe very large, coriaceous, roundiſh, obſcurely triangular; nut large, ſomewhat egg-ſhaped, acuminate, one-celled, valveleſs, hard, obtuſely triangular, perforated by three holes; kernel hollow.

Eſſ. Ch. *Males.* Calyx three-leaved; corolla three-petalled, ſtamens ſix. *Females.* Cal. and Cor. as in the males; ſtigmas three, drupe coriaceous.

Sp. 1. C. *nucifera.* Cocoa-nut tree. Linn. Sp. Pl. Mart. 1. Lam 1. Jacq. Amer. 277. tab. 168. Pict. 135. Gært. tab. 4, 5. Lam. Ill. tab. 894. (Palma indica coccifera anguloſa; Bauh. Pin. 508. Nux indica; Lob. ic. 2. p. 273. Tenga; Rheed. Mal. 1. tab. 1, 2, 3, 4. Calappa; Rumph. Amb. tab. 1, 2.) "Unarmed; fronds pinnated; leaflets folded back, enſiform." *Trunk* from forty to ſixty feet high, of a moderate thickneſs in proportion to its height, ſtraight, naked, marked with the ſcars of fallen leaves. *Leaves* from ten to twelve, cluſtered, forming a terminal head; upper ones erect, middle ones horizontal, lower ones rather drooping, from ten to fifteen feet long, about three feet broad, pinnated; common petiole naked near its baſe; leaflets numerous, petioles in two ranks, which are a little inclined to each other. *Spathes* oblong, acute, opening on one ſide. *Flowers* yellowiſh white, ſeſſile, in a branched panicle; female ones near the baſe of the branches; male ones more numerous, covering the upper part. *Fruit* nearly as large as a man's head, cluſtered, egg-ſhaped, obſcurely three-ſided, with rounded angles, umbilicated at both ends, with three obtuſe projections; external rind thin, even-ſurfaced, very tough; inner one extremely fibrous; ſhell of the nut nearly globular, hard, with three raiſed ſpurious ſutures, and three holes at the baſe cloſed with a black membrane; kernel white, in firmneſs and taſte reſembling that of the hazel-nut, hollow, containing a milky fluid. This kernel in ſome plants is near an inch thick, encloſing about a pint of ſweet, delicate, wholeſome, refreſhing liquor. A native of Africa, of the Eaſt and Weſt Indies, and of South America, in a ſandy ſoil; bearing fruit twice or three times a year. Travellers, from the time of Dampier to the preſent day, are profuſe in their praiſes of this tree, and of the various uſeful purpoſes to which it is applied by the inhabitants of the warm climates, in which it is indigenous. Its trunk is made into boats, rafters, the frames of houſes, and gutters to convey water. The leaves are uſed for thatching buildings, and are wrought into mats, baſkets, and many other things for which oſiers are employed in Europe. They are alſo written upon by the Eaſt Indians as a ſubſtitute for our paper and parchment. The fibrous coat or huſk of the ſhell, after being ſoaked in water, is beaten into oakum, ſpun into a variety of yarns, woven into ſail-cloth, and twiſted into ropes and cables even for the largeſt ſhips. For theſe purpoſes it is preferable to hemp on account of its greater durability. (ſee Coir). The woody ſhell itſelf, or nut which encloſes the kernel, is poliſhed and formed into goblets, powder-boxes, and various kinds of cups. In Siam it is generally employed as a liquid meaſure, and its capacity is determined by filling it with cowries (cypræa moneta: Linn.) ſmall univalve ſhells current in that country inſtead of coined money. Thus there are cocoas of 1000 cowries, of 500, &c The kernels, preſſed in a mill, yield an oil, which is ſaid to be the only one uſed in the Indies at the table. When recent it is equal in goodneſs to the oil of ſweet almonds; but it ſoon becomes rancid, and is then employed only by painters. If the end of the young ſpathes be cut off, or the body of the tree be bored, there exudes from the wound a white, ſweet liquor, which is collected by the natives in pots, properly tried for the purpoſe; but by this operation the tree is inevitably rendered barren: the juices neceſſary for the ripening of the fruit being entirely exhauſted. The liquor, thus procured, is called palm wine, and is a favourite beverage in the country. It is very ſweet when freſh; kept a few hours, it becomes more poignant and agreeable; but the next day it begins to grow ſour, and in the ſpace of twenty-four hours is compleat vinegar. By diſtillation it produces a tolerably good brandy, or as it is there called arack, more eſteemed than that obtained from rice. Boiled with quick-lime, it thickens into the conſiſtence of honey; and after long evaporation, acquires the ſolidity, and in ſome degree the thickneſs of ſugar. As ſuch it is uſed by the confectioners, but is much inferior to the produce of the ſugar-cane. The tender leaves, before they fully expand, are ſometimes eaten in place of cabbage and other culinary greens; but as this luxury can be obtained only by the deſtruction of ſo valuable a tree, it is generally thought too expenſive a treat, except in thoſe parts of the country where the plantations are numerous. 2. C. *butyracea*, Linn. jun. Supp. 454. Mart. 2. Lam. 2. (Pindova; Piſ. Braſ. 125. Pindoba; Rai. Hiſt. 1361) "Unarmed; fronds pinnated; leaflets ſimple." A loftier tree than the preceding ſpecies, with a larger head. *Univerſal ſpathe* from four to ſix feet long, cylindrical-oblong, leſſened at both ends, woody; even-ſurfaced within; rendered uneven on the outſide by numerous, longitudinal parallel projections, a little remote from each other about the middle of the ſpathe, but approaching, and almoſt united near the ſummit; ſplitting longitudinally, and falling off after the expanſion of the ſpadix. *Spadix* the length of the ſpathe, branched; branchlets a foot long, quite ſimple, much crowded, one or two in each palm, containing only male flowers; ſix or eight others, both male and female. In thoſe which have only males, each of the flowers is ſupported by a ſmall, ſomewhat egg-ſhaped, rigid bracte; leaves of the proper perianth three, reſembling ſcales, very ſmall, oblong, flattiſh, a little united at the baſe, rather erect; petals three, linear, roundiſh, leſſened at both ends, ſix or eight lines long, bent different ways above the middle, very white, ſucculent, ſlightly connected at the baſe, alternating with the calyx-ſcales, even ſurfaced; filaments ſix, filiform, three times ſhorter than the petals, inſerted into the receptacle, ſomewhat united; anthers linear, the length of the filament, verſatile, bifid at the baſe, two-celled; pollen reſembling ſawduſt, white, very ſmall. Theſe flowers fall off at the irruption of the ſpadix, or on the leaſt touch, making a great heap under the tree. Male flowers of the androgynous ſpadixes ſimilar to the former, but continuing longer; thoſe intermingled with the females, thinly ſcattered, but in the upper part, where there are no females, much crowded; petals thinner; filaments ſhorter; anthers with two horns. Female flowers crowded in an imbricate manner; bractes triple, rather looſe, quite flat; leaves of the calyx three, hard, cartilaginous, large, egg-ſhaped, concave, broad and ſomewhat rounded at the baſe, nearly covering the other parts of the flower; petals three, white, fleſhy, reſembling the leaves of the calyx, but ſhorter and thinner; nectary corolla-ſhaped, tubular, very white and very thin, three times ſhorter than the petals, ſurrounding the greateſt part of the germ; germ egg-ſhaped, rather acuminate, quite ſmooth, the length of the corolla; ſtyle ſcarcely any; ſtigmas three, rather long, even ſurfaced on the outer ſide, roughiſh on the inner one, ſomewhat erect. *Drupe* inverſely egg-ſhaped, obſcurely trigonous, one-celled, ſucculent, ſurrounded by the permanent calyx and corolla; rind cartilaginous; pulp fibrous; nut dry, very hard, ſlightly ſtriated, with ſmall longitudinal lines, convex on one ſide, flattiſh on the other, oblong, a little acute at both ends, perforated at the baſe with three oblique holes; kernel cartilaginous, very hard, with the flavour of that of C. nucifera. A native of South America, where the inhabitants obtain from the imperfectly ground nuts, without preſſure, or the application of fire, and by ſimple maceration in water, a kind of butter which ſwims at the top, the heavier parts ſinking to the bottom. All the butteraceous matter is extracted by the third maceration. It does not, however, acquire the conſiſtence of butter in a temperature, above the twentieth degree of Reaumur; at the twenty-third it is perfectly liquid like other oils. The ſucculent pulp is rather ſweet, very mucilaginous, and excellent for fattening hogs. The oil or butter procured from the kernel, is in conſtant uſe among the Indians of South America as an article of food, and as a medicine, while it continues freſh, but is rancid and noxious when old. 3. C. *guineenſis*, prickly pole. Linn. Syſt. Nat. 2. Mant. p. 137. Mart. 3. Lam. 3. (Bactris minima; Gært. tab. 139. fig. 5. B. minor fructibus ſubrotundis; Jacq. Amer. tab. 171. fig. 1. Palma ſpinoſa minor; Sloane. Jam. Hiſt. 2. p. 121. P. americana ſpinoſa; Baub. Pin. 507. Pluk. Alm. tab. 103. fig. 1. L. Avoira canne; Aubl. Guian. obſ. 97. Autara; Marg. Braſ. 64. bad.) "Whole plant prickly; fronds diſtant; root creeping." *Root* knotty, cylindrical, thicker than the trunk, ſhort, bent horizontally directly below the ſurface, preſently putting out another trunk ſo as to form a thicket, whilſt it fixes itſelf firmly in the ſoil by ſlender fibrous roots. *Stem* about ten feet high in open ſituations, ſomewhat higher in woods, about an inch in diameter, erect, armed in its whole length with numerous ſpines as ſharp as needles. *Leaves* pinnated, diſtant, common petiole embracing the ſtem, prickly; leaflets enſiform, flat, acuminate, ſhining, with numerous ſcarcely perceptible ſpines at their edges, and a few ſcattered larger ones on both ſurfaces. *Spathes* axillary, ſolitary, ſpreading, permanent after the maturity of the fruit. *Flowers* pale yellow, ſcentleſs, calyx many times ſmaller than the corolla, ſometimes three-leaved; corolla triquetrous, frequently three-cleft almoſt to the baſe. *Drupes* roundiſh, dark purple, about the ſize of a common cherry; yielding an acidulous juice, of which the Americans make a kind of wine; eatable, but not pleaſant, and affording food chiefly to the wild hogs. Jacq. and Browne. *Drupe* roundiſh, ſomewhat depreſſed, ſucculent, acidulous; rind coriaceous; nut ſomewhat globular, hard as ſtone, very thick, roughened on all ſides by obſolete tubercles, ſtamped about the middle with three holes, ſtriated in rays at their mouths; two ſmaller ones not paſſing through the ſhell; the other pervious, leading to the central cell. *Seed* conoid, horizontally decumbent, tubercled, brown, with a very prominent papilla at the baſe of the cone; albumen fleſhy, friable, with a large cavity in the centre; embryo awl-ſhaped, horizontal, ſituated within the papilla. A native of the Weſt Indies and of South America. The trivial name given by Linnæus in the firſt mantiſſa, and continued by all ſubſequent authors, was probably a miſprint for guianenſis; canes are made of the trunk, ſtripped of its bark; they are very light, knotty, black, and ſhining. The French call them cannes de Tobago, under which name they are ſometimes imported into Europe. In alluſion to their uſe as walking canes, Jacquin named this palm, *Bactris απο του βακτρου*. 4. C. *aculeata*. Great macaw-tree. Mart. 4. Swartz. Prodr. 151. Brown. Jam. 344. n. 7. Sloan. Jam. 2. 119. tab. 214. Jacq. Amer. 278. tab. 169? (Bactris globoſa minor; Gært. 1. 22. fig. 9.) "Aculeate-ſpinous; trunk ſpindle-ſhaped; fronds pinnated; ſtipes and ſpathes ſpinous." *Trunk* the thickneſs of the human body, thirty feet high, thick ſet with ſharp black prickles of different lengths, and placed uſually in rings. *Leaflets* very long and prickly. *Fruit* the ſize and ſhape of a crab; rind green; pulp thin, ſweetiſh, aſtringent; kernel white, ſweet, eatable. Sloane. *Drupe* globular, a little flattened, about an inch in diameter, terminated by three acute ſeſſile ſtigmas, protected at the baſe by the permanent calyx and corolla; leaves of the calyx ſmall; rind thick, coriaceous; fleſh thick, ſucculent, at length fungous-coriaceous, adhering to the ſhell of the nut; nut globular, ſomewhat lenticular, hard as ſtone, thick, of a ferruginous bay colour, one-celled; ſtamped at the ſides with three holes, two of them cloſed at the bottom, the third pervious. *Receptacle* none. *Seed* ſingle, ſomewhat globular, lying horizontally oppoſite to the pervious hole of the ſhell, flattiſh, or ſlightly depreſſed near the hole, reticulated on all ſides with arched ſtriæ, of a brown bay colour. *Albumen* fleſhy, oleaginous, white, ſomewhat friable, hollow within. *Embryo* horizontal, oblong, milky white, elongated from a roundiſh baſe into a thick oblong lamina. Gært. A native of the Caribbee iſlands. Obſ. Gærtner ſeparates the laſt two ſpecies from cocos, on account of the horizontal poſition of the embryo. Whether ſuch a difference in the internal ſtructure of the ſeed be a ſufficient generic character, we may doubt, but will not determine.

Cocos *nypa*; Loureiro. See Nipa.

Propagation and Culture. The cocoa-nut tree is ſometimes raiſed in our ſtoves; but it is many years in advancing to any conſiderable height; the young leaves, however, being pretty large, they make a good appearance among other tender exotics in two or three years. The nuts muſt be imported when they are fully ripe, in a tub filled with dry ſand, and carefully ſecured from vermin; they will frequently ſprout in their paſſage, which is an advantage, becauſe they may be immediately planted in pots of earth, and plunged into the hot-bed. As their roots ſhoot deeply and widely, they will not bear tranſplanting, unleſs when very young, and even then great caution is requiſite to prevent their being injured.

Cocos, in *Geography*, a ſmall iſland in the Pacific ocean; uninhabited, but affording anchorage, the beſt at the north-eaſt extremity, excellent water, wood, fiſh, birds, and cocoa-nut trees, whence its name. The anchoring place is by Vancouver's obſervations in N. lat. 5° 35′. E. long. 86° 55′.

Cocos, a group of ſmall iſlands in the Indian ſea, ſituated about the diſtance of 165 leagues to the S.W. of *Flat* point, the moſt ſouthern of the iſland of Sumatra. The northernmoſt is a ſingle low iſland, in S. lat. 11° 50′. E. long. 97° 8′. and lies due N. from the moſt weſtern of the cluſter of iſlands, at the diſtance of 14 miles. Between them is a fair paſſage. The ſouthernmoſt are a circular range of low iſlands, whoſe latitude is from 12° 4′ to 12° 23′ S. Their eaſtern extreme 97° 19′ E. long.; and their weſtern extreme under the meridian of the moſt northern iſlands.

Cocos, *Cape*, a cape on the eaſt coaſt of the iſland of Madagaſcar. S. lat. 14° 20′. E. long. 55° 58′.

Cocos, in *Natural Hiſtory*, a pyritic foſſil, found in the cliff of the iſland of Shepey, annexed by ſir Joſeph Banks to the collection in the Britiſh Muſeum.

COCOSA, in *Ancient Geography*, a place of Gaul, on one of the routes from Aquæ Tarbellicæ to Burdigala.

COCOSATES, a people of Gaul, in Aquitaine.

COCOSSII, a people of Africa, im Mauritania Tingitana. Ptolemy.

COCOTZIN, in *Ornithology*, the name given by Buffon and others to the Indian turtle or ground dove, *columba paſſerina*. See Columba.

COCOXIHUITL, in *Botany*, Her. Mex. See Bocconia.

COCROTALEON, in *Natural Hiſtory*. Under this name the ancients deſcribe a ferocious hybrid brute, generated, as they pretended, between the hyæna and the lioneſs. This animal, according to their account, poſſeſſed many qualities of the mantichora; and as ſome believe was only another name for the ſame beaſt; it was alſo called leucrocotta, and leucrocatta, or ſimply crocotta, and cocrotta. We regard the whole hiſtory of this creature as fabulous; the production of a hybrid brute engendered between the two animals before-mentioned, is within the limits of poſſibility, but their deſcription is inadmiſſible; they tell us the body reſembled that of the lioneſs, that the tail was annulated, and the viſage human.

COCTIER, James, or Cottier, as Chaumel calls him, in *Biography*, in his "Eſſay on the State of Medicine in France," was phyſician to Lewis XI. and obtained ſuch influence over the mind of that voluptuous and cruel prince, as to be ſeared, the hiſtorians of the times ſay, by him, who was the dread of the reſt of the world. Having cured the king of a complaint which had baffled the endeavours of the phyſicians and ſurgeons who had been uſed to attend him, he had the art to get them diſmiſſed, and to have their places filled by his own creatures, who, finding their patient enfeebled by diſeaſe, and dreadfully afraid of dying, were unceaſing in their commendations of their patron, whom they extolled as the only phyſician capable of prolonging his liſe. Coctier, on his part, took care to profit by this weakneſs, extorting from him immenſe ſums, as the reward for his ſervices. On the death of Lewis, in 1483, a commiſſion was inſtituted to inquire by what means Coctier had acquired his prodigious poſſeſſſions; when it appeared he had received from the king 98,000 crowns within the laſt eight months. Coctier, finding he was in danger of loſing the whole of his ill-gotten wealth, had the addreſs to prevail on the king, Charles VIII. to accept 50,000 crowns, and to put an end to the inquiry. Philip de Comines. Eloy. Dict. Hiſt.

COCTION, a general name for all alterations made in bodies, by the application of fire or heat. See Boiling.

COCUJUS, in *Entomology*, the name under which Mouffet deſcribes the inſect vulgarly known by the name of Jamaica fire-fly; it is of the elater genus, and has a large oval lucid, or ſhining yellow-ſpot on each ſide of the thorax. Brown, in his "Hiſtory of Jamaica," calls it *elater major fuſcus phoſphoricus*; and tells us, that the lucid ſpots on the thorax are phoſphoreſcent, in which particular, his aſſertion is corroborated by the teſtimony of other writers. This inſect is the *elater noctilucus* of Linnæus.

COCUMONT, in *Geography*, a town of France, in the department of the Lot and Garonne; two leagues S.W. of Marmande.

COCUSUS, or CUCUSUS, in *Ancient Geography*, a town of Cataonia, upon the Carmalus, near the frontiers of Cilicia, N.E. of Irenopolis.

COCYLIUM, a town of Myſia.

COCYTA, a river of Epirus, which ran near the town of Cichyra, according to Pauſanias.—Alſo a river of Italy, in Campania, near the Lucrine lake, according to Silius Italicus, and Petronius.

COCYTA, in *Entomology*, the *papilio cocyta* of Cramer, is the ſpecies deſcribed by Fabricius, under the name of *papilio morpheus*, which ſee.

COCYTUS, in *Mythology*, one of the rivers of Hell; ſo named from a Greek word κωκυειν, to *lament*; Thus, Milton (Par. Loſt, B. ii.)

> "Cocytus, named from lamentation loud
> Heard on the rueful ſtream."

Cocytus and Phlegethon were branches of the river Styx, which flowed in contrary directions, and afterwards reuniting, augmented the large channel of the Acheron. According to Horace, Cocytus flowed with a dull and languid ſtream. Hence was derived "Cocyta virgo," the appellation of Alecto, one of the Furies.

COD, in *Ichthyology*, a genus of fiſhes, comprehending about twenty different ſpecies. See GADUS.

COD, *Cape*, in *Geography*, a cape of North America, the ſouth-eaſtern point of Maſſachuſetts' bay, in the ſtate of Maſſachuſetts'. N. lat. 42° 4'. W. long 70° 10'. It probably derives its name from the multitude of cod-fiſh, found on its coaſt. Its form reſembles a man's bended arm, with the hand turned inwards towards the body. The cape comprehends the county of Barnſtaple, though the name "Cape Cod," ſtrictly ſpeaking, ought to be confined. See BARNSTAPLE, and PROVINCE-TOWN. What is called "Racc-point," known to all ſeamen, is the north-weſterly extremity of the cape, and lies N.W. from Province-town, diſtant three miles. See RACE-POINT. The ſoil of Cape Cod is, in general, more thin and barren than any other part of New England, but the ſea-air impregnates all vegetables with a quality which renders them much more nutritious to cattle than the ſame quantity far inland. The ſalt-hay, which is almoſt their only forage, affords a manure which is ſuperior to that which is procured at a diſtance from the ſea. This greatly aſſiſts their crops of corn and rye. The lands of Cape Cod, however, could never ſupport its inhabitants, which are reckoned to amount to upwards of 18,000. The men and boys are, therefore, for the moſt part, conſtantly employed at ſea; ſo that Cape Cod is an excellent nurſery for ſeamen. The Cape abounds with clear freſh ponds, well ſtocked with fiſh; and formerly the inhabitants took many whales round the Cape; but that buſineſs is almoſt at an end. The manner of taking black-fiſh, which are of the whale kind, about five tons in weight, and yield oil, like the whale, is ſomewhat ſingular. When a ſhoal of them is diſcovered, ſometimes conſiſting of ſeveral hundreds, the inhabitants put off in boats, and getting beyond them, drive them, like a herd of cattle, to the ſhore and flats, where they are left by the tide, and thus become an eaſy prey. The ſhore of the Cape is, in many places, covered with the huge bones of theſe fiſh, and of whales, which remain unconſumed for many years. The wood on the Cape is generally pitch-pine.

It has been conjectured that the Cape is gradually wearing away, and that it will ultimately fall a ſacrifice to the ravages of the winds and ſeas. Many circumſtances ſeem to favour this opinion. At Province-town harbour, ſtumps of trees are ſeen, which are now covered by the ſea in common tides. When the Engliſh firſt ſettled upon the Cape, about the year 1620, there was an iſland off Chatham, at the diſtance of three leagues, called "Webb's iſland." containing 20 acres, covered with red cedar or ſavin. The inhabitants of Nantucket uſed to carry wood from it. This iſland has been wholly worn away for almoſt a century. A large rock, that was upon the iſland, and which ſettled as the earth waſhed away, now marks the place; it riſes as much above the bottom of the ſea, as it uſed to riſe above the ſurface of the ground. On this ſpot the water is ſix fathoms deep, and in many places on the Cape the ſea appears to be encroaching upon the land. The Cape is ſo much expoſed to various winds, that fruit trees do not thrive. The ſituation is healthy, but the piercing winds that proceed from the ſea are trying to delicate conſtitutions. The inhabitants, however, live in general, as long as thoſe of other parts of the northern ſtates. The winds in every direction come from the ſea; and invalids, by viſiting the Cape, ſometimes experience the ſame benefit as from going to ſea.

COD'S *Head*, a cape on the S.W. coaſt of Ireland. N. lat. 51° 36'. W. long. 9° 59.'

COD-*fiſh*, in *Ichthyology*. See GADUS *morhua*.

COD-*fiſhery*. See FISHERY.

CODA, BENEDETTO, in *Biography*, a Ferrareſe painter, who was, according to Vaſari, a ſcholar of Giovanni Bellini; he afterwards ſettled in Rimini, where he painted many works, in a ſtyle ſomething leſs dry than thoſe of his maſter. Amongſt his beſt pictures, is the marriage of the Madonna, which is placed in the Duomo, with the inſcription "opus Benedicti," and that of the roſary, at the Dominicans. He died about the year 1520. Benedetto was, however, far ſurpaſſed by his ſon, Bartolommio Coda, of whom there is, at the church of St. Rock, at Peſaro, an altar picture, repreſenting the tutelar ſaint, and St. Sebaſtian, one on each ſide the throne of the Madonna, accompanied by a choir of angels full of grace; it bears date 1528, and is in almoſt every reſpect a performance worthy the golden age in which it was painted. Lanzi. Storia Pitt.

CODA, *Ital.* a tail-piece, addition to, or termination of, a movement in muſic.

CODA *lancea*, in *Ornithology*, the name given by the Italian authors to the *anas caudacuta*, and vulgarly known in England by the names of *cracker*, or *ſea pheaſant*; the *pintail duck* of Engliſh, and *anas acuta* of modern Latin writers. This bird is diſtinguiſhed by having the two middle tail-feathers longer than the reſt, and acute or pointed; the hind head on each ſide marked with a white line, and the back aſh-coloured and undulated. The female is rather ſmaller than the male. It inhabits America, Europe, and Aſia.

CODAGAM, in *Botany*. Rheed. Mal. See HYDROCOTYLE *aſiatica*.

CODAGA-PALA. Rheed. Mal. See NERIUM *antidyſentericum*.

CODANA, in *Ancient Geography*, a place of Aſia, ſituated, according to Ptolemy, on the coaſt of Gedroſia.

CODANONIA, an iſland, placed by Mela in the Codanus Sinus; ſuppoſed to be the iſle of Seeland or Zealand.

CODANUS Sinus, the Baltic ſea, a gulf N. of Germany, between this country and Scandinavia. Mela repreſents it as diverſified with large and ſmall iſlands, inhabited by the Cimbri and Teutones. See Baltic.

CODA-PILAVA, in *Botany*. Rheed. Mal. See Morinda *citrifolia*.

CODARIUM. Solander. Vahl. Claſs and Order, *diandria monogynia*.

Eſſ. Ch. Calyx five-leaved. Corolla one-petalled, linear-lanceolate, inſerted into the ring of the nectary. Legume pedicelled, filled with a farinaceous ſubſtance, generally with a ſingle ſeed, but ſometimes with two or three, valveleſs.

Sp. C. *guineenſe* (dialium guineenſe. Willd.) A tree, or ſhrub. *Branches* cylindrical; bark grey, uneven with chinks and wartlike projections. *Leaves* alternate, unequally pinnated; leaflets five, oblong, quite entire, ending in an obtuſe point, veined; ſmooth and ſhining on the upper ſurface, uneven underneath, with papillæ, which are not viſible without a lens; petioles pubeſcent, tranſverſely wrinkled. *Flowers* numerous, in a very compound panicle, pubeſcent; calyx-leaves coriaceous, pubeſcent on the outſide; upper one broader, oblong, emarginate; the others oblong, acute; filaments two, thick, awl-ſhaped, incurved; anthers two on each filament, connate, oblong; germ ſuperior; ſtyle awl-ſhaped, incurved; ſtigma awl-ſhaped. A native of Guinea.

CODBECK. in *Geography*, a river of England, in the north-riding of Yorkſhire, which paſſes by Thirſk, and joins the Willowbeck, about 2 miles below that town; and about 2 miles after their union they fall into the Swale.

CODDA-PANNA, in *Botany*. Rheed. Mal. See Corypha.

CODDAM-PULLI. Rheed. Mal. See Cambogia.

CODDED *Corn violet*. See Campanula *hybrida*.

CODDY-moddy, in *Ornithology*, the Engliſh name of a ſpecies of gull, very common in the winter ſeaſon on our coaſts; it is the winter-mew of ſome Engliſh authors, and *larus hybernus* of Gmelin; *larus fuſcus ſ. hybernus*, Ray. *Larus canus β cinereus ſubtus niveus, capite albo maculis fuſcis vario, collo ſupra fuſco, alis variis, rectricibus albis faſcia nigra.* Lath. Ind. Orn. It is cinereous, beneath ſnowy white, the head white and varied with brown ſpots, the neck brown, wings ſpotted with brown, and the tail marked with a black band. Suppoſed to be a young bird, of the common gull kind, which has not attained its full ſtate of plumage.

CODE, Codex, a collection of the laws and conſtitutions of the Roman emperors, made by order of Juſtinian.

The word comes from the Latin *codex, a paper book*; ſo called *à codicibus*, or *caudicibus arborum, the trunks of trees*; the bark whereof, being ſtripped off, ſerved the ancients to write their books on.

The code is compriſed in twelve books, and makes the ſecond part of the civil, or Roman law.

There were ſeveral other codes before the time of Juſtinian, all of them collections or abridgements of the Roman laws. The moſt ancient code, or digeſt, was ſtyled "jus Papirianum," from the firſt compiler, Papirius, who flouriſhed about the time of the Regifugium. Mr. Gibbon, however, ſuſpects, that the Caius Papirius, the pontifex maximus, who revived the laws of Numa (Dionyſ. Hal. l. iii. p. 179), left only an oral tradition; and that the "jus Papirianum" of Granius Flaccus, (Pandect. l. 4. tit. xvi. leg. 144.) was not a commentary, but an original work, compiled in the time of Cæſar (Cenſorin. de die natali. l. iii. p. 13. Duker de Latinitate J. C. p. 157.) Gregorius and Hermogenes, or Hermogenianus, two lawyers, who flouriſhed under Conſtantine and his children, made each a collection of this kind, called, from their names, the *Gregorian Code*, and *Hermogenian Code*. The former included the conſtitutions of the emperors from Adrian, or, as ſome ſay, Auguſtus, to Diocleſian and Maximian. This was publiſhed in Schultens's "Juriſprudentia Ant. Juſtitiæ." The latter, which is a ſupplement to the former, was compiled in the age of the Conſtantines, and compriſed all the imperial conſtitutions of Diocleſian and Maximian, beſides thoſe of Claudius, Aurelian, Probus, Caius, and Caginus, to the year 306, or 312. The authors, in compiling theſe, their reſpective works, followed the order of time; which was afterwards obſerved in the codes of Theodoſius and Juſtinian. They were both abridged by thoſe who abridged the Theodoſian code; Gregorius is commonly believed to have been the moſt ancient of the two. The ſtyle of Hermogenianus is very uncouth, and often obſcure.

Cujas aſſigns to Gregory the reigns from Adrian to Gallienus, and the continuation to his fellow-labourer Hermogenes. But though this general diſtribution may be juſt; yet they often treſpaſſed on each other's ground. We have nothing remaining of them but a few fragments in different books of juriſprudence; the compilations themſelves falling to the ground for want of authority to put them in execution.

Theodoſius the Younger was the firſt emperor who made a code, which was compriſed in 16 books, formed out of the conſtitutions of the emperors from Conſtantine the Great to his own time; and compiled by eight able civilians, at the head of whom was Antiochus, who had been conſul in 431; abrogating all other laws not included in it; and this is what we call the Theodoſian code, which was publiſhed in the year 438, and received and obſerved in the eaſt for about 90 years, till annulled by the code of Juſtinian.

The Theodoſian code has been a long time loſt in the Weſt; Cujas took a great deal of pains to retrieve it, and to publiſh it in a better condition than ever. Gothofred has given us a comment on the Theodoſian code; a work which coſt him thirty years.

Theodoſius, in publiſhing the code, enacted, that the laws made by one prince ſhould be of no force in the dominions of the other, unleſs confirmed and ſigned by him.

In 506, Alaric, king of the Goths, made a new collection of the Roman laws, taken from the three former codes, the Gregorian, Hermogenean, and Theodoſian, which he likewiſe publiſhed under the title of the Theodoſian code. This code of Alaric continued a long time in force; and was all the Roman law received into France. It is ſometimes called the code of Anian, becauſe compiled by Anian, who was chancellor to Alaric.

Laſtly, the emperor Juſtinian, finding the authority of the Roman law exceedingly weakened in the Weſt, upon the decline of the empire, made a general collection of the whole Roman juriſprudence. The management hereof he committed to his chancellor, Trebonianus; who choſe out the moſt excellent conſtitutions of the emperors, from Adrian to his own time; and publiſhed his work in 529, under the title of the New Code.

But becauſe Juſtinian had made ſeveral new deciſions, which made ſome alteration in the ancient juriſprudence, he retrenched ſome of the conſtitutions inſerted by Trebonianus, and added his own in their place; on which account he publiſhed a new edition of the code in 534, and abrogated the former. See Civil *Law*.

There have been various other later codes, particularly of the ancient Gothic, and ſince of the French kings; as the code of Frederic, the code Michault, code Louis, code Neron, code Henry, code Marchand, code des Eaux, code Noire, &c.

Code *of canons*, *Codex canonum*. See Canon.

CODECEIRO, in *Geography*, a town of Portugal, in the province of Beira; ſix miles S. from Guarda.

CODEN, a town of America, in the ſtate of Virginia, nine miles S.E. of Cumberland.

CODERA, Cape, a cape of South America, on the N. coaſt of Terra Firma, in the diſtrict of Caraccas. N. lat. 10° 50′. W. long. 66° 21′.

CODESI, a town of European Turkey, in the province of Eoire. 16 miles E. of Valona.

CODEX, in *Antiquity*, a kind of puniſhment by means of a clog, or block of wood, to which ſlaves, who had offended, were tied faſt, and obliged to drag it along with them; and ſometimes they ſat on it cloſely bound.

Codex *Argenteus*. See Argenteus *Codex*.

CODIA, in *Botany*, (from κωδεια, a *little ball*; the flowers growing in a ſmall head.) Linn. jun. Supp. 33. Schreb. 675. Willd. 783. Forſt. Gen. 30. Juſſ. 430. Claſs and order, *octandria digynia*.

Gen. Ch. *Cal. common*. Involucre four-leaved, leaves oblong, horizontal. *Cal. proper*. Perianth four-leaved; leaves elliptical, erect. *Cor*. Petals four, linear, with claws. *Stam*. Filaments eight, longer than the corolla, growing two together at the baſe of each petal. *Piſt*. Germ ſuperior, very ſmall, villous; ſtyles two, awl-ſhaped, the length of the ſtamens; ſtigmas ſimple. *Receptacle common*, villous.

Eſſ. Ch. Calyx four-leaved. Petals four. Common receptacle involucred.

Sp. C. *montana*. A ſhrub. *Leaves* oppoſite, petioled, elliptical, obtuſe, entire, very ſmooth. *Heads of flowers* globular, peduncled, ſhort, axillary and terminal. *Fruit* unknown. A native of New Caledonia.

CODIÆUM, Rumph. See Croton *Variegatum*.

CODIAVANACU, Rheed. See Tragia *Chamælea*.

CODICIL, a ſchedule, or ſupplement to a will, or other writing.

It is uſed as an addition to a teſtament, when any thing is omitted which the teſtator would add, explain, alter, or retract; and is of the ſame nature as a teſtament, except that it is without an heir, or executor. So that a codicil is a leſs ſolemn will, of one that dies either teſtate or inteſtate, without the appointment of an heir; teſtate, when he that hath made his codicil hath either before or afterwards made his teſtament, on which that codicil depends, or to which it refers; inteſtate, when one leaves behind him only a codicil without a teſtament, wherein he gives legacies only to be paid by the heir at law, and not by any heir inſtituted by will, or teſtament.

A codicil, as well as a will, may be either *written*, or *nuncupative*. Some authors call a teſtament, a *great will*; and a codicil, a *little one*.

But there is this further difference between a codicil and a teſtament, that a codicil cannot contain the inſtitution of an heir; and that in a codicil, a man is not obliged to obſerve ſtrictly all the formalities preſcribed by law for ſolemn teſtaments.

In cuſtomary countries, teſtaments, properly ſpeaking, are no more than codicils; becauſe cuſtom itſelf names the heir, and does not allow of teſtamentary inheritors.

Codicils were firſt brought into uſe in the time of Auguſtus, by L. Lentulus; they were originally intended to follow the teſtament; which was, as it were, their baſis. In proceſs of time, codicils came to have their effect, even though made before the teſtament; provided there was nothing in the teſtament contrary to the codicil. People were alſo allowed to make codicils without teſtaments. Conqueſt and the formalities of law, ſays Mr. Gibbon, (Hiſt. of the Decline and Fall of the Roman Empire, vol. viii. p. 80) eſtabliſhed the uſe of codicils. If a Roman was ſurpriſed by death in a remote province of the empire, he addreſſed a ſhort epiſtle to his legitimate or teſtamentary heir; who fulfilled with honour, or neglected with impunity, this laſt requeſt, which the judges before the age of Auguſtus were not authoriſed to enforce. A codicil might be expreſſed in any mode, or in any language; but the ſubſcription of five witneſſes muſt declare that it was the genuine compoſition of the author.

Raymond Lully has a book which he calls the "Codicil;" wherein he pretends to have left his readers the ſecret of the philoſophers' ſtone; provided they do but underſtand it.

CODINA, in *Geography*, a town of the iſland of Sardinia, 14 miles E.S.E. of Oriſtagni.

CODINUS, George, in *Biography*, flouriſhed in the latter part of the fifteenth century. To him, in conjunction with others, was entruſted the care of the palace of Conſtantinople. He wrote a treatiſe concerning the origin of that city in the Greek language, and another concerning the officers of the palace, and thoſe of the great church in that city. Theſe works were tranſlated into the Latin, and printed in Greek and Latin at Paris, in 1615.

CODIROSSO, in *Ornithology*, the name under which Olina deſcribes the red-ſtart, *motacilla phœnicurus*. See Motacilla.

Codirosso-*maggiore*, of Olina, is the rock-ſhrike, *lanius infauſtus* of Gmelin, merle de roche of Buffon. See Lanius.

CODIUM, in *Botany*, a genus formed by Stackhouſe, for the fucus tomentoſus of Linnæus, to which he gives the following character. *Fructification* in ſmall implicated tubes. *Frond* cylindric-compreſſed; when wet, having the appearance of ſpunge; when dry, tomentous. See Fucus.

CODLINS and Cream. See Epilobium *Hirſutum*.

CODMA, in *Geography*, a town of Perſia, in the province of Segiſtan, 154 miles S.S.W. of Zareng.

CODOGNO, a town of Italy, in the Lodeſan, at the conflux of the Adda and the Po; 12 miles S.S.E. of Lodi.

CODOLAN, Cape, a cape on the E. coaſt of the iſland of Formentera, in the Mediterranean.

CODON, in *Antiquity*, a cymbal, or rather little braſs bell, reſembling the head of a poppy. They were faſtened to the trappings and bridles of horſes.

Codon is alſo uſed to ſignify the orifice of a trumpet.

Codon, in *Botany*, (from κωδων, a *little bell*.) Linn. Gen. 1285. Syſt. Nat. Ed. 13. vol. ii. p. 292. Schreb. 715. Willd. 823. Gært. 596. Juſſ. 422. Claſs and order, *decandria monogynia*. Nat. Ord. *undetermined*; Juſſ. *Borragineæ*; Lam.

Gen. Ch. *Cal.* Perianth one-leafed, deeply ten-cleft; permanent; ſegments narrow, linear. *Cor*. monopetalous, campanulate, toruloſe at the baſe; border ten-cleft, regular; nectary conſiſting of ten ſcales, inſerted into the baſe of the ſtamens, covering the receptacle. *Stam*. Filaments ten, the length of the corolla; anthers thick. *Piſt*. Germ ſuperior, conical; ſtyle the length of the ſtamens; ſtigmas two, long, briſtle-ſhaped, diverging. *Peric*. two-celled. *Seeds* roundiſh, echinate, bedded in a juiceleſs coloured pulp.

Eſſ. Ch. Calyx ten-cleft, permanent. Corolla bell-ſhaped; border ten-cleft. Nectary compoſed of ten ſcales. Pericarp two-celled, containing ſeveral ſeeds.

Sp. C. *Royeni.* Mart. Lam. Willd. (C. aculeatum; Gært. tab. 95. fig. 7.) *Root* annual. *Stem* about a foot high, herbaceous, firm, full of pith, cottony, echinate, with numerous very white prickles, branched. *Leaves* alternate, petioled, egg-ſhaped; clothed on each ſide with a ſhort cottony down, and rough with ſmall hard prickles, ſimilar to thoſe which are found in moſt of the borragineæ; nerves and petioles beſet with white prickles. *Flowers* ſituated a little above the axils of the leaves, ſolitary, rather large; peduncles ſhort, cottony, and like the calyxes, very prickly. Lam. From a ſpecimen ſent to Juſſieu by ſir Joſeph Banks. *Fruit,* capſule, encloſed in the permanent, connivent calyx; ovate-acuminate, terminated by the compreſſed forked ſtyle, marked along both ſides with a ſharp ſuture, ſmooth, two-celled, two-valved; partition contrary to the valves, cloven and ſpongy next the axis. *Seeds* numerous, ſmall, variouſly angular, blood-red, covered on all ſides with ſoft papillæ of the ſame colour. Gært. Native country unknown.

CODORUS, in *Geography,* a townſhip of America, in York county, Pennſylvania.

CODRANA, in *Ancient Geography,* a town of India, on this ſide of the Ganges. Ptolemy.

CODRINGTON, CHRISTOPHER, in *Biography,* was born at Barbadoes in the year 1688. When he was able to bear the fatigues of the voyage he was ſent to England, and, after ſome continuance at a private ſchool at Enfield, he was removed to Chriſt-church, Oxford. Here he took the degree of maſter of arts, and then was entered as probationer-fellow of All-Souls college, where he completed his ſtudies, and juſtly obtained the character of an accompliſhed gentleman and univerſal ſcholar. Without quitting the fellowſhip of his college, he joined the army, and, through the intereſt of the prince, ſoon attained the rank of captain in the firſt regiment of guards. He was inſtrumental in driving the French out of the iſland of St. Chriſtophers, which they had ſeized at the breaking out of the war between France and England. He diſtinguiſhed himſelf at the ſiege of Namur; and upon the peace of Ryſwick he was made captain-general, and governor of the Leeward Caribbee iſlands. For his conduct in this office he was charged with miſdemeanors, and ſeveral articles of impeachment were exhibited againſt him to the Houſe of Commons in England; to which an anſwer was publiſhed, with atteſtations in his favour, from the lieutenant-governor, members of the council, and the repreſentatives of Nevis. In 1703, he ſhowed the greateſt courage in the attack upon Guadaloupe, though the enterprize failed: this was probably the laſt warlike expedition in which he engaged, and he ſhortly after reſigned his government, and retired to enjoy a literary leiſure. He died in 1710, at his ſeat in Barbadoes, and was at firſt buried in that iſland, but in 1716 his body was removed to England and interred in the chapel of All-Souls, in which two orations were delivered on the occaſion, one by Digby Cotes, univerſity orator, the other by Edward Young, LL. B. By his laſt will he bequeathed a conſiderable eſtate in Barbadoes to the ſociety for the propagation of the Goſpel in foreign parts; he left alſo ten thouſand pounds to the college of All-Souls, for the purpoſe of building a library and the purchaſe of books. Biog. Brit.

CODRIO, in *Ancient Geography,* a ſtrong town of Macedonia, mentioned by Livy, l. xxxi. c. 27.

CODRONCHUS, BAPTIST, in *Biography,* a learned and intelligent phyſician of Imola in Italy, and author of ſeveral ingenious works on the ſubject of medicine, flouriſhed the latter end of the 16th and beginning of the 17th centuries. That he was much valued, we learn from his correſponding with the moſt eſteemed writers in his time; his works are alſo in the liſt of thoſe recommended by Boerhaave in his "Methodus ſtudii Medici." The titles of the principal of them are, "De chriſtiana et tuta medendi ratione, cum tractatu de baccis orientalibus, (cocculis indicis) et antimonio." Ferraria, 4to. 1591. The Indian berries were uſed as poſſeſſing an intoxicating power to attract or intice fiſh to the hook. They have long been ſuppoſed to be uſed by brewers, to give their beer a power of ſtupefying, without infuſing ſo much malt as would otherwiſe be required. In too large a doſe they would deſtroy life; the uſe of them in brewing is, therefore, very properly prohibited. "De morbis qui Imolæ et alibi communiter, anno 1602, vagati ſunt, commentarius, in quo potiſſimum de lumbricis tractatur, et de morbo novo, prolapſu nempe cartilaginis mucronatæ." Bononiæ, 1603, 4to. In this complaint, which appears to have been a fever, the patients were not relieved until after diſcharging a kind of worm, which the author deſcribes as differing from thoſe commonly found in the inteſtines. The author wrote alſo on the effects of different kinds of poiſons, and the remedies for each kind, and the diſeaſes occaſioned by witchcraft, in which he appears to have had great faith: On hoarſeneſs and other affections of the voice, and on the method of giving evidence in courts of juſtice: On the hydrophobia, of which he had ſeen ſome inſtances, and on the adminiſtering of hellebore, which he highly commends as a cathartic. Haller Bib. Med. Eloy. Dict. Hiſt.

CODROPIO, in *Geography,* a town of Italy, belonging to the ſtate of Venice, in the country of Friuli; 10 miles S.S.W. of Udina.

CODROPOLIS, in *Ancient Geography,* a town of Illyria, ſituated at the lower part of the Adriatic ſea, and ſerving as a boundary to the empire, divided between Auguſtus and Marc Antony.

COD-ROY, in *Geography,* a river of Newfoundland, which runs into the ſea, between cape Ray and cape Anguille.

CODRUS, in *Biography,* the 17th and laſt king of Athens, is celebrated for the noble act of ſacrificing his life for his country. He was the ſon of Melanthus, and had reigned twenty years, when the Heraclidæ made war againſt Athens. On this occaſion the Delphic oracle was conſulted, who declared that victory would decide for that people whoſe ſovereign was ſlain in battle. The enemy gave ſtrict charge to ſpare the life of Codrus, but the monarch, reſolving to enrol his name among the benefactors of his people, diſguiſed himſelf as a peaſant, and was ſlain in combat. When this was known to the Heraclidæ, they, dreading the accompliſhment of the prediction, broke up the camp and retreated. From this period, the Athenians regarded Codrus as the father of his country, and to pay the higheſt poſſible regard to his memory, they reſolved that no man was fit to reign as king after him; the monarchy was accordingly aboliſhed, and the government placed in the hands of elective magiſtrates, entitled archons, of whom the firſt was Medon, ſon of Codrus, who ſuſtained the office 20 years. This event took place about 1070 years before the Chriſtian æra. Juſtin. Univer. Hiſt. Du Freſnoy.

CODUTÆ, or CUDUTÆ, in *Ancient Geography,* a people of India, on the other ſide of the Ganges. Ptolemy.

CŒCILA, a town of Spain, placed by Ptolemy in Bœotia, in the country of the Turduli.

CŒCILIANA, a place on the river Calipos, E. of Cetobriga, and S.E. of Ulifipo.

CŒCINUM, a town of Italy, on the eaſtern coaſt of Brutium.

CŒCINUS, a ſmall river which watered the town of Cœcinum, and diſcharged itſelf into the ſea to the eaſt.

CŒCK, Pieter, in *Biography*, called likewiſe *P. Van Aelſt*, from the place of his nativity, a town in Flanders, was, if we can form any judgment from the writers who have ſpoken of him, or from the admirable prints remaining from his deſigns, one of the greateſt painters which either Germany or Flanders produced in his time. After he had been ſometime inſtructed in the ſchool of Bernard of Bruſſels, he went to Rome to complete his ſtudies, and ſoon proved himſelf an excellent deſigner, and a bold and ſpirited painter, as well in freſco as in oil. At his return to his own country he married, but his wife ſoon dying, he once more gave way to his natural inclination for travelling, and at the ſolicitations of a merchant, a friend of his, accompanied him to Conſtantinople in the year 1531.

Having ſtaid ſome time with the Turks, and drawn ſome moſt animated repreſentations of their cuſtoms and ceremonies, which he afterwards cut in wood, he once more arrived in the place of his nativity, and took a ſecond wife. Towards the latter part of his life he wrote ſome excellent treatiſes upon geometry, architecture, and perſpective. His pictures of hiſtory, as well as his portraits, were much eſteemed. He was made painter to the emperor Charles V. and died at Antwerp, in the year 1550. After his death the prints which he had made of Turkiſh coſtume were publiſhed by his widow. This admirable work conſiſts of ſeven large pieces, which, when joined together, form a frieze, divided into compartments by Cariaticles: on a tablet in the firſt block is written in old French, "Les mœurs et fachom de faire de turez, avecq les regions y appertenantes, ont eſt au vif contrefaicetze par Pierre Cœck d'Aloſt, luy eſtant en Turque, l'an de Jeſu Chriſt, MDXXXIII. lequel auſſy de ſa main propre a pourtraict ces figures duyſantes a l'impreſſion dy'celles;" and on the laſt is this inſcription, "Marie ver hulſt, veſue du dict Pierre d'Aloſt, tres paſſe en l'an MDL. a faict imprimer les dict figures, ſoubz grace et privilege d'l'imperialle majeſte en l'an MCCCCCLIII." Theſe prints are very rare. Baldinucci. Strutt.

CŒCUM, in *Anatomy*, the firſt portion of the large inteſtine, in which the ſmall inteſtine ends. As its dimenſions exceed thoſe of the reſt of the canal, it is alſo known by the name of *caput coli*. See Inteſtine.

CŒDAMUSII, in *Ancient Geography*, a people of Africa, mentioned by Ptolemy, who inhabited the environs of the town of Sitipha, and of the river Ampſagas, in Mauritania Cæſarienſis.

CO-EFFICIENTS, in *Algebra*, are numbers, or given quantities, prefixed to letters, or unknown quantities, into which they are ſuppoſed to be multiplied; and therefore, with ſuch letters, or with the quantities repreſented by them, making a product or co-efficient production; whence the name, firſt given by Vieta.

Thus, in $3a$, or bx, or cxx; 3 is the co-efficient of $3a$; b, of bx; and c, of cxx. If a letter have no number prefixed, it is always ſuppoſed to have unit for the co-efficient. Thus, a, or bc, import as much as $1a$, or $1bc$.

In any equation whoſe higheſt power or term has 1 for its co-efficient, the co-efficient of the ſecond term is always the aggregate of all the roots retaining their proper ſigns; ſo that if all the negatives be equal to all the affirmatives, the ſecond term will vaniſh; and where the ſecond term is thus wanting, it is a ſign that the quantities under contrary ſigns were thus equal.

The co-efficient of the third term is the aggregate of all the rectangles or products ariſing by the multiplication of every two of the roots, how many ways ſoever thoſe combinations of duals can be had; as once in a quadratic, three times in a cubic, ſix times in a biquadratic equation, &c.

The co-efficient of the fourth term is the aggregate of all the ſolids made by the continual multiplication of every three of the roots, how often ſoever ſuch a ternary can be had; as once in a cubic, four times in a biquadratic, ten times in an equation of five dimenſions, &c. And thus it will go on infinitely.

Co-efficients *of the ſame order*, is a term ſometimes uſed for the co-efficients prefixed to the ſame unknown quantities, in different equations.

Thus, in the equations $\left\{\begin{array}{l} ax+by+cz=m \\ dx+ey+fz=n \\ gx+hy+kz=p \end{array}\right\}$ the co-efficients a, d, g, are of the ſame order, being the co-efficients of x; alſo b, e, h, are of the ſame order, being the co-efficients of y. &c. The co-efficients alſo that affect no unknown quantity, are ſaid to be of the ſame order.

Co-efficients, *oppoſite*, ſuch as are taken each from a different equation, and from a different order of co-efficients. Thus, in the foregoing equations, a, e, k, and a, h, f, as alſo $d. b, k$, are oppoſite co-efficients.

COEHORN, in *Gunnery*. See Mortars, under the article Cannon.

COEL, in *Geography*, a town of Hindooſtan, in the country of Delhi, 65 miles S.E. of Delhi, and 33 N. of Agra. N. lat. 27° 48′. E. long. 78° 27′.

COELA, in *Ancient Geography*, the name of a part of the Elide, a country of Peloponneſus, according to Pauſanias and Strabo.—Alſo, a town ſituated on the ſtrait of the Helleſpont, S. of Seſtos, and at the lower part of the creek, or ſmall bay in the Thracian Cherſoneſus, whence it took its name "Portus Coelos." Pomponius Mela ſays, that the port of Coela is famous on account of the victory which the Athenians obtained here over the Lacedæmonians, whoſe fleet was utterly deſtroyed. The town of Coela, advantageouſly ſeated both for navigation and commerce, acquired, under Adrian, the privileges and dignity of a municipium; and it was recogniſed under the appellation of "Ælium," from his proper name. After the diſmemberment of the greater provinces of the empire, it became a part of the province of Thrace, called "Europe," under the metropolis of Heraclea.

Coela *of Eubœa*, a place of Greece in the iſland of Eubœa, denoting the ſpace or diſtrict which lay between Aulide and Gereſte.

COELÆ, a ſmall iſland ſituated before the town of Smyrna, on the coaſt of Aſia Minor. Pliny.

COELALETÆ, a people of Thrace, mentioned by Tacitus, and diſtinguiſhed by Pliny into the greater and leſs, and called Cœlatæ. He places the former at the foot of mount Hæmus, and the latter at the foot of mount Rhodope.

COELERINI, a people of Hiſpania Tarragonenſis. Pliny and Ptolemy.

COELESTIAL, in a general ſenſe, denotes any thing belonging to *cœlum* or the heavens. Thus,

Coeleſtial *obſervations*, are obſervations of the phenomena of the heavenly bodies, made with a proper apparatus of aſtronomical inſtruments, in order to determine their places, motions, phaſes, &c.

Obſervations in the day-time are eaſy; becauſe the croſs hairs in the focus of the object-glaſs of the teleſcope are then diſtinctly perceivable; in the night, thoſe croſs hairs are to be illumined to make them viſible. This illumination is either performed by a candle, placed obliquely near them, ſo that the ſmoke does not intercept the rays; or, where this is inconvenient, by making an aperture in the tube of the teleſcope, near the focus of the object-glaſs, through which a candle is applied to illumine the croſs hairs. M. De la Hire has made an improvement on the firſt method, which renders it of very good uſe; and it is by covering that end of the tube next to the object-glaſs with a piece of gauſe, or fine white ſilken crape. For, in ſuch caſe, a link, placed at a good diſtance from the tube, ſo enlightens the gauſe, as to render the croſs hairs very perceivable.

Obſervations of the ſun are not to be made without placing a glaſs, ſmoked in the flame of a lamp or candle, between the teleſcope and the eye; to take off from its luſtre, which would otherwiſe damage the eye, were not a good part of its beams intercepted.

Coeleſtial obſervations are chiefly of two kinds; the one when the objects are in the meridian; the other, when they are in vertical circles. For an account of the inſtruments with which obſervations are made, ſee our articles Circle, and Observatory.

Coelestial *globe*. See Globe.

Coelestial *Sphere*. See Sphere.

COELESTINE. The native ſulphat of ſtrontian, called coeleſtine, from the blueiſh tint which it generally aſſumes, is divided into three varieties, the foliated, fibrous, and compact.

1. Foliated. Its colour is milk-white paſſing into blue. It occurs in maſs, or cryſtallized in ſtrait rhomboidal priſms, or cuneiform octohedrons, or ſhort hexahedral priſms. Its luſtre is glittering or ſhining. Its fracture is imperfectly ſoliated. It is ſemitranſparent, rarely tranſparent. It is ſomewhat ſofter than flour ſpar, and is eaſily frangible. Sp. Gr. 3.5.

It conſiſts, according to Vauquelin, of

54	Strontian.
46	Sulphuric acid.
100	

It occurs in the neighbourhood of Briſtol in looſe nodules, and very finely cryſtallized in Sicily.

2. Fibrous. Its colour is between indigo blue and blueiſh-grey, paſſing into milk-white; by long keeping it loſes its colour. It occurs in maſs and in plates. Its longitudinal fracture is curved-fibrous approaching to foliated, with a ſhining luſtre; its croſs fracture is ſplintery, with a glittering pearly luſtre. It is tranſlucent, ſomewhat ſofter than the preceding variety, and eaſily frangible. Sp. Gr. 3.83.

It conſiſts, according to an analyſis by Klaproth, of

58	Strontian.
42	Sulphuric acid, with a trace of iron.
100	

It occurs in ferruginous marl in the vicinity of Briſtol, and at Frankſtown in Pennſylvania.

3. Compact. Its colour is blueiſh or yellowiſh-grey. It occurs in maſs, and in flattened ſpheroidal and kidney-ſhaped maſſes. Its fracture is fine-ſplintery, paſſing into foliated. It is opake, and ſometimes tranſlucent on the edges. It is ſoft and eaſily frangible. Sp. Gr. 3.59.

According to Vauquelin it conſiſts of

91.42	Sulphat of ſtrontian.
8 33	Carbonat of lime.
0.25	Oxyd of iron.
100.	

It occurs imbedded in clay in the gypſum quarries of Mont Mortre, near Paris.

COELESTIS Dea, in *Ancient Mythology*, the *heavenly goddeſs*, a deity worſhipped in Africa, and ſuppoſed to be the ſame with the Mithra of the Perſians, and Aſtarte of the Phœnicians. It had a ſplendid temple at Carthage, dedicated by one Aurelius, a Pagan high-prieſt, and deſtroyed by another Aurelius, created biſhop of Carthage, A. D. 390, who converted the Pagan temple into a Chriſtian church, and placed his epiſcopal chair on the ſpot where the ſtatue of the goddeſs had ſtood. At Rome, on the baſe of a ſtone on which the ſtatue of this deity was placed, is found this inſcription, "Invictæ Coeleſti."

CŒLE-SYRIA, or Coelo-Syria, in *Ancient Geography*, lay, according to Strabo, between the two mountains Libanus and Antilibanus, and was thence called *Cœle-Syria*, or the Hollow Syria. The cities and towns in this part of Syria, were, according to Ptolemy, Heliopolis, Abila Lyſaniæ, Gaana, Ina, Damaſcus, Samulis, Abida, Hippus, Capitolias, Adra, Scythopolis, Geraſa, Pella, Dium, Gadora, Philadelphia, and Canatha; to which ſome add Laodicea Cabioſa, or ad Libanum. According to Galen, this country produced black inflammable ſtones, probably a ſpecies of ſurturbrand or bituminized wood, ſimilar to the Bovey-coal of England; theſe, he ſays, were generated in the hills on the eaſt ſide of the Dead ſea, where the bitumen is produced, and had a ſcent ſimilar to bitumen.

COELIA, Κοιλια, or Κοιλιη in *Anatomy*. This has many different ſignifications; firſt, it imports a cavity in any part of the body, or in any of the viſcera; ſecondly, it implies the ſame as *aleres*. The κοιλιη, with the addition of ανω, that is, ἡ κατω κοιλιη, is the lower belly, or inteſtinal tube

COELIACA Arteria, a large artery derived from the trunk of the aorta, ſoon after that veſſel has entered the abdomen, and diſtributed to the ſtomach and duodenum, the liver, ſpleen, and pancreas. See Arteries.

Coeliaca *ganglia*, are the nervous ganglia found in the coeliac plexus. See the deſcription of the great ſympathetic nerve in the article Nerve.

Coeliaca, or the *Coeliac paſſion*, in *Medicine*, a term uſed by the older writers, to denote a diarrhœa, in which the ſtools were of a white appearance, reſembling, or conſiſting of chyle. A diſtinction was made between this diſeaſe and the lientery, inaſmuch as the food paſſed off in an undigeſted ſtate in the latter; whilſt in the coeliac paſſion the ſtomach completed the act of digeſtion, but the chyle, produced by this function, not being abſorbed by the lacteals, was diſcharged by ſtool. This ſpecies of diarrhœa rarely, if ever, occurs; ſince, where the glands and abſorbents of the meſentery, or the inteſtines themſelves, are conſiderably diſeaſed, the ſtomach is generally enfeebled in its functions, by ſympaathy. See Diarrhoea, and Lientery.

Coeliacus *plexus*, in *Anatomy*, is a moſt intricate nervous network, formed chiefly by the ſplanchnic nerves, and ſome branches of the par vagum; conſiſting of ſeveral ganglia, which vary conſiderably in number, form, ſize, and poſition, and are connected to each other by larger and ſmaller nervous chords; and ſurrounding the root of the coeliac artery. See Nerve.

CŒLIANUM, in *Ancient Geography*, a place of Lucania, on the route which led from Opinum to Heraclea.

COELICOLÆ, in *Eccleſiaſtical Hiſtory*, a ſect called alſo "Hypſiſtarii," which aroſe about A. D. 300, or ſomewhat ſooner. They are mentioned in the Theodoſian code, as heretics; and ſeem to have been perſons who, rejecting idolatry and polytheiſm, and all revealed religions, admitted only natural religion. See Wetſtein's Proleg. in N. T. p. 38.

COELICOLOR, in *Natural Hiſtory*, a name given by ſome to the opal.

COELIOBRIGA, in *Ancient Geography*, a place upon the Nebis, in the country of the Callaici, W. of Bracara Auguſta.

COELIUS *Mons*, one of the ſeven mountains or hills of the city of Rome, which owes its name to Coelius, or Coeles, a famous Tuſcan general, who pitched his tents there, when he came to the aſſiſtance of Romulus, againſt the Sabines. Livy (l. i. c. 30.) and Dionyſius Halicarnaſſenſis (l. iii.) attribute the incloſure of it to Tullus Hoſtilius; but Strabo (l. v.) to Ancus Martius. The other names by which it was ſometimes known, were Querculanus, or Quercetulanus, and Auguſtus: the firſt, occaſioned by the abundance of oaks growing there: the other impoſed by Tiberius, when he had erected new buildings upon it after a fire which conſumed the whole of this quarter of the city. (Tacit. Annal. L. Suet. in Tiber. c. 48.) One part of this hill was called "Coeliolus," and "Minor Coelius." To the eaſt it had the city walls; to the ſouth "Mons Aventinus;" to the weſt, "Mons Palatinus;" to the north, "Mons Eſquilinus." Its compaſs was about $2\frac{1}{2}$ miles.

COELLO, ALONZO SANCHEZ, in *Biography*, a Portugueſe painter, was born in 1526: after having ſtudied ſome time in Rome, he viſited Spain, where he profited from the inſtruction of Antonio Moro: (ſir Antony More): from Spain he paſſed into Portugal, and was employed by don Juan, and afterwards by donna Juanna, his widow, ſiſter to Philip II. of Spain. About this time, Antonio Moro, in conſequence of an indiſcretion he had been guilty of, found it adviſable to retire from the court of Spain; and Philip ſolicited his ſiſter to ſend Coello to occupy his place; on his arrival at Madrid he was treated by that monarch with every mark of reſpect and condeſcenſion, and ſeveral times employed to paint the portrait of Philip, on foot, and on horſeback, as well as thoſe of the nobles of his court. There are ſeveral altar-pieces by Coello in the Eſcurial, and two of his pictures, repreſenting Siſiphus and Titius, in the royal palace of Madrid; but his greateſt compoſition is the martyrdom of St. Sebaſtian, in the church of San Geronimo in that city; on the right of the ſaint ſtands the figure of Chriſt, on the left that of the Madonna, and below them San Bernardo and San Franceſco; the figure of the Almighty, enveloped in glory, forms the top of the picture. This, like his other works, is executed with great boldneſs of deſign and expreſſion, and a ſtyle of colouring nearly reſembling that of the great Titian. This artiſt, who certainly ranks amongſt the firſt of the Spaniſh ſchool of that period, died in the ſixty-fifth year of his age in 1590. Cumberland.

COELLO, CLAUDIO, of the ſame family with the above-mentioned artiſt, was born in Madrid in the ſeventeenth century, but in what year is not known. He became the favourite diſciple of Franceſco Ricci, painter to Philip III. and through his means gained acceſs to the royal collection, where he aſſiduouſly copied many of the fineſt works of Titian, Rubens, Vandyke, and other maſters. With theſe advantages, and theſe alone, for he never was out of Spain, Coello became, in the opinion of many, the greateſt painter of the ſchool, and decidedly holds a place in the firſt claſs. There is a Nativity by this maſter in the royal palace at Madrid, which, although hanging in the ſame room with the Adoration of Rubens, loſes nothing by the compariſon. But his chef d'œuvre is the picture "de las Colocazion de las Santas Formas," which hangs at the altar of the grand Sacriſty of St. Lorenzo in the Eſcurial; this piece is executed in ſo maſterly a ſtyle, with ſo ſtriking an effect of chiaroſcuro, and ſo much harmony, that the eye of the ſpectator is immediately attracted by it, although it is ſurrounded by many of the works of Raphael, Titian, and others, of the Italian and Flemiſh maſters; the portraits of the king and the principal nobility are introduced in the great group of the proceſſion, without any wiſe diſturbing the order or ſolemnity of the whole. The artiſt was ſeven years in completing this admirable compoſition; after which he returned to Madrid, in the year 1689, and was liberally rewarded. It is much to be regretted, that many of Coello's works, in the churches and convents of Madrid, Toledo, and Saragoſſa, are placed in ſuch bad lights and injudicious ſituations, as not to appear to that advantage which they ſo deſervedly merit.

His ſtyle is ſaid to reſemble that of Paul Veroneſe, particularly in his draperies, colouring, and characters: nor does he fall ſhort of him in magnificence of compoſition.

His death, which happened in 1693, was, it is ſuppoſed, accelerated by the mortification he felt, upon Luca Giordano's being ſent for by Charles II., to paint the freſcos of the great ſtaircaſe of the Eſcurial. Cumberland.

COELMANS, JAMES, an engraver of Antwerp, where he was born in 1670. His chief work conſiſts of ſome prints, executed by him entirely with the graver, about 1709, from the collection of pictures belonging to M. de Boyer, Comte d'Aguilles, at Aix in Provence; but we cannot ſay much for his ſtyle in general, as it is too dark, heavy, and inharmonious, and by no means correct in point of drawing. Amongſt the beſt of his engravings, for the above mentioned work, are, "The Murder of the Innocents," from Claude Spierre, and "The Fall of the Giants, with Victory crowning David," from Nicolo Pouſſin. His death happened in the year 1735. Strutt. Heinecken.

COELOMA, in *Surgery*, a hollow and round ulcer, in the horny tunic of the eye.

COELOS, in *Ancient Geography*, a town and port of the ſea of the Thracian Cherſoneſus, between Elæa and Cardia, according to Pliny. It is called "Cœla" by Ammianus Marcellinus. See CŒLA.

COELOSSA, or COELUSA, a mountain of the Peloponneſus, in the Argolide, according to Strabo. The Carnæate mountain formed a part of it.

COELUM. See HEAVEN.

COELUM is alſo uſed by ſome anatomiſts for the cavity of the eye towards the angles, or *canthi*. See EYE, CANTHUS, &c.

COELUS, in *Mythology*, one of the heathen deities, the ſame with the Greek *Uranus*.

COEMETERIUM. See CEMETERY.

COEMPTION, among the *Romans*, a rite of marriage, practiſed on the part of the bride, which, when ſhe was bought by the huſband of her parents, ſhe fulfilled by purchaſing, with three pieces of copper, a juſt introduction to his houſe and houſhold deities.

COEMPTIONALES, among the Romans, an appellation given to old ſlaves, which were ſold in a lot with others, becauſe they could not be ſold alone.

COEN, JOHN PIETERZOON, in *Biography*, was born in 1587, at Hoorn, in the United Provinces. He was ſent to Rome at an early age, to be inſtructed in trade and commerce, under Piſcatore, a celebrated merchant there. In 1607, he went to India; and in 1613, the whole management of the India trade was devolved on him, under the title of "director general," an office which ſeems to have been made for him. He was choſen preſident of Bantam, where he fixed his reſidence, and had great powers entruſted to him. There a plot was laid to aſſaſſinate him, which, though it miſcarried, led him to the reſolution of changing his abode. In conſequence of this, the Dutch, in the year 1619, took poſſeſſion of Batavia, where they eſtabliſhed the ſeat of their commerce. For ſeveral years the Dutch had to contend with the native king of the place, aſſiſted by the Engliſh. Peace was at length concluded between the two companies. The Engliſh re-embarked, and Coen laid the foundation of a new city, the ſtreets of which were laid out in ſtraight lines, and ſo ſpacious as to admit of canals of water, bordered by trees, that they might afford a ſhade to thoſe who paſſed backwards and forwards in boats. The place was fortified, and put into a ſtate of defence, and then it was declared the capital of the Dutch ſettlements in India. In the year 1622, Coen obtained leave to return to Europe, and in the following January he ſet ſail with five ſhips, richly laden, and arrived at Zealand in December, having held the ſupreme command in India for more than four years. In 1627, he proceeded to India again, but he had not been long at Batavia, before the emperor of Java, jealous of the Dutch power, endeavoured to drive them from the iſland. Twice he laid ſiege to this city, but ſo many of the Javaneſe were killed by the artillery of the beſieged, that a contagious diſtemper broke out among them, to which great numbers fell a ſacrifice. It extended even to the Dutch camp and city, and deſtroyed many of the inhabitants. The Javaneſe were forced, ultimately, to raiſe the ſiege; exaſperated with the defeat, they attempted to aſſaſſinate Coen. With this view, they ſent to Batavia ſeveral ſmall veſſels laden with proviſions, having ſome armed men concealed in the bottom of them below bamboos. They proceeded to the market-place, where the conſpirators hoped to accompliſh their purpoſe, but Coen was too ſtrongly guarded for them to venture upon an attack. He died in September, 1629. Gen. Dict. Univer. Hiſt.

COENA *domini*, *bull*. See Bull.

Coena *Triumphalis*, in *Military Language*. When a victorious general made his triumphal entry, it was cuſtomary for him to give a banquet or entertainment to the Roman people.

CŒNAKER, in *Geography*, a town of the iſland of Ceylon, near the ſouth coaſt; 100 miles S. of Candy.

COENDOU, in *Zoology*, the French name of the Braſilian porcupine, *Hyſtrix prehenſilis*.

CŒNE, or Coenopolis, in *Ancient Geography*. See Cæne.

CŒNENUM, a town, placed by Ptolemy in the northern part of Germany.

COENNERN, or Konnern, in *Geography*, a town of Germany, in the circle of Lower Saxony, and duchy of Magdeburg, containing about 333 houſes; 38 miles S. of Magdeburg.

CŒNOBITE, in *Eccleſiaſtical Hiſtory*, formed of κοινος, *common*, βιος, *life*, a religious, who lives in a convent, or in community, under a certain rule; in oppoſition to *anachoret*, or *hermit*; who lives in ſolitude.

Caſſian makes this difference between a *convent* and a *monaſtery*, that the latter may be applied to the reſidence of a ſingle religious, or recluſe; whereas the *convent* implies *cœnobites*, or numbers of religious living in common.

Fleury ſpeaks of three kinds of monks in Egypt; *anachorets*, who live in ſolitude; *cœnobites*, who continue to live in community; and *ſarabaites*, who are a kind of monks errant, that ſtroll from place to place. (See Monk.) He refers the inſtitution of cœnobites to the times of the apoſtles, and makes it a kind of imitation of the ordinary lives of the faithful at Jeruſalem. Though St. Pachomius is commonly owned the inſtitutor of the *cœnobite* life; as being the firſt who gave a rule to any community.

COENOBIUM, the ſtate of living in a ſociety or community, where all things are in common. Pythagoras is thought to be the author, or firſt inſtitutor of this kind of life; his diſciples, though ſome hundreds in number, being obliged all to give up their private eſtates, in order to be annexed to the joint ſtock of the whole. The Eſſenians among the Jews, and Platoniſts, are ſaid to have lived in the ſame manner. Many of the Chriſtians alſo have thought this the moſt perfect kind of ſociety, as being that in which Chriſt and his apoſtles choſe to live. See Coenobite.

COENOTAPH. See Cenotaph.

COENSIS Civitas, in *Ancient Geography*, the ſame with Cos, the capital of an iſland of the ſame name, which was an epiſcopal ſee.

COENYRÆ, a place in the iſland of Taſos, between which, and that called Ænyræ, or Annyræ, there were very rich mines.

CO-EQUALITY, a term expreſſing the relation of equality between two things.

The retainers to St. Athanaſius's doctrine of the Trinity hold the Son and Holy Spirit *co-equal* with the Father. The Arians, &c. deny the *co-equality*. See Trinity and Arian.

COEQUOSA, in *Ancient Geography*, a town of Gaul in Aquitaine, placed by the Itinerary of Antonine on the route from Aquæ Tarbellicæ to Burdigala.

COERULEUM Montanum. See Copper, *ores of*.

Coeruleum *nativum*. See Armenius *lapis*.

COES, among *Miners*, are little houſes which the miners make over their mines to lay ore in.

COESCOES, in *Zoology*, the Surinam opoſſum, *Didelphis orientalis*, is deſcribed by Valentine under this name.

COESFIELD, in *Geography*, a town of Germany, in the circle of Weſtphalia, and biſhopric of Munſter, the ordinary reſidence of the biſhop, containing two pariſh churches and five convents; 14 miles W. of Munſter.

COESNON, a river of France, which runs into the ſea, between Pontorſon and Mont St. Michael.

COESTOBOCI, in *Ancient Geography*, a people of European Sarmatia, according to Ptolemy.

CO-ETERNITY is uſed among *Divines* to denote the eternity of one being equal to that of another. The orthodox hold the ſecond and third perſons in the Trinity *co-eternal* with the firſt.

COETI, in *Ancient Geography*, a people of Aſia, in the vicinity of the Tibareni and of the river Thermodon.

COEUR, Jacques, in *Biography*, a celebrated French merchant, and adminiſtrator of the finances under Charles VII. Of ſuch conſequence were his commercial purſuits, that he is ſaid to have had 300 clerks in the ports of the eaſt, and that he became the richeſt individual in Europe. His liberality was as extenſive as his wealth was great, and he advanced very conſiderable ſums to his ſovereign, to enable him to recover his dominions from the Engliſh; in return for this generoſity, he was raiſed to the higheſt offices of ſtate, and was employed on many important embaſſies; in theſe his own wealth was made uſe of to enhance the glory of his country. His good fortune excited the jealouſy of his contemporaries, who exhibited againſt him many heavy charges, from moſt of which he readily cleared himſelf, but he was convicted, by a partial tribunal, of others, and was condemned to pay an enormous fine; his eſtates were confiſcated, and he himſelf was confined to the convent of Cordeliers at Beaucaire, from whence he eſcaped to Rome. His ſubſequent hiſtory is involved in obſcurity, but it is generally believed that he embarked in an expedition fitted out againſt the Turks by pope Callixtus III. and died at the iſle of Chio in 1456. Nouv. Dict. Hiſt.

COEUR, in *Heraldry*.—*Party en* Coeur, ſignifies a ſhort line of partition in pale, in the centre of the eſcutcheon, which extends but a little way, much ſhort of top and bottom; being met by other lines, which form an irregular partition of the eſcutcheon.

COEUS, in *Ancient Geography*, a river of the Peloponneſus, in Meſſenia, which watered the town of Electra, according to Pauſanias.

COEUVRES, or Estrees, in *Geography*, a town of France, in the department of the Aiſne, and diſtrict of Soiſſons; 7 miles S.W. of it.

CO-EXISTENCE, a term of relation, denoting two or more things to exiſt together at the ſame time, &c. See Existence.

COEYMANS, in *Geography*, a townſhip of America, in the ſtate of New York and county of Albany; 12 miles below Albany.

COFFEA, in *Botany*, (its true name, according to Bruce, is *Caffé*, from Caffa, the ſouth province of Narea, in Africa, where it grows ſpontaneouſly in great abundance), Linn. Gen. 230. Schreb. 314. Willd. 353. Gært. 139. Juſſ. 204. Vent. 2. 583. (Caffeyer, Encyc.) Claſs and order, *pentandria monogynia*. Nat. Ord. *Stillatæ*, Linn. *Rubiaceæ*, Juſſ. Vent.

Gen. Ch. *Cal.* Perianth ſuperior, very ſmall; four, five, or ſix-toothed. *Cor.* monopetalous, ſalver or funnel-ſhaped; tube cylindrical, ſlender, much longer than the calyx; border longer than the tube, four, five, or ſix-cleft; ſegments lanceolate, expanding, or obliquely reflexed. *Stam.* Filaments four or five, inſerted into the tube of the corolla; anthers linear. *Piſt.* Germ inferior; ſtyle ſimple, the length of the corolla; ſtigmas two, awl-ſhaped, reflexed. *Peric.* Berry roundiſh, about the ſize of a cherry, umbilicated at its ſummit. *Seeds* one or two, elliptically hemiſpherical, gibbous on one ſide, flat and furrowed longitudinally on the other, involved in an aril.

Eſſ. Ch. Corolla ſalver or funnel-ſhaped. Stamens inſerted into the tube. Berry inferior, one or two-ſeeded. Seeds arilled.

Sp. 1. C *arabica*, Arabian coffee-tree. Linn. Sp. Pl. 1. Mart. 1. Lam. 1. Willd. 4. Lam. Ill. tab. 160. fig. 1. Woodv. Med. Bot. tab. 230. Gært. tab. 25. (Jaſminum arabicum, Juſſ. Act. 1713. p. 388. tab. 7. Till. Piſ. 87. tab. 32. Evonymo. ſimilis œgyptiaca, Bauh. Pin. 428. Bon ſive ban, Alp. Ægyp. tab. 36. Pluk. Almag. 69. tab. 272. fig. 1.) "Flowers five-cleſt; berries with two ſeeds." Linn. "Leaves oblong-acuminate; peduncles axillary, aggregate; corollas five-cleft." Willd. An evergreen ſhrub, from fifteen to twenty feet high. *Trunk* erect, not more than two or three inches in diameter; branches brachiate, two growing at every joint, almoſt cylindrical, flexible, looſe, expanding; lower ones extending horizontally, generally ſimple. *Leaves* four or five inches long, two inches broad, oppoſite, ſimple, ovate-lanceolate, acuminate, quite entire, ſmooth, green, ſhining on the upper ſurface, pale green underneath, on very ſhort petioles. *Stipules* two at each knot of the branch, awl-ſhaped, enlarged at the baſe, oppoſite, intrafoliaceous. *Flowers* white, ſeſſile, axillary, cluſtered four or five together, ſweet-ſcented, ſoon falling off. *Berries* oval-globular, of a dark red colour when fully ripe. Lam. *Berry* inferior, elliptic-ſphæroidal, with a little circular area at the ſummit, having within it a callous point; two-celled, containing a fleſhy, ſomewhat gelatinous pulp; partition vaſcular-fleſhy. *Seeds* one in each cell, elliptical, convex on one ſide, flattiſh, with a longitudinal chink on the other, of a pale glaucous colour; aril of a ſubſtance reſembling paper, elaſtic, pellucid, looſely ſurrounding the ſeed, and entirely covering it. Gært. A native of the old continent and adjacent iſlands, between or near the tropics. 2. C. *mauritiana*. Lam. 2. Illuſ. tab. 160. fig. 2. (C. arabica β. Willd.) "Berries oblong, acute at the baſe; ſeeds two." Lam. *Branches* compound; branchlets oppoſite. *Leaves* only two inches and a half long, ſomewhat acute, but not acuminate, narrowed to a point at the baſe, ſcarcely petioled, ſmooth, much veined. *Berries* axillary, almoſt ſeſſile, never globular, but oblong and narrowed to a point at their baſe, two-celled. *Seeds* one in each cell, oblong, cartilaginous, pointed at one end, not having much thickneſs. Deſcribed by La Marck from a ſpecimen without flowers ſent to Juſſieu. It is evidently nearly allied to the preceding, but eſteemed by La Marck to be ſpecifically diſtinct, on account of the different ſhape of the fruit. This eminent botaniſt has, however, been unaccountably negligent with reſpect to their ſpecific characters, having retained, without addition, that formed by Linnæus for C. arabica, which, in the Species Plantarum, is oppoſed only to C. occidentalis, and by no means excludes any part of the ſpecific character given by La Marck to his C. mauritiana. The following ones will, we believe, ſufficiently diſcriminate them from each other, and from all the ſucceeding ſpecies. C. *arabica*. "Flowers five-cleft; peduncles axillary, cluſtered; leaves acuminate; berries nearly globular; two-celled, with two ſeeds." C. *mauritiana*. "Peduncles axillary, generally ſolitary; leaves ſomewhat acute; berries oblong, leſſened to a point at their baſe, two-celled, with two ſeeds." But after all, it may be doubted whether the ſuperior plumpneſs of the berries of the Arabian coffee may not be entirely the effect of cultivation. A native of the iſle of Bourbon. La Marck, when he wrote the article in the Encyclopedie, did not know whether the coffee, imported into France by the name of caffé de Bourbon, is the produce of the indigenous tree, or of cultivated plants brought originally from Arabia. It has ſince been aſcertained, that the Bourbon coffee is obtained from Arabian plants ſent from Mocha in the year 1717. And we learn from the Memoirs of the Academy of Sciences at Paris for the year 1715, that the inhabitants of the iſland, on ſeeing a branch of the common coffee-tree with leaves and fruit, brought from Mocha in a French ſhip, inſtantly recollected that they had obſerved a ſimilar tree growing wild on their mountains, which was ſoon after produced, and found to be little different. 3. C. *guianenſis*. Mart. 5. Lam. 3. Willd. 6. Aubl. Guian. 1. tab. 57. "Leaves lanceolate; peduncles axillary, aggregate; corollas quadrifid." Willd. "Flowers quadrifid; berries ſmall, violet-coloured, with two ſeeds." Aubl. A ſhrub, one or two feet high. *Branches* quadrangular, knotty. *Leaves* oppoſite, brachiate, acute, quite entire, green, ſmooth, ſhining, on ſhort petioles. *Stipules* two at each joint, oppoſite, intrafoliaceous, acute. *Flowers* white, ſeſſile. *Berries* ſpherical. *Seeds* coriaceous. A native of Guiana. 4. C. *triflora*. Mart. 10. Willd. 5. Forſt. Prod. 95. "Leaves ovate-lanceolate, acuminate; peduncles three, terminal, one-flowered." A native of Otaheite. 5. C. *paniculata*. Mart. 6. Lam. 4. Willd. 7. Aubl. Guian. 1. tab. 58. "Leaves oblong, acuminate; panicle terminal, divaricated; corollas quadrifid; branches quadrangular." Willd. "Branches quadrangular; leaves large, ovate-oblong, acute; corollas quadrifid; berries with two ſeeds." Aubl. A ſhrub. *Trunk* ſeven or eight feet high, five or ſix inches in diameter; covered with a grey, wrinkled, cracked bark. *Branches* oppoſite, compound, knotty. *Leaves* oppoſite, brachiate, on ſhort petioles. *Stipules* intrafoliaceous, caducous. *Flowers* white, ſweet-ſcented; peduncles quadrangular, with oppoſite brachiate ramifications; calyx four-toothed; ſtamens four. *Berries* blueiſh; one of the ſeeds frequently abortive. A native of Guiana. 6. C. *occidentalis*. Linn. Sp Pl. 2. Mart. 2. Lam. 5. Willd. 8. Jacq. Amer. 67. tab. 47. (Pavetta, Brown. Jam. 142. tab. 6. fig. 1. Jaſminum, Burm. Amer. tab. 156. fig. 2.) "Flowers four-cleft; berries with one ſeed." Linn. "Leaves oblong-lanceolate, acuminate; panicle terminal, trifid, few-flowered; berries with one ſeed; little branches quadrangular." Willd. A ſhrub about ſix feet high. *Branches* long, compound, brittle. *Leaves* oppoſite, quite entire, ſhining, on ſhort petioles. *Stipules* intrafoliaceous. *Flowers* white, ſweet-ſcented; ſtamens four; anthers ſcarcely projecting beyond the tube. *Berries* roundiſh, about the ſize of an olive, crowned at the top, of a blueiſh black colour when ripe. *Seeds* ſolitary, roundiſh, cartilaginous, ſtriated, encloſed in a membranous aril. A native of Jamaica, St. Domingo, and Martinico. 7. C. *racemoſa*. Mart. 3. Lour. Cochin. 145. "Much branched; leaves rugged; racemes terminal; berries with two ſeeds." A ſmall tree, only four feet high. *Branches* numerous, cylindrical, diffuſe. *Leaves* oppoſite, ovate-lanceolate, quite entire, beſet with many tubercles, on ſhort petioles. *Flowers* in erect brachiate racemes; common peduncle long, quadrangular; partial ones ſhorter, cylindrical, oppoſite or ſtellate. *Berry* roundiſh, ſmall, red, watery, one-celled, with two hemiſpherical ſeeds. A native of Mozambique. 8. C. *zanguebariæ*. Mart. 4. Lour. Cochin. 145. "Corollas ſix or ſeven-cleft; fruit angularly nerved, with two ſeeds." A ſmall upright tree, ſix feet high. *Branches* thick, ſhort, ſpreading. *Leaves* ovate-lanceolate, ſmooth, oppoſite. *Flowers* white, axillary, ſeveral together, on ſhort one-flowered peduncles. *Berries* red, oblong-ovate, angular with longitudinal nerves. A native of Africa on the coaſt of Zanguebar; and cultivated near Mozambique with the preceding ſpecies. 9. C. *ſambucina*. Mart. 7. Willd. 1. Forſt. Prod. 92. "Leaves oblong-lanceolate, cymes corymbous, terminal." A native of the Friendly Iſlands. 10. C. *opulina*. Mart. 8. Willd. 2. Forſt. Prod. 93. "Leaves ovate-lanceolate; cymes contracted, globular, terminal." A native of New Caledonia. 10. C. *odorata*. Mart. 9. Willd. 3. Forſt. Prod. 94. "Leaves egg-ſhaped, acute; cymes corymbous, axillary." A native of Tanna and the Friendly Iſlands.

Propagation and Culture. None of the ſpecies, except the firſt, have been cultivated in Europe; and as this, like all the others, is a native of tropical climates, it is of courſe confined to our ſtoves, to which its evergreen-leaves, beautifully white flowers, and ſucceeding red berries, are a valuable ornament. It is raiſed moſt ſucceſsfully from the berries, which muſt be fully ripe, and ſown ſoon after they are gathered, for if kept out of the ground a ſhort time, they will not grow. If freſh berries cannot be obtained, young plants muſt be procured in ſmall pots. The pots in which the ſeeds are ſown ſhould be filled with a light kitchen-garden earth, plunged into a hot-bed of tanners' bark, and ſparingly watered once or twice in a week. In a month or five weeks the plants will appear, and in two months more will be fit to tranſplant. As many of the berries will produce two plants, theſe muſt be carefully ſeparated, and treated as before. The plants ſhould have free air admitted to them every day according to the warmth of the ſeaſon. In ſummer they will require frequent watering, but ſhould have only a ſmall quantity at a time. They ſhould not be tranſplanted more than twice a year, and unleſs they have made great progreſs in their growth, once will be ſufficient. The ſtove in which they are placed ſhould be kept to the heat aſſigned for the ananas in the botanical thermometer.

COFFEE, in *Domeſtic Economy* and *Medicine*, the name of a well known potable liquor, made by a decoction, or ſimple infuſion of the ſeeds of the coffee-berry, after they have been properly roaſted, and ground to powder in a ſmall mill, conſtructed for the purpoſe. Its introduction into the civilized world is comparatively of modern date. It was unknown to the Greeks and Romans; nor is it mentioned by any of the European writers who were engaged in the cruſades; it could not, therefore, have been uſed in Syria during the 12th and 13th centuries. We are aſſured by Mr. Bruce, that it is a native of Abyſſinia, and is found wild in great abundance from Caffa to the banks of the Nile.

It is alſo generally ſaid to have been cultivated in that country from time immemorial. M. Lagreneé, one of the moſt intelligent agents that France ever had in the India ſervice, ſays the abbé Raynal, procured ſome of the fruit, and made trial of it. He found it, as the abbé informs us, to be larger, rather longer, and almoſt as fragrant as that which is obtained from Arabia. That the qualities of the wild, or cultivated berry, have been long known in that part of Africa, is confirmed by Bruce. The Gallæ, he tells us, a wandering nation of Africa, in their incurſions on Abyſſinia, being obliged to traverſe immenſe deſerts, and being alſo deſirous of falling upon the towns and villages in the cultivated part of Abyſſinia without warning; carry nothing with them to eat, but coffee roaſted till it can be pulverized, and then mixed with butter to a conſiſtency, that will ſuffer it to be rolled up in balls, and put into a leathern bag. One of theſe, about the ſize of a billiard ball, keeps them, they ſay, in ſtrength and ſpirits during a whole day's fatigue, better than a loaf of bread, or a meal of meat. Bruce's Travels, vol. ii. p. 226.

It is, however, from Arabia that coffee was firſt brought into Europe. Whether it is indigenous in that country, has not been poſitively aſcertained; and it is not poſſible to reconcile the reports concerning it, which are given by different oriental writers. According to ſome, the uſe of it was firſt introduced by the prior of an Arabian monaſtery, who, being informed by a goat-herd of the effects produced on his goats, when they had happened to browſe on the coffee-tree, gave an infuſion of the berries to his monks, to prevent the inclination to ſleep, which frequently interfered with the due performance of their nocturnal prayers. According to others, a mollack, named Chadely, was the firſt among the Arabians who made uſe of coffee, to relieve himſelf from a continual drowſineſs which hindered him from attending punctually to his nightly devotions. His derviſes did the ſame, and their example was followed by the lawyers. It was ſoon found out, that this liquor purified the blood by a gentle agitation; diſſipated the crudities of the ſtomach, and raiſed the ſpirits; and, in conſequence of theſe properties, it was ſoon adopted by thoſe who had no occaſion to keep themſelves awake. Both theſe accounts, eſpecially the former, clearly imply that the coffee-tree grew wild in Arabia at that time, but was not till then cultivated for the ſake of its fruit. The author of an Arabian manuſcript, formerly in the library of the king of France, and now depoſited in the Bibliotheque Nationale, attributes the firſt introduction of this beverage into Arabia, to Megaleddin, mufti of Aden, about the middle of the 15th century. He is ſaid to have met with it on a journey into Perſia, where it was then only coming into uſe; and, on his return, to have employed it himſelf, and given it to the derviſes, with whom he was accuſtomed to ſpend the night in prayer.

The example of the muſti rendered this new luxury popular in Aden, whence it rapidly extended to Mecca, Medina, and the other cities of Arabia Felix. Public coffee-houſes were opened within a ſmall ſpace of time in Perſia, as well as in thoſe cities, which afforded a lounge to the idle, and a relaxation to the man of buſineſs. There the politician retailed the news, the poet recited his verſes, and the mollacks delivered their ſermons. The fame of this bewitching potation quickly reached Grand Cairo, and was received with equal avidity at Conſtantinople. But in theſe populous cities, it did not obtain ſimilar favour from the ruling powers. At Grand Cairo it was oppoſed on religious grounds. In the year 1511, it was prohibited by Khaiae Beg, from a perſuaſion that it had an inebriating quality, and produced inclinations forbidden by the Koran. But the prohibition was ſoon after taken off by his ſucceſſor, Cauſon. In the year 1523, Abdallah Ibrahim again denounced it in a ſermon delivered in the moſque of Haſſananie. A violent commotion was produced, and the parties came to blows. Upon this the ſheik, El-beiet, commander of the city, aſſembled the doctors, and, after giving a patient hearing to their tedious harangues, treated them all with coffee, firſt ſetting the example by drinking it himſelf, and then diſmiſſed the aſſembly without uttering another word. By this prudent conduct, the public peace was reſtored; and coffee continued to be drank at Grand Cairo without further moleſtation.

At Conſtantinople it had to encounter political, as well as religious, oppoſition. Religion, as uſual, took the lead. The derviſes had the ſagacity to diſcover, that coffee, when roaſted, has become a kind of coal; they, therefore, declaimed againſt it with fury, coal being one of the ſubſtances which their prophet declared not intended by God for human food. The muſti was of their party, and the coffee-houſes were ſoon ſhut up. A more ſenſible muſti ſucceeded, who aſſured the faithful, that roaſted coffee is not coal, and they were again opened. But, though religious ſuperſtition thus eaſily gave way to the ſeductive influence of ſenſitive enjoyment, a ſubmiſſion not at all uncommon, the political objections were not ſo readily ſilenced. The ever-trembling apprehenſions of a deſpotic government found, or fancied that they found, in the public coffee-houſes, receptacles for the diſaffected, and nurſeries of ſedition. Theſe dangerous places of reſort were, conſequently, always regarded with a jealous eye; and, after ſeveral viciſſitudes of connivance and diſcouragement, were at length finally prohibited. But they were not deemed formidable beyond the precincts of Conſtantinople. They were of too much importance to the public revenue to be entirely ſuppreſſed, and were ſuffered to remain, without much reſtraint, in all other parts of the empire. Nor in the capital itſelf was the uſe of coffee in private families at all diſcouraged; ſcruples of conſcience were no longer excited againſt it; and it has ever ſince been allowed to all ranks of men, with the full permiſſion both of the muſti and of the civil government. The Turks have now a particular officer, whom they call *Kahveghi*, or inſpector of coffee; and in the ſeraglio there are ſeveral Kahveghis, each of whom preſides over twenty or thirty Battagis, who are ſolely employed in preparing this favourite liquor for the inhabitants. A refuſal to ſupply a wife with coffee, is even ſaid to be reckoned among the legal cauſes of a divorce.

The firſt mention of coffee in the weſt of Europe is by Rauwolff, a German traveller, who returned from Syria in 1573. The tree was particularly deſcribed in 1591 by Proſper Alpinus in his "Medicina Ægyptiorum," and alſo in his "Hiſtory of Ægyptian Plants," printed at Venice in 1592. Its uſe, as a beverage, is noticed by two Engliſh travellers in the beginning of the 17th century; Biddulph about 1603, and William Finch in 1607. The former ſays, "The Turks have for their moſt common drink coffee; which is a black kind of drink, made of a kind of pulſe, like peaſe, called *coava*." The latter, "The people in the iſland of Socotora have, for their beſt entertainment, a China diſh of cobo, a black bitteriſh drink, made of a berry like a bay-berry brought from Mecca, ſupped off hot." Pietro della Valle, a Venetian, tells his friend in a letter written from Conſtantinople in 1615, that, upon his return, he ſhould bring with him ſome coffee, which, he believed, was a thing unknown in his country. In France, it was introduced firſt at Marſeilles, in the year 1644, by ſome gentlemen who accompanied Monſ. de la Haye to Conſtantinople, and brought with them on their return, not only ſome coffee, but the proper apparatus and veſſels for making and drinking it. In 1660, ſeveral bales were imported from Egypt: and in 1671, a coffee-houſe was opened at Marſeilles, in the neighbourhood of the exchange, where people met to ſmoke, talk of buſineſs, and divert themſelves with play. It was firſt brought to Paris in 1657, by the celebrated traveller Thevenot; but only in a ſmall quantity, and conſequently was confined to his own family and particular friends. By the public at large it was never ſeen, and ſcarcely heard of, but from the account of travellers. In 1669, it was more generally introduced by Soliman Aga, ambaſſador from the ſultan Mahomet IV.: and in 1672, a public coffee-houſe was opened by an Armenian, called Paſcal, who afterwards removed to London. But the uſe of coffee had been introduced in the Engliſh capital before the return of Thevenot from the Eaſt. For, in 1652, Daniel Edwards, a Turkiſh merchant, brought home with him a Greek ſervant, whoſe name was Paſqua, who underſtood the method of roaſting and making it. This ſervant was the firſt that publicly ſold coffee, and kept a houſe for that purpoſe in George Yard, Lombard-ſtreet. The firſt mention of coffee in our ſtatute books is anno 1660 (12 Car. II. cap. 24.) when a duty of four-pence was laid upon every gallon of coffee made and ſold, to be paid by the maker. In 1663, it was ordered, by a particular ſtatute, that all coffee-houſes ſhould be licenſed at the general quarter ſeſſions of peace for the county. And in 1675, Charles II. iſſued a proclamation to ſhut them up as ſeminaries of ſedition; but in a few days the proclamation was abrogated by a ſecond. Since that time coffee is often mentioned in our ſtatute books, but only with a view to the regulation of the duties. Ray, in his "Hiſtory of Plants," publiſhed in 1688, ſuppoſes that there were then in London as many coffee-houſes as in Grand Cairo itſelf, and that ſimilar houſes were to be met with in all the principal cities and towns in England. At the ſame time he expreſſes his ſurprize that the neighbouring countries ſhould permit ſo rich a treaſure to be confined to a ſingle province, and wonders what watchful dragon is employed by the natives to prevent ſtrangers from procuring either the plant itſelf or its recent ſeeds; which, he doubts not, would readily grow in a ſimilar climate and ſoil to the great advantage of the cultivator. It cannot be imagined that the enterpriſing commercial nations of Weſtern Europe, which have formed colonies in the tropical regions, would be inattentive to the value of ſuch an acquiſition. The Dutch were the firſt who made the attempt with ſucceſs. We are informed by Boerhaave, in his "Index to the Leyden Garden," that Nicholas Witſen, burgomaſter of Amſterdam, and governor of the Eaſt India company, inſtructed Van Hoorn, governor of Batavia, to procure from Mocha, in Arabia Felix, ſome berries of the coffee-tree to be ſown at Batavia. This was accordingly done, and about 1690, many plants were raiſed from ſeeds, one of which was ſent to the garden at Amſterdam, where it bore fruit, and in a ſhort time many other plants were raiſed from it. In the year 1714, the magiſtrates of Amſterdam ſent to Lewis XIV. a fine tree about five feet high, in full foliage, with both green and ripe fruit. This plant is ſaid by Du Tour to have been the parent of all that have ſince been cultivated in France and in the French Weſt India-iſlands. In 1717, ſeveral plants were ſent to Martinico, under the care of M. de Clieux, who approved himſelf worthy of the truſt. For the voyage being long, and the weather unfavourable, they all died but one; and the whole ſhip's company being at length reduced to ſhort allowance of water, this zealous patriot divided his own ſhare between himſelf and the plant committed to his charge, and happily ſucceeded in bringing it ſafe to Martinico, where it flouriſhed, and afforded a ſtock for the neighbouring iſlands. In 1718, the Dutch colony at Surinam firſt began to plant coffee; and, in 1722, the French governor of Cayenne, having buſineſs at Surinam, contrived by an artifice to bring away a plant, which, in the year 1725, had produced many thouſands. In the year 1732, coffee was cultivated in Jamaica, and an act paſſed to encourage its growth in that iſland.

It is well known that the Arabian coffee is univerſally allowed to be better in quality, and conſequently bears a higher price than that which is raiſed in any of the European colonies. The reaſons that have been aſſigned for this difference may be reduced to five: 1. Difference of climate and ſoil. That part of Arabia where the coffee tree is cultivated is rocky, dry, and hot. At Batavia the ſoil is rich and deep; and in the rainy periods the quantity of wet that falls is exceſſive. Hence it is probable that the plant had in ſome meaſure degenerated before it arrived in Europe. Nor was it likely to be improved by its removal to the Weſt Indies, where it is generally cultivated on the richeſt ground. For though the planters know by experience that coffee grown in a light ſoil, and on dry and elevated ſlopes, ſuch as are choſen for it in Arabia, has a ſmaller berry, with a delicate flavour; while that which is produced in a low, fertile, and moiſt ſoil, has a larger berry, but comparatively flat and inſipid: yet, as they alſo learn from experience, that the trees in this rich ſoil commonly yield from twelve to ſixteen ounces per plant; while thoſe in the drier ſoils will ſcarcely furniſh more than from ſix to eight ounces, making a difference of one half in the weight; and as in all the European markets the ſtated difference in the price of each is only from 15 to 20 per cent. it is evidently their intereſt to raiſe their coffee in the richeſt ſoil, notwithſtanding the deterioration in the quality of the berry, which is the neceſſary conſequence. 2. The cuſtom of pollarding the trees, which is univerſal in almoſt all the French iſlands. The branches are obliged by this operation to take more of a lateral direction, in conſequence of which they grow thicker, and afford leſs acceſs to the rays of the ſun; they are alſo apt to become decumbent, and more expoſed to the moiſt evaporations of the ſoil: and hence, as Du Tour imagines, the berries are ſeldom perfectly ripened. 3. Gathering the fruit before it is perfectly ripe, and not drying it in a proper manner. In Arabia the coffee berries are not gathered till they readily fall off on ſhaking the tree, when they are received on linen ſheets ſpread for the purpoſe, and are then removed to a ſituation where they can be completely dried in the ſhade on mats, which are fitted to imbibe their moiſture. But in the Weſt Indies this cannot be effected, for though the air in thoſe climates is hot, it is always ſo damp, that coffee could never be dried in the ſhade, ſufficiently for exportation to Europe. The rains, moreover, which are then very frequent, often make the berries fall before they are perfectly ripe. Du Tour recommends the drying of them in ſtoves. The method of curing coffee in the Weſt Indies, as it is deſcribed by Dr. Titford of Spaniſh-town, Jamaica, (ſee the 9th volume of the Tranſactions of the Society of Arts, &c.) is as follows: They bring the coffee-berries, after they are ripened on the trees, to a machine called a peeling-mill, where it is diveſted of its outer ſkin and pulp: after which it is put in heaps, and undergoes a ſlight fermentation, which is then ſpread out and dried on platforms or terraces, until it is perfectly cured, when it is ſtored till the whole crop is got in. When this work is completed, they begin to prepare it for market, by again putting it in the ſun, and carrying it to the peeling and winnowing-mills, where it is totally diveſted of its coats and impurities, and the broken and bad coffee picked out, &c.; after which it is fit for market. The ſmall and needy planters, however, who have no mills, beat out their coffee in large wooden mortars, or troughs, which occaſion a waſte by breaking the berry. When any coffee is kept for private uſe, or iſland conſumption, it does not undergo the above proceſſes; but the ripe fruit, as it is picked from the tree, is ſpread out in the ſun, and ſimply well dried, and beat out as it is wanted for uſe or ſale. Coffee is well known to improve, when ſo preſerved, by drying it in the berry; but to be impaired, when it is diveſted of its coverings, as it is now ſent to market. Dr. Titford, therefore, recommends its being ſent home, in the whole berry, well dried. One advantage attending this mode is the ſaving of the labour to the negro, and conſequent expence to the planter; and another is the prevention of the coffee's imbibing the ill flavour of ſugar, rum, pimento, &c. which may be ſhipped with it, and which, it is ſaid, is the principal objection to the uſe of the Weſt India coffee in England. 4. Want of proper care in ſtowing them for the voyage. If they come in a ſhip with raw ſugars and rum, they are ſure to contract a taſte which cannot be driven off by the ſubſequent roaſting. The French are in this reſpect much more attentive than the Engliſh, and, in conſequence, their coffee, eſpecially that from the Windward iſlands, is commonly better. This ſuperiority is the effect of peculiar circumſtances. Moſt of the Engliſh ſhips are hired for the freight; the captains ſtow the goods as they receive them, and the owners are ſatisfied, if the veſſel is but well filled. The French ſhips are generally laden for the proprietor's own uſe; the captains buy the goods themſelves; and that they may be able to give a good account of their management, they are obliged to pay great attention to the ſtowage of their veſſel, and the preſervation of their cargoes. 5. Uſing the coffee-berries too ſoon. Dr. Browne aſſerts, that the worſt coffee produced in America will, in a courſe of years, not exceeding fourteen or fifteen, be as good, parch and mix as well, and have as high a flavour, as the beſt we now have from Turkey, if kept in a dry place, and properly preſerved; and that ſmall-grained coffee, or that which is raiſed in a dry ſoil and warm ſituation, will, in about three years, be as good as that which is now uſed in the London coffee-houſes. Du Tour, on the other hand, aſſerts, that whether it be old or new is of little importance, provided it have been gathered when fully ripe, and have loſt all its vegetable juices. He is, moreover, of opinion that, *cæteris paribus*, it is always beſt when new; and aſſures us that he has drank in St. Domingo the coffee of that country made of berries gathered only ſix weeks before, which was not worſe, if not better, than Mocha coffee that was three years old. It is true, he adds, that he gathered the berries himſelf when they were juſt ready to fall, deprived them immediately of their pulp, dried the ſeeds in the ſun as ſpeedily as poſſible, and roaſted them when they ceaſed to diminiſh in ſize, and when he could ſcarcely break them with his teeth. In all other reſpects he treated the two kinds of coffee in the ſame manner, and made uſe of them in equal proportions.

Thus, in the courſe of three centuries and a half, has a berry, which was not before known as an article of food, except to ſome ſavage tribes in the confines of Abyſſinia, made its way through the whole civilized world. In the nations which profeſs the religion of Mahomet, it is drunk at leaſt twice a day by all ranks of men, from the ſultan and mufti to the artificer and the peaſant. Among the profeſſors of Chriſtianity, by whom it has been known little more than a century and a half, it is ſtill regarded rather as a luxury, and is uſed only by the middle and upper claſſes. In England, indeed, tea is moſt generally preferred; but on the continent, eſpecially in France, coffee is in univerſal requeſt. In conſequence of this prevailing faſhion, the tree which produces it is now extenſively cultivated in the tropical climates of both hemiſpheres. Of Arabia Felix it may be reckoned the moſt valuable produce. The Dutch, as we have ſeen, early introduced it into the iſland of Java, and ſoon after into Ceylon. The Engliſh have plantations of it about Madras; the French once had at Pondicherry, and ſtill raiſe it in great quantities in the Iſles of France and of Bourbon. In America it is cultivated by the coloniſts of theſe three maritime powers, and in ſome degree by the Spaniards. It is not poſſible to procure an accurate account of the quantity that is raiſed and conſumed; but ſome idea may be formed from the following partial details.

	Pounds Weight.	
Arabia furniſhes annually to the European companies	1,500,000	
———— Perſians	3,500 000	
———— fleet from Suez	6,500,000	
———— to Hindooſtan, the Maldives, and the Arabian colonies on the coaſt of Africa	50,000	
———— to the Caravans	1,000,000	
Total	12,550,000	Raynal.
Surinam exported in 1775	15,387,000	Do.
Martinico	9,688,960	Do.
Guadaloupe	6,302,902	Do.
Cayenne	65,888	Do.
St. Domingo exported in 1767	12,197,977	Do.
———— in 1775	45,933,941	Do.
———— immediately before the French revolution	71,663,187	Edwards.
St. Lucia in 1752	about 5,000,000	Raynal.
Porto Rico in 1778	1,116,325	Do.
Grenada in 1776	1,827,166	Edwards.
———— in 1787	987,004	Do.
St. Vincent in 1787	71,041	Do.
Dominica in 1787	2,032,778	Do.
———— in favourable years	3,000.000	Do.
Jamaica in 1768	420,300	Do.
———— in 1774	650,700	Do.
———— in 1787	716,315	Do.
———— in 1790	1,783,740	Do.

A pound of coffee is generally more than the produce of a ſingle tree; but vigorous trees of a proper age ſometimes produce four pounds or more; and at Surinam ſome that were five years old and eighteen feet high, have been known to produce even ſeven pounds.

The Arabians and Turks drink their coffee very hot, and without ſugar. People of the firſt faſhion uſe only what is called ſultana coffee, made of the dried pulp of the berry. This pulp, after it has been bruiſed, is put into an iron or earthen pan, placed on a charcoal fire, and ſtirred about till it becomes a little brown, but not of ſo deep a colour as the common coffee; it is then thrown into boiling water, with the addition of at leaſt a fourth part of the membranous huſk or aril of the ſeeds, commonly called, in the Weſt Indies, the parchment. The whole is boiled together in the manner of common coffee. The ſeeds are thought by the Arabians to be too heating; the common people, therefore, generally uſe a weak liquor made of the membranous huſks alone. Theſe, as well as the pulpy part, are carefully taken off from all the coffee that is ſent to the weſt of Europe, and the ſeeds, becoming dry, ſoon loſe their vegetative life. The excellence of our coffee depends in a great meaſure on the ſkill and attention employed in the roaſting; if done too little, it has little flavour, and lies heavy on the ſtomach; if too much, it becomes acrid, acquires a diſagreeable burnt taſte, and is rendered pernicious, or at leaſt, is deprived of its beſt qualities; whereas, according to Du Tour, the action of fire, when nicely regulated, takes away its rawneſs, and the aqueous part of its mucilage, deprives it of its ſaline qualities, and gives it that empyreumatic ſcent, which is ſo pleaſant and refreſhing, and which is ſomewhat ſimilar, but greatly ſuperior, to that produced by broiling meat on a gridiron.

In England the ſeeds are commonly roaſted in a cylindrical tin box, perforated with numerous holes, and fixed upon a ſpit which runs longitudinally through the centre, and is turned by means of a jack. The whole is ſuſpended over a large charcoal fire in a ſemicircular hearth; or, as in Yorkſhire, placed directly in front of the large kitchen fire, and taken off occaſionally, that the berries may be ſhaken and preſerved from burning. When the oil riſes, and the ſeeds have a dark brown colour, it is emptied into receivers made with large hoops, and with iron plates at the bottom ; there the coffee is again ſhaken and left to cool. If it look bright and oily, it is a ſign that it is well done. In Perſia boiling water is frequently poured upon the entire ſeeds, which makes a weak, but agreeable infuſion. And in Europe ſome are of opinion that the coffee has a more delicate flavour when the ſeeds have only been bruiſed or pounded in a mortar; but the common method is to grind it in a mill to a fine powder. It is generally allowed that it is much the beſt when it has been recently roaſted. The powdered coffee is ſometimes put into a linen bag or ſtrainer, ſuſpended at the mouth of a coffee-can, or as it is called in the north of England, a coffee-biggin: boiling water is then poured upon it, till the can is ſo full as to keep the ſtrainer completely immerſed in the hot water. When it has ſtood a ſufficient time, the liquor is conveyed through the ſpout of the can, clear of the coffee grounds. This is pronounced by Du Tour to be a good method. But, in his opinion, the following is much better. Let the powder be poured into a coffee-pot filled with boiling water in the proportion of two ounces and a half to two pounds, or two Engliſh pints of water: let the mixture be ſtirred with a ſpoon, and the coffee-pot be ſoon taken off the fire, but ſuffered to remain cloſely ſhut, for at leaſt two hours on the warm aſhes. During the infuſion, the liquor ſhould be ſeveral times agitated by a chocolate frother, or ſomething of the ſame kind, and be finally left for about a quarter of an hour to ſettle. Coffee thus prepared, adds the experienced French naturaliſt, is perfect. In France coffee is almoſt univerſally made ſtronger than in England. The Engliſh, ſays a lively French traveller, care little about the quality of their coffee, if they can but get enough of it. Dr. Fothergil recommends the following method of making it for breakfaſt: Let it be made in the uſual manner, only a third part ſtronger than uſual, and let as much boiling milk be added to it before it is taken from the fire, as there is water. When it has ſettled, drink it either with cream or without, but with very little ſugar, which is apt to make it become acid on weak ſtomachs. Our Engliſh phyſician was of opinion, that if our poor and middling people were able to procure this, it would be much more nouriſhing and beneficial than the wretched beverage of ordinary tea, in which they now indulge themſelves.

In none of the ſtates of Chriſtendom was the uſe of coffee oppoſed by religious fanaticiſm; nor had it to encounter political jealouſy, except for a few days in the reign of our Charles II. But, like every other ſubject which has occupied the human mind, it could not fail to occaſion a difference of opinion. Among the profeſſors of medicine in particular, it met with aſſailants and abettors. The Theſis, entitled *Potus Coffeæ*, delivered by a Swediſh ſtudent in the univerſity of Upſal, and publiſhed in the "Amænitates Academicæ" under the direction of Linnæus himſelf, is a ſarcaſtic entertaining invective againſt the introduction of this novel luxury, which the patriotic youth apprehended would vitiate the native taſte, and debauch the ſimple manners of his countrymen. He accordingly inveighs againſt it with an honeſt indignation, as one of the pernicious irrational indulgences which had been imported into Sweden from degenerate France ; and gives a ludicrous liſt of the expenſive utenſils required for its uſe in that faſhionable ſtyle which the vanity of his fair country women would not permit them to forego ; and enumerates, with ſomewhat of a triumphant ſatisfaction, the numerous bodily diſorders, which it has been known, or is likely to generate. Nor is it without ſome reluctance that he acknowledges its beneficial effects in a few particular caſes. Others, on the contrary, are as vehement in its praiſe. If we may believe Du Tour, it baniſhes languor and anxiety, gives thoſe who drink it a pleaſing ſenſation of their own well-being, and diffuſes through their whole frame a vivifying delightful warmth ; it is alſo highly favourable to the ſocial virtues, promotes cheerful converſation, ſharpens the capacity for witty repartee, ſmooths the wrinkled brow, and is ſometimes able to convert enemies into friends. Did it certainly poſſeſs the latter property, who would not devoutly wiſh that Napoleon and all the other monarchs of Europe, without inquiring whether they have acquired their crowns by uſurpation or by legal hereditary ſucceſſion, would meet once a year, each accompanied by his prime miniſter, and take an exhilarating cup of coffee together? How in that caſe would they ſmile upon each other, and in what good humour would they return to their reſpective palaces, to diſcharge, with benevolent faithfulneſs, the important duties of their elevated ſtation! But to deſcend from theſe extravagancies of cenſure and panegyric, the truth ſeems to be, that coffee, like tea, has different effects upon different conſtitutions, and that phyſicians are inclined to recommend or diſparage the one or the other, as it happens to agree or to diſagree with their own. Dr. Fothergil did not venture to decide which of the two is abſolutely the beſt. From his perſonal experience he preferred coffee ; but obſerves that neither of them afford any material ſupport, and that they are rather the vehicles of nouriſhment than nutritious of themſelves. The complaints ſaid to have been produced by the frequent or exceſſive uſe of coffee are habitual head-achs, vertigo, tremors, maſculine imbecility, pimples of the face, weakened viſion, and according to profeſſor Murray, apoplexy. It has alſo been ſuſpected of producing palſies, and Dr. Percival aſſures us, from his own obſervation, that the ſuſpicion is not altogether without foundation. As it produces or aggravates hyſterical and hypochondriacal affections, Tiſſot cautions literary and ſedentary people againſt its uſe. To thoſe, however, who are inclined to trim the midnight lamp, it cannot but be acceptable : but they will perhaps do well to uſe it rather as an occaſional refreſhment than a regular beverage. Coffee, ſays Dr. Percival, is ſlightly aſtringent and antiſeptic ; it moderates alimentary fermentation, and is powerfully ſedative. Its action on the nervous ſyſtem probably depends upon the oil which it contains, which receives its flavour, and is rendered mildly empyreumatic by the proceſs of roaſting. Its medicinal qualities ſeem to be derived from the grateful ſenſation it produces on the ſtomach, and from the ſedative powers it exerts on the *vis vitæ*. Hence it aſſiſts digeſtion, and relieves the head-ach; but in delicate habits, it often occaſions watchfulneſs, tremors, and many of thoſe complaints which are denominated nervous. Dr. Fothergil thought the French practice of drinking coffee immediately after dinner, with a view to promote digeſtion, much better than our cuſtom of taking it later in the evening ; and that at any rate it is a deſirable ſubſtitute for the bottle, which, in England and the northern parts of Europe, detains the gentlemen at the dinner-table ſo long after the cloth is drawn, to the prejudice of their health, and ſometimes to the injury of their fortunes. (See Ellis's Hiſtory of Coffee. The abbé Raynal's Hiſtory of European Settlements: French Edition of 1780. Bruce's Travels in Abyſſinia. Edwards's Hiſtory of the Britiſh Weſt India Iſlands. Woodville's Medical Botany. Du Tour in Nouveaux Dictionaire d'Hiſtorie Naturelle, and Dictionaire Encyclopedie Methodique, Agriculture, under the word Caffayer).

By 43 G. III. c. 68. all former duties of cuſtoms on coffee are repealed, and the following new duties impoſed: For that which is the produce of any Britiſh colony or plantation in America, or of any other country or place, on importation, to be ſecured in warehouſes, 6*d.* per cwt.; and when taken out of ſuch warehouſes for home conſumption, 5*d.* per lb. By 43 G. III. c. 69. all former duties of exciſe are in like manner repealed, and in lieu of them the following are impoſed: For every lb. weight avoirdupoiſe of coffee, of the growth or produce of any Britiſh colony or plantation in America, imported into Great Britain, 1*s.* 1*d.*; for the ſame, if imported by the Eaſt India Company, 1*s.* 6*d*; and for the ſame of all other coffee imported into Great Britain, 2*s.* No coffee ſhall be imported into Great Britain otherwiſe than in cheſts, caſes, or packages, containing at leaſt 112 lb., on pain of forfeiting the ſame; and none other ſhall be entered for exportation. 5 G. III. c. 43. 23 G. III. c. 79. 42 G. III. c. 93. Officers of the exciſe and cuſtoms may go on board ſhips, ſearch, and ſeize. 11 G. III. c. 80. By 5 G. III. c. 43. if any veſſel, coming from foreign parts, having on board 20 lbs. of coffee, ſhall be found at anchor, or hovering within two leagues of the ſhore, the coffee ſhall be forfeited, and the veſſel, &c. be alſo forfeited, provided ſuch veſſel doth not exceed the burden of 50 tons. By 35 G. III. c. 118. the commiſſioners of exciſe ſhall provide near to the reſpective ports warehouſes for lodging coffee and cocoa-nuts: and officers of exciſe ſhall mark every caſk or package of theſe articles on board of ſhips importing them: and if they are ſhipped before they are marked, they ſhall be forfeited and ſeized. When they are taken out of warehouſes, the proprietor ſhall give written notice to the officers, if for home conſumption one hour, if for exportation 1½ hours; bring them to be weighed, and pay the duty. On producing a certificate of the payment of the duties, a permit for the removal of them ſhall be granted. The importer, within 30 days after the entry of the veſſel, ſhall enter the coffee, cocoa-nuts, &c. with the officer of exciſe appointed for this purpoſe; and the ſame ſhall be landed or warehouſed, on paying or ſecuring the duties. In default of ſuch entry, the ſame ſhall be deemed clandeſtinely run, and forfeited. 10 G. c. 10. 5 G. III. c. 43. Coffee, &c. not removed, and delivered within the time, ſpecified in the permit, ſhall be deemed as removed without permit. Coffee, and alſo tea, intended to be taken out for exportation, ſhall be delivered on ſecurity given that they ſhall be exported, and not relanded; which ſecurity ſhall be diſcharged, on a certificate under the common ſeal of the chief magiſtrate beyond the ſeas, or under the hands and ſeals of two known Britiſh merchants there, that the ſame were landed, or on proof by credible perſons, that they were taken by enemies, or periſhed in the ſeas. 10 G. c. 10. By 21 G. III. c. 55. no damaged coffee, which cannot be ſold for 1*s.* 6*d.* a pound, nor cocoa-nuts for 1*s.* a pound, ſhall be ſold to be conſumed in this kingdom, but ſecured in warehouſes, and not taken out till ſecurity be given for the exportation of them. Officers of exciſe ſeizing forfeited coffee, &c. ſhall be allowed one-third of the clear ſum that ſhall ariſe from the ſale after condemnation, &c. 21 G. III. c. 55. Every perſon keeping a public-houſe, ſhop, &c. for ſelling of brandy and other ſpirituous liquors, who ſhall have in his cuſtody coffee, tea, chocolate, or cocoa-nuts above 6 lbs. weight, ſhall be deemed a dealer in ſuch articles. 11 G. c. 30. By 20 G. III. c. 35. no perſon ſhall ſell any coffee, &c. without a licence; for which he ſhall pay (by 43 G. III. c. 69.) 5*s.* 6*d.* to be annually renewed: and ſelling without ſuch licence, incurs a forfeiture of 20*l.* Houſes of manufacturing and ſale are to be entered at the office for the diviſion on pain of forfeiting 200*l.* and the goods, &c. 10 G. c. 10. Every houſe, in which coffee, tea, cocoa-nuts, or chocolate ſhall be ſold, muſt have an inſcription over the door, "dealer in coffee, tea, &c." on pain of 200*l.* And perſons buying any of the ſaid articles of a perſon not having ſuch inſcription over his door, ſhall forfeit 100*l.* Perſons having ſuch inſcription without entry of their houſes, ſhall forfeit 50*l.* over and above the penalties for ſelling or dealing without entry. 19 G. III. c. 69. Officers may enter houſes, &c. where ſuch articles are ſold, to ſurvey and weigh, and in weighing, be aſſiſted by the owner, who ſhall keep juſt weights and ſcales, on pain of 100*l.* and forfeiture of the ſame. 10 G. c. 10. 10 G. III. c. 44. 28 G. III. c. 37. Deceiving or obſtructing the officer incurs a forfeiture of 100*l.* 26 G. III. c. 77. If any perſon ſhall obſtruct an officer ſearching for goods ſuppoſed to be concealed, he ſhall forfeit 100*l.*; and the ſeller or dealer concealing the ſaid articles, ſhall forfeit the ſame, and treble value, with package, &c.; and the obſtruction of an officer in ſeizing or removing the ſaid goods incurs a forfeiture of 50*l.* 10 G. c. 10. No perſon ſhall mix with coffee, any butter or other materials, to increaſe the weight, and knowingly buy, or ſell any ſo mixed, under forfeiture of 100*l.* 11 G. c. 30. Roaſting houſes ſhall be appointed by the commiſſioners, with proper officers and perſons ſkilled in roaſting, and perſons having paid the duties may have their coffee berries roaſted for 8*s.* per. cwt.; or the ſellers and dealers may find their own roaſters, paying 3*s.* per cwt. By 48 G. III. c. 129. if any article, made to reſemble coffee or cocoa, be found in the poſſeſſion of any dealer, or called by him Engliſh or Britiſh coffee, &c. it ſhall be forfeited, and the dealer ſhall forfeit 100*l.* All ſellers and dealers of coffee, &c. ſhall keep a daily account of all coffee, tea, chocolate, and cocoa-nuts ſold in ſmall quantities under 6 lbs.; and alſo an account of each parcel above 6 lbs. ſold in each day, in books prepared by the commiſſioners, to be returned to the officer upon oath of the truth of the entries: and neglect of doing the ſame ſhall incur a forfeiture of 100*l.* 10 G. c. 10. The commiſſioners ſhall cauſe all coffee and tea ſeized in London and condemned, to be ſold there; and if ſeized elſewhere, they ſhall cauſe it, after condemnation, to be brought and ſold in London; or, after having been valued by ſworn valuers, they may be ſold where the commiſſioners ſhall think proper. 12 G. c. 28.

COFFEE-*Berries*, in *Natural Hiſtory*. Theſe are figured pyritæ found in the cliff of Shepey iſland, and thought to reſemble the berries of the coffee-tree in their external form, by Mr. Jacob, who publiſhed an account thereof at the end of his "Plantæ Faverſhamenſes."

COFFER, a long ſquare box about three feet long, and one and a half broad, uſed for breaking in pieces tin ore in a ſtamping-mill.

COFFER, *Capſa*, in *Architecture*, a ſquare depreſſure, or ſinking, in each interval between the modillions of the Corinthian cornice; originally filled up with a roſe, ſometimes with a pomgranate, or other enrichment.

Theſe ſinkings, called alſo *panels*, are of different figures in the compartments of vaults and ſoffits.

COFFER, in French *Coffre*, in *Fortification*, a hollow lodgment, or little ditch made in the great ditch when it is dry, and has no fauſſe-bray. Coffers are made oppoſite to or before the flanks of the baſtions, are from 15 to 20 feet wide, from ſix to ſeven feet deep, and are covered with planks and earth raiſed about two feet higher than the level of the bottom of the ditch, after the manner of a parapet, in order to have embraſures in them for ſmall pieces of artillery to defend the faces of the oppoſite baſtions, and to prevent the paſſing of the ditch. Inſtead of coffers, caponiers are frequently made acroſs the ditch, oppoſite to the middles of the tenailles or curtains, which are lodgments four or five feet deep, having on each ſide a paliſaded parapet about three feet high, as a double covered way, to cover the muſqueteers lodged in it, who fire through the meurtrieres, and paſs through ſuch caponiers to get to the outworks. Theſe are alſo made often upon the *glacis* of the *eſplanade*, to repel the enemy when he endeavours to take the covered way. Coffers are of uſe only to the beſieged. The chamber of a mine is alſo called *coffre*.

COFFER, *Coffre a feu*, conſiſts of ſeveral coffers filled with fire-works, and other combuſtible materials, which they conceal in places, by which they ſuppoſe or ſuſpect the enemy will ſend ſome ſoldiers to attempt an enterpriſe. They ſet fire to it by means of a train of powder, or by a ſauciſſon.

COFFER *of a horſe*, denotes the hollow formed by the contour of the ribs. See HORSE.

COFFER, or *Cradle*, in *Inland Navigation*, denotes a large wooden trunk or veſſel open at top, with moveable ends, large enough to receive a barge or veſſel from a canal, in order to its being hoiſted into a higher pound of a canal, or let down from it. See ſubſtitutes for locks in our article CANAL. See CANAL and LOCK.

COFFER-DAM, a term in *Engineery* for a circular double range of piles, with clay rammed between, formed round any entrance lock to a dock, baſon, or canal, where the ſame cannot otherwiſe be laid dry for digging out and building the foundations. See our articles CANAL and LOCK.

COFFER-DAM, *Batardeau*, Fr.; an encloſure uſed in laying the foundations of bridges and other aquatic buildings. The earlieſt mention of coffer-dams occurs in the writings of Alberti, cap. 6. lib. 2. "Make," ſays he, "the foundations of your piers in autumn when the water is loweſt, having firſt raiſed an encloſure to keep off the water, which may be done in this manner. Drive in a double row of ſtakes, very cloſe and thick ſet, with their heads above the top of the water like a trench; then put hurdles within this double row of ſtakes, cloſe to that ſide of the row which is next to the intended pier, and fill up the hollow between the two rows with ruſhes and mud, ramming them together ſo hard that no water can get through; then whatever you find within the encloſure, water, mud, ſand, or whatever elſe is a hindrance to you, throw them out, and dig till you come to a ſolid foundation." This method recommended by Alberti, will anſwer for ſhallow water, but the coffer-dams in deep and rapid rivers muſt be conſtructed with four or ſix rows of ſtrong piles connected together with ties, to form a frame-work of timber, and covered on each ſide with a ſheeting of planks; then the interſtices of the frame are to be filled in with clay or chalk carefully rammed to make the whole ſtaunch.

COFFERER *of the King's Houſehold*, a principal officer in the court, next under the comptroller; who, in the compting-houſe, and elſewhere at other times, has a ſpecial charge and overſight of other officers of the houſe, for their good demeanour and carriage in their offices; to all whom he pays the wages. See HOUSEHOLD.

COFFIN, in a general ſenſe, a wooden box or trunk, into which the bodies of dead perſons are put, in order for burial.

Coffins, at various periods, have been made of very different materials. Coffins formed of a ſingle ſtone, hollowed with a chiſſel, are attributed by Mr. Gough to the Romans. They were ſometimes of marble. Some of them contained two or more bodies, others only one; in which caſe it was not unuſual for them to be made to fit the body, with cavities for the reception of the head, arms, and other protuberances. The ſolid ſtone, or marble coffin, often curiouſly wrought, was in uſe among the firſt Chriſtians in England; who, in all probability, copied the cuſtoms of the Romans, after the conquerors had quitted our iſland. The coffin, called "kiſtvaen," found among ancient relics in this kingdom, was compoſed of rough ſtones, ſet edgeways at the ſides and ends, and covered with one or more flat ſtones. Sometimes the ſtones were cemented together ſo that the joints were not diſcernible, and ſometimes they were compoſed of baked clay or tiles. The leaden coffin was in uſe among the Romans, not only for the reception of the body, but, in many inſtances, for the aſhes and bones. It was adopted by the Chriſtians, and continues in frequent uſe to the preſent time, eſpecially among the more opulent. However, lead was not the only metal uſed for coffins. Alexander was buried in a golden coffin by his ſucceſſor Ptolemy; and Mr. Gough ſays, that glaſs coffins have been found in England. The moſt ancient inſtance of wooden coffins on record among us, is that of king Arthur, who was buried in an entire trunk of oak, hollowed. The monk of Glaſtonbury calls it "Sarcophagus ligneus." On this ſubject ſee Gough's Sepulchral Monuments in Great Britain, part i. fol. 1786.

The great improvements which took place in the caſting of iron about 20 or 30 years ago, enabling large articles to be run much thinner than before, ſuggeſted the introduction of caſt-iron coffins; theſe were caſt at ſome of the Yorkſhire founderies, of different ſizes, extremely thin, and ſo apportioned, that they packed one within another, after the manner of neſts of pill-boxes, for the convenience of carriage. From not having heard of theſe iron coffins of late, we apprehend that they were not found to anſwer in point of expence. The increaſing practice of ſtealing dead bodies out of church-yards and burying grounds, for the uſe of the anatomical ſchools, and lecture rooms of the metropolis, having excited the alarms of a great number of perſons, on the 5th of July, 1796, Mr. Gabriel Aughtie took out a patent for an improved kind of coffin, which ſhould render the ſtealing of bodies therefrom very difficult, if not impoſſible. Theſe patent coffins are made of wood, in the common way, except that no ſaw-curfs are made in the ſides for facilitating their bending to the ſhape, and by which the ſides of common coffins are ſo much weakened; the inſide of the bottom, ſides, end, and top, are ſecured by iron plating, and with angle pieces, from being cut or forced open; on the under-ſide of the lid are fixed eight double ſpring-catches, and within the top of the ſides, eight braſs ſockets, exactly fitted to the catches, ſo that when the coffin is to be finally cloſed theſe ſpring-catches enter the ſockets, and by ſpringing open when the lid is cloſe put down, they effectually ſecure the lid from being again removed, as no tool or inſtrument can be introduced to contract the ſprings again, and prepare them for being drawn back. Between theſe ſpring-catches the patentee employs ſcrews to further ſecure the lid, ſimilar to thoſe uſed in common, except that each ſcrew head has both halves of it filed away in a bevelled form, and in contrary directions, ſo that the ſcrew-driver has perfect hold for driving or ſcrewing them in, but none for drawing or unſcrewing them again. For further ſecurity, theſe patent ſcrews have their heads let into the lid, and a plug of wood, which matches the grain of the wood in the lid, is fitted in upon them, ſo as to conceal the places of theſe ſcrews.

COFFIN, in the *Manege*, the whole hoof of a horſe's foot, above the coronet; including the coffin-bone, the ſole, and the fruſh.

Coffin *bone*, is a ſmall ſpongy bone, encloſed in the midſt of the hoof, and poſſeſſing the whole form of the foot.

Coffin-*joint*, is that where the leſſer paſtern joins the foot. A ſtrain in this joint occaſions a ſtiffneſs, which can only be removed by bliſtering and firing.

Coffin, *in the Manufacture of China*. See Cassette.

COG, in *Mechanics*. See Mill and Wheel.

COGA, in *Geography*, an iſland of Abyſſinia, in the lake of Dembea.

COGÆONUM, in *Ancient Geography*, the name of a river and of a mountain, placed by Strabo in the country of the Getæ. He ſays, that Zamolxis cuſtomarily reſided on this mountain, and that the Getæ, after having deified him, gave it the epithet of "Sacred."

COGAMUS, a river of Aſia Minor, at the foot of mount Imolus, according to Pliny, l. v. c. 29.

COGARETO, in *Geography*, a town of Italy, in the ſtate of Genoa; 9 miles E.N.E. of Savona.

COGEAD, a lake of North America, 50 miles long, and 10 broad. N. lat. 66°. W. long. 109°.

COGEDUS, or Congedus, in *Ancient Geography*, a river of Spain, in Celtiberia, and in the vicinity of Bilbilis. It is thought to be the preſent "Rio de Codes," which runs into the Xalon.

COGGESHALL, in *Geography*, a town of England, in the county of Eſſex, with a weekly market on Thurſdays; 9½ miles W. of Colcheſter, and 44 N.E. of London.

Coggeshall's *Sliding-rule*, an inſtrument uſed in gauging, ſo called from its inventor. See the deſcription and uſe under Sliding-rule.

COGGIA, or Cocia, in *Geography*, a town of the iſland of Corſica; 6 miles S. of Vico.

COGGLE, or Cog, a ſmall fiſhing-boat upon the coaſts of Yorkſhire; and *cogs (cogones)* are a kind of little ſhips or veſſels uſed in the rivers Ouſe and Humber. Stat. 23 H. VIII. c. 18. *Præparatis* cogonibus, *galles, & aliis navibus, &c.* Mat. Paris, an. 1066. And hence the cogmen, boatmen, and ſeamen, who, after ſhipwreck or loſſes by ſea, travelled and wandered about to defraud the people by begging and ſtealing; until they were reſtrained by divers good laws.

COGHAN, William, in *Biography*, maſter of arts, and bachelor of phyſic (as he calls himſelf in the title to his work), was born in Somerſetſhire, about the middle of the 16th century. He received his academical education at the univerſity of Oxford; was made bachelor of arts, and fellow of Oriel college in 1563, and bachelor in medicine in 1574. The year following he quitted Oxford, having been appointed maſter of the ſchool at Mancheſter, where he alſo practiſed in his profeſſion, to the time of his death, which happened in the year 1607. In the year 1584, he publiſhed "The Haven of Health," chiefly gathered for the comfort of ſtudents, amplified upon five words of Hippocrates, *viz.* "labor, cibus, potio, ſomnus, venus;" whereunto is added, "A Preſervation from the Peſtilence, with a ſhort Cenſure of the late Sickneſs at Oxford." It is a very curious book, full of quotations from the claſſics, recommending temperance and exerciſe, as the beſt preſervatives and reſtorers of health. Towards the end of the volume, he has given a brief hiſtorical account of the ſweating ſickneſs, and of the ſickneſs which happened at Oxford in 1575. "It began," he ſays, "on the ſixth day of July, from which day to the twelfth day of Auguſt next enſuing, there died five hundred and ten perſons, all men and no women." As the author was there at the time, we are obliged to give credit to this ſtrange circumſtance, of which no parallel, as far as we know, is to be found. Coghan alſo publiſhed in 1602, "An Epitome of the familiar Epiſtles, and ſome of the Orations of Cicero," for the uſe, we preſume, of his ſchool. Wood's Athenæ Oxon.

COGHNAWAGA, in *Geography*. See Caghnewaja.

COGITATION, the act or operation of thinking. See Thinking.

COGLIANO, in *Geography*, a town of Naples, in the province of Principato Citra; 13 miles N.N.W. of Cangiano.

COGNABANDA, in *Ancient Geography*, a town of India, on this ſide of the Ganges, according to Ptolemy.

COGNABARA, or Cognandava, a town of India, on this ſide the Ganges. Ptolemy.

COGNAC, in *Geography*, a town of France, and principal place of a diſtrict in the department of the Charente, ſeated on the river Charente, and having a ſub-prefect and a court of juſtice. The town contains 2827, and the canton 11,358 inhabitants. The territory comprehends 235 kiliometres and 19 communes. The whole diſtrict includes 70 communes, 785 kiliometres, and a population amounting to 44,145 perſons. It has four cantons, *viz.* Cognac, Chateauneuf, Jarnae-Charente, and Segonzac. The ſoil is very fertile, and produces in abundance corn, wine, and fruit. It has always been famous for its brandy; and carries on a conſiderable trade not only in brandy, but in wine, both red and white, ſpirit of wine, and linſeed. It has alſo ſome manufactures of earthen ware. Cognac is 7 leagues W. of Angouleſme. N. lat. 45° 42'. W. long. 20° 28'.

Cognac, a town of France, in the department of the Upper Vienne; 20 miles S.E. of Confolent.

COGNATION, in the *Civil Law*, the bond of relation between all the deſcendants of the ſame ſtock, both males and females; by which it is diſtinguiſhed from *agnation*, which only comprehends the deſcendants of the male ſex.

In France, for the ſucceſſion of the crown, they follow *agnation*; in England, Spain, &c. *cognation*; women coming to the ſucceſſion, according to the degree of proximity, in default of males, or their deſcendants from branch to branch.

In the *Roman Law*, the words *cognatio* and *cognati* are alſo taken in a more limited ſenſe; *cognatio* ſignifying only the bond of relation between the deſcendants from the ſame ſtock by women; and *cognati* thoſe between whom there was ſuch a bond of relation ſubſiſting.

COGNE, in *Geography*, a valley of Piedmont, belonging to the biſhop of Aoſta, ſo called from the ſmall river which waters it. The mountains, by which it is ſurrounded, are rich in mines of iron and copper. It contains 13 villages, the chief of which is Cogne; 6 miles diſtant from Aoſta.

COGNI, in *Ancient Geography*, a people of Germany, according to Ptolemy.

Cogni, or Konieh, in *Geography*, a town of Aſiatic Turkey, the capital of Caramania, and the ordinary reſidence of a beglerbeg, ſituated in a beautiful and fertile country. It is very large, and its walls are ſupported by 108 ſquare towers, at the diſtance of 40 paces from each other. It has two conſiderable fauxbourgs, into one of which the caravans and ſtrangers retire. All the inhabitants are Turks, Armenians, Jews, and others, who come hither to trade, and lodge in the khans, where they are ſupplied with all neceſſaries. Cogni is the ſee of a biſhop;

260 miles S.E. of Conſtantinople. N. lat. 38° 13′. E. long. 50° 45′.

COGNIOL, in *Ichthyology*, a name given by ſome to the *ſcomber colias*, a kind of mackarel, rather ſmaller than the common ſort, and which has the body varied with fine green and blue. It is ſuppoſed to be the young of the common mackarel.

COGNISEE, or CONNUSEE, in *Law*, is the perſon to whom a fine of lands, &c. is acknowledged.

COGNISOR, or CONUSOR, is he that paſſeth, or acknowledgeth, a fine of lands and tenements to another. See FINE, and RECOGNIZANCE.

COGNITIVE is ſometimes applied to that faculty or power of the human mind, by which we know any thing, or are enabled to diſtinguiſh truth from falſity.

Latin writers uſe the terms *facultas cognoſcitiva* in the ſame ſenſe.

Hobbes has made uſe of the terms *cognitive* power, for the power of knowing, or conceiving, in contradiſtinction to *motive* power, or appetite.

COGNITIONIBUS *mittendis*, in *Law*, a writ to any of the king's juſtices of the common pleas, who has the power of taking a fine, and who, having taken a fine, defers to certify it, commanding him to certify the ſame.

COGNIZANCE, or COGNISANCE, in *Heraldry*. See CREST.

COGNIZANCE, or CONUSANCE, in *Law*, is the acknowledgement of a fine; or the conceſſion of a thing done. In which ſenſe we ſay *cognoſcens latro, a thief that confeſſes*.

COGNIZANCE is alſo uſed for a power, or juriſdiction. Thus, *cognizance of pleas* denotes an ability to call a plea out of another court; which no one but the king can do, unleſs he can ſhow a particular charter for it. See FRANCHISE.

Before defence made, if at all, cognizance of the ſuit muſt be claimed or demanded; when any perſon or body corporate hath the franchiſe, not only of *holding pleas* within a particular limited juriſdiction, but alſo of the *cognizance of pleas*; and that, either *without* any words excluſive of other courts, which entitle the lord of the franchiſe, whenever any ſuit that belongs to his juriſdiction is commenced in the courts of Weſtminſter to demand cognizance thereof; or *with* ſuch excluſive words, which alſo entitle the defendant to plead to the juriſdiction of the court. 2 Lord Raym. 836. 10 Mod. 126. Upon this claim of cognizance, if allowed, all proceedings ſhall ceaſe in the ſuperior court, and the plaintiff is left at liberty to purſue his remedy in the ſpecial juriſdiction. As, when a ſcholar, or other privileged perſon, of the univerſities of Oxford or Cambridge, is impleaded in the courts at Weſtminſter, for any cauſe of action whatſoever, unleſs upon a queſtion of freehold. In theſe caſes, by the charter of theſe learned bodies, confirmed by act of parliament, the chancellor and vice-chancellor may put in "a claim of cognizance," which, if made in due time and form, and with due proof of the facts alleged, is regularly allowed by the courts. It muſt be demanded, before full defence is made or imparlance prayed; for theſe are a ſubmiſſion to the juriſdiction of the ſuperior court, and the delay is a *laches* in the lord of the franchiſe: and it will not be allowed, if it occaſions a failure of juſtice, or if an action be brought againſt the perſon himſelf, who claims the franchiſe, unleſs he hath alſo a power in ſuch caſe of making another judge. 2 Ventr. 363. Hob. 87. Yearbook, M. 8. Hen. VI. 20. 3 Comm. 298. See *Univerſity* COURT.

COGNIZANCE, notice, power, or juriſdiction. In a *military* ſenſe or acceptation, it denotes the inveſtigation or trial, to which any perſon ſubject to martial law, or any act of his, is liable. During the ſuſpenſion of civil authority, every offence is an object of military cognizance, is ſubject to martial law, and may be proceeded upon according to the ſummary ſpirit and nature of its regulations.—A drum-head court-martial for inſtance.

COGNIZANCE is ſometimes uſed alſo for an audience, or hearing of a matter judicially. In which ſenſe we ſay, *to take cognizance*, &c.

COGNIZANCE, again, is uſed for a badge on a waterman's, or ſervingman's ſleeve, which is commonly the giver's creſt, whereby he is diſcerned to belong to this or that nobleman, or gentleman.

COGNIZANCE, &c. *fine Sur*, &c. See FINE.

COGNIZANCE in *replevin*. See REPLEVIN.

COGNOMEN, in *Roman Antiquity*, a name that was peculiar to ſome family, or more properly to ſome branch of that family. The cognomen, which originally was often a kind of nick-name, or on the contrary an appellation of honour, diſtinguiſhed the different branches of the ſame houſe, "in eadem gente;" as when Livy ſays (l. 9. c. 29.), that the houſe of the Potitii was divided into 12 families. See NAME.

COGNOVIT *actionem*, in *Law*, is where a defendant acknowledges or confeſſes the plaintiff's cauſe againſt him to be juſt and true; and before or after iſſue, ſuffers judgment to be entered againſt him without trial. Here the confeſſion generally extends no farther than to what is contained in the declaration; but if the defendant will confeſs more, he may. 1 Rol. 929. Hob. 178. See JUDGMENT. But frequently the defendant confeſſes one part of the complaint, and traverſes or denies the reſt.

COGOLLA, in *Geography*, a river of Spain, which runs into the Nagarella, in the country of Rioja.

COGOLLUDO, a town of Spain, in New Caſtile; 20 miles W. of Siguença.

COGORETO, or COGURETO, a village of Italy, on the coaſt of Genoa, remarkable for being the native place of Chriſtopher Columbus, the diſcoverer of America.

COGOXIMA. See CANGOXIMA.

COGS. See COGGLE.

COGWARE is ſaid to be a ſort of coarſe cloths, made in divers parts of England, of which mention is made in 13 R. II. c. 10.

CO-HABITATION, implies a concubinage, copulation, or carnal knowledge, between two perſons. It is rarely uſed, except in a criminal ſenſe.

COHALA, in *Geography*, a ſtationary tribe of Arabs in Abyſſinia, who do not live in tents, but are tributary to the mek, occupying different diſtricts of Sennaar, near the river Rahad, and regularly paying all the taxes and exactions which are impoſed by the government of Sennaar.

COHASSET, a townſhip of America in the county of Norfolk, and ſtate of Maſſachuſetts, incorporated in 1770, and containing 817 inhabitants. It has a congregational church, and includes 126 houſes, ſcattered in different forms. The dangerous rocks of this name lie off this place, about a league from the ſhore. It is diſtant about 25 miles S. E. from Boſton, or in a ſtraight line about half of this diſtance.

COHAUSEN, JOHN HENRY, in *Biography*, a learned and ingenious phyſician, was born at Hildeſheim in Lower Saxony, towards the end of the ſeventeenth century. Being educated to the practice of medicine, after taking the degree of doctor, he went to Munſter, where he ſoon diſtinguiſhed himſelf, by his ſuperior ſkill and abilities. His works, which are numerous, bear ample teſtimony to the vigour of his intellects, and of his application to letters. His laſt work, "Hermippus Redivivus," in which he profeſſes to ſhew the practicability of prolonging the lives of elderly perſons to 115 years, by receiving the breath, and tranſpirations of healthy young females, was written, or firſt publiſhed, when he was in his 77th year. This was tranſlated into Engliſh, and publiſhed, with additions and improvements, by the late Dr. John Campbell, under the title of "Hermippus Redivivus, or the Sage's triumph over old Age and the Grave." A vein of humour runs through this, and indeed through moſt of the productions of this writer, which gave them great popularity when firſt publiſhed, though they are now little noticed, excepting, perhaps, the work juſt mentioned, in which the irony is extremely delicate, and his rhapſody, againſt the prevailing paſſion of taking ſnuff. He affects to conſider a paſſion for taking ſnuff as a diſeaſe of the noſtrils, ſimilar to that affecting the ſtomach of girls in chloroſis, and therefore calls it the pica naſi. The title of this production is, "Diſſertatio Satyrica, phyſico-medico-moralis, de Pica Naſi ſive Tabaci ſternutatorii moderno abuſu, et noxa." Amſtelodami, 1716, 12mo.

Ruyſch, in the latter part of his life, imagined he had diſcovered a muſcle at the fundus uteri, to which he delegated the office of expelling the placenta, and to which he thought the performance of that duty might be left. This our author has ridiculed in a little volume, to which he gave the title of "Lucina Ruyſchiana, ſive muſculus uteri orbicularis a clariſſimo, D. D. Ruyſchio detectus," publiſhed at Amſterdam, 1731. The following is a ſpecimen of the author's humour on the occaſion :

"Vos obſtetrices manum a placenta ;
Nolite illam, ſi reluctetur, tangere.
Adeſt expulſor muſculus,
Qui illam, mechanicis ſuis digitis, extrahet,
Et molem inutilem ejiciat, deſtinato tempore ;
Si fata volent."

And further on,

"Vos obſtetrices, ſi fætum extraxeritis,
Reſiſtat autem placenta.
Ite nunc domum, haud anxiæ,
An mors, an alia ſymtomata illam retentam ſequantur,
Modo utero vim nullam intuleritis.
Muſculus orbicularis veſtras vices
ſupplebit,
Et placentam indubitatò, ni fallimur, extrahet.
Quid ad vos, ſi hic ſuo officio
non fungatur ?
Ovos, nunc tali invento muſculo, felices !
Vos fæminæ decumanis laudibus mactate
Magnum Ruyſchium,
Quod ſalutis veſtræ myſterium non celarit, obſtetrices."

He publiſhed the preceding year, "Archæus faber febrium et Medicus," and in 1716, "Neothea," written to ſhew the folly of ſending to China for tea, when we have ſo many herbs at hand, as pleaſant, and more healthy ; but his wit was not powerful enough to make either the uſe of tea or tobacco unfaſhionable. For the titles of others of his works, ſee Boerhaave's Methodus Studii Medici. Cohauſen died at Munſter, July 18th, 1750, in the 85th year of his age.

COHAWSY or CÆSARIA, in *Geography*, a ſmall river of North America, which riſes in the county of Salem, in the ſtate of New Jerſey, and purſuing its courſe through Cumberland county, diſcharges itſelf into Delaware river, oppoſite to the upper end of Bombay Hook. It is about 30 miles in length, and is navigable for veſſels of 100 tons to Bridgetown, at the diſtance of 20 miles from its mouth.

CO-HEIR, a perſon who ſhares an inheritance or eſtate with another heir.

COHEL, a name given in Egypt to a preparation of tin burnt with gall-nuts, which the Turkiſh women make uſe of to blacken, and lengthen their eye-brows.

COHERENCE, a ſchool-term, applied to propoſitions, diſcourſes, &c. which have a mutual connection, or dependance on one another.

COHESION, compounded of the particle *co*, with or together, and the verb *haerere*, to ſtick, in *Philoſophy*, means that action or power, by which the homogeneous particles of bodies remain attached to each other, as if they were but one ; thus the particles of gold, or of mercury, or even of water, &c. cohere together ; nor can they be ſeparated without employing a degree of force, which muſt be different not only in different bodies, but likewiſe in the ſame body under different circumſtances. This ſame power of coheſion, between the homogeneous particles of matter, is called, by the chemiſts, the *attraction of aggregation*. The philoſophical writers have generally annexed the ſame meaning to the words *adheſion* and *coheſion ;* we have, however, for diſtinction ſake, uſed the former in a ſenſe ſomewhat different from the latter, and this difference has already been ſtated under the article ADHESION.

In contemplating the power of coheſion, two different particulars preſent themſelves for our examination ; namely, the facts which have been experimentally aſcertained relatively to it, and the theories which have been offered in explanation of thoſe facts.

The various bodies of the univerſe, when conſidered with reſpect to the connection of their particles, are diſtinguiſhed into ſolids, fluids, and elaſtic fluids. The particles of the ſolids cohere with a very great power ; whilſt thoſe of the elaſtic fluids, inſtead of cohering, repel each other. The fluids, like water or alcohol, are in an intermediate ſtate, *viz.* their component particles ſlightly cohere, at the ſame time that, when expoſed, they are continually evaporating, that is, aſſuming the elaſtic, or vaporous form.

Several bodies have been found to aſſume all the above-mentioned ſtates, according as they are more or leſs combined with caloric, or the matter of heat. Thus water is a ſolid below the temperature of 32°, is a fluid between the temperatures of 32° and 212° ; and becomes an elaſtic fluid when heated beyond the laſt mentioned degree. Abſtract the heat, and the vapour gradually becomes a fluid, and this fluid becomes a ſolid, *viz.* ice. The like tranſition of ſtate has been obſerved in various other bodies ; hence we are induced, from analogy, to conclude, that, were it in our power to deprive every ſubſtance of all its heat, the whole range of natural bodies, including even the aërial fluid, might be converted into ſolids.

Beſides heat, there is another power which weakens the coheſion of the homogeneous particles of bodies, and this is the attraction between the particles of different ſorts of matter. Thus, a ſolid ſalt, when put in water, is diſſolved, *viz.* its particles are ſeparated from each other, in virtue of the attraction between them and the particles of water. Remove the water by means of evaporation, and the particles of ſalt will again cohere into a ſolid form. This is called by the chemiſts, *the attraction of affinity*, and the very extenſive ſeries of chemical phenomena, depends principally, if not entirely, upon the various affinities of natural bodies. See CHEMICAL AFFINITY.

It appears, therefore, that the homogeneous particles of every ſort of matter, have a mutual tendency towards one another, in conſequence of which they cohere more or leſs powerfully, according as that power is counteracted in a leſſer or greater degree, either by the interference of heat, or by the affinity to other bodies, namely, the chemical affinity. And the effect is much more remarkable when both thoſe powers act at the ſame time. Strictly ſpeaking, the action of heat ought to be included in the general name of chemical affinity.

Independent of the actual interference of the two above-mentioned counteracting powers, the particles of the ſame kind of matter will cohere with various degrees of force, according as they have been permitted to deſcend from the ſoft, or fluid ſtate, to the ſolid form, either gradually or abruptly; which clearly indicates a ſort of polarity in the particles, that is, a tendency to arrange themſelves in one particular manner, rather than in any other, in order to cohere more powerfully; and hence ariſe ſeveral qualities of the ſame ſolid, *viz.* tenacity, elaſticity, rigidity, tranſparency, regularity of form, commonly called cryſtallization, &c. Thus, if the aqueous part of a ſaline ſolution, and the heat, be cauſed to eſcape ſuddenly, the ſalt will be left in a pulverized form, whoſe particles ſhew a ſlight adheſion, if any, to one another. But let the water and the heat eſcape very gradually, and the particles of the ſalt will arrange themſelves, ſo as to form regular bodies, called cryſtals, of conſiderable ſize, hardneſs, and tranſparency. Thus likewiſe, if a piece of ſteel be made red hot, and be afterwards cooled gradually, it will remain pretty ſoft and pliable; but if it be cooled ſuddenly, as by plunging it in water, and eſpecially in quickſilver, the piece of ſteel will afterwards be found very hard and brittle, ſo much ſo that a file will have no action upon it.

It is hardly neceſſary to add any proofs of the exiſtence of the above-mentioned coheſive power, ſince common experience ſhows, how two drops of water, or of quickſilver, or of any other fluid, ruſh together when they are barely brought to touch in ſome ſmall part of their ſurfaces; how a drop of a fluid endeavours to aſſume a globular form, in conſequence of the mutual attraction of its particles; how the motion of a ſolid in a fluid is retarded by the coheſion between the particles of the latter; how difficult it is to break a metallic rod, or any other ſolid, &c.

Take two leaden bullets, ſuch as are uſed for muſkets, ſcrape off a part of each, ſo as to form two ſmall plain and bright ſurfaces, apply theſe to each other, bringing the parts cloſe by compreſſion, and a little twiſt with your fingers. Now theſe bullets will be found to adhere very forcibly to each other, ſo as to require a ſtrong power (equivalent ſometimes to the weight of 5, or 6, or 8, or even more pounds), in order to ſeparate them. When ſeparated, the ſurfaces will no longer appear flat; for part of the metal of one bullet ſeems to be intimately faſtened to the other. This experiment will not anſwer in the ſame manner when harder metallic bodies are employed.

The knowledge of the tenacity of bodies is of great conſequence in civil economy, and eſpecially in the mechanical arts; hence ſeveral experiments have been inſtituted for this purpoſe; yet it is to be wiſhed that the performance of a greater variety of ſuch experiments, under the various circumſtances which affect the ſtrength and tenacity of bodies, *viz.* the various temperature, ſize, and other qualities, were undertaken by perſons of knowledge and ability, in order to render the uſe of natural bodies in mechanics, and other uſeful branches, more certain and determinate. Profeſſor Muſchenbroeck made and publiſhed a greater number of experiments, for determining the coheſion of various ſubſtances, than any other philoſophical writer. They do not all relate to bodies of an homogeneous nature; for he tried likewiſe the coheſion, or ſtrength of different ſorts of wood, which are compoſed of earthy, ſaline, reſinous, and various other particles. We ſhall, however, tranſcribe them all together, as they form a very uſeful collection of reſults, relative to the ſtrength of various bodies.

P. Muſchenbroeck, in order to try the coheſive power of two poliſhed planes, took two lumps of the ſame ſubſtance, ſuch as glaſs and glaſs, copper and copper, &c. he flattened and poliſhed a part of each, and adapted thoſe ſurfaces to each other, by the interpoſition of ſome ſoft ſubſtance which might exclude the air; then, having faſtened one of thoſe pieces to a firm ſtand, he appended weights to the other, until the planes were ſeparated from each other, and noted the weights which effected the ſeparation. When the poliſhed planes were about two inches in diameter, the pieces were heated in boiling water, in order to melt a little greaſe that was interpoſed between the poliſhed planes. Two lumps of glaſs, or braſs, &c. thus prepared, were ſeparated by the weights expreſſed in the following table:

	Cold greaſe.	Hot greaſe.
Planes of glaſs,	130 lb.	300 lb.
braſs,	150	800
copper,	200	850
marble,	225	600
ſilver,	150	250
iron,	300	950

When the braſs planes were made to adhere by the interpoſition of other ſubſtances, the reſults were as follow:

With water,	12 oz. to ſeparate them.
oil,	18
Venice turpentine,	24
candle tallow,	800
reſin,	850
pitch,	1400

To aſcertain the abſolute coheſion of ſolid pieces of wood, he uſed pieces in the ſhape of long ſquare parallelopipedons, each of whoſe ſides was 0.26 of an inch, and they were broken by the following weights, which were applied in the direction of their length:

Fir,	600 lb.
Elm,	950
Alder,	1000
Linden-tree,	1000
Oak,	1150
Beech,	1250
Aſh,	1250

He tried likewiſe wires of different metals, by appending weights in the direction of their length, until they parted. The diameter of each wire was equal to 0.1 of a Rhinland inch (equal to 0.09712 of an inch Engliſh). The reſult were as follows:

Lead	29¼ lb.
Tin	40¼
Copper	299¼
Yellow braſs	360
Silver	370
Iron	450
Gold	500

In order to try the tranſverſe coheſion of different ſorts of wood, or when the force acted in a direction perpendicular to their length, he fixed one of the ends of the pieces, (which were ſimilar to thoſe mentioned above) into a ſquare hole in a metal plate, and hung weights on the other end, ſufficient to break each piece at the ſaid hole. The weights and diſtances from the hole were as follow:

Pieces of Wood.	Diſtances.	Weights.
Fir - -	9 inches. -	40 oz.
Oak -	8½ -	48
Elm - -	9 - -	44
Pine - -	9¼ -	36½
Alder -	9½ - -	48
Beech - -	7 - -	56½

See Muſchenbroek's Introductio ad Cohærentiam Corporum firmorum apud Phyſicæ Exper. et Geom. Diſſertationes; and Introductio ad Philoſ. Nat. 4to. ed. 1762. tom. i. cap. 21.

Mr. Emerſon likewiſe performed ſeveral experiments reſpecting the ſame ſubject, to which he ſubjoined ſome judicious obſervations. See his Principles of Mechanics, the latter end of the 7th ſection; where he expreſſes himſelf in the following manner:

"The proportion of the ſtrength of ſeveral ſorts of wood, and other bodies, that I have tried, will appear in the following table:

"Box, yew, plum tree, oak -	11
Elm, aſh - - -	8½
Walnut, thorn - - -	7½
Red fir, holly, elder, plane, crab tree, apple tree - - -	7
Beech, cherry tree, hazle - -	6⅔
Alder, aſp, birch, white fir, willow or ſaugh	6
Iron - - -	107
Braſs - - -	50
Bone - - - -	22
Lead - - -	6½
Fine free ſtone - - -	1

"In this table I have put ſeveral ſorts of wood into one claſs together, which I found to be pretty nearly of the ſame ſtrength; as I found ſometimes one ſort to exceed in ſtrength, and ſometimes another; there being a great difference even in the ſame ſort of wood; and I don't doubt but other people that ſhall make experiments, will find them as different and various as I have done, and perhaps, quite different from mine, juſt according to the goodneſs or badneſs of the wood they uſe. But I have contented myſelf to ſet down what I found from my own experience, as the reſult of a great many trials, without any regard to what other people have done or may do. What I ſhall further add is this:

"A cylindric rod of good clean fir, of an inch circumference, drawn in length, will bear at the extremity, 400 lb.; and a ſpear of fir two inches diameter, will bear about ſeven ton; but not more.

"A rod of good iron of an inch circumference, will bear near three ton weight.

"A good hempen rope of an inch circumference, will bear 1000 lb. at the extremity.

"All this ſuppoſes theſe bodies to be ſound and good throughout, but none of theſe ſhould be put to bear more than a third or fourth part of that weight, eſpecially for any length of time."

The late Dr. Crawford, a gentleman well known for his excellent publication on elementary heat, once undertook a ſeries of experiments for the purpoſe of determining the various degrees of force requiſite to break metallic wires in different degrees of temperature; but his premature death prevented the accompliſhment of his experiments; nor does it appear, that the reſult of thoſe few which he lived to perform, was ever made public. He heated the wires in a cylindrical veſſel full of oil.

Having ſtated the particulars that have been aſcertained experimentally concerning the power of coheſion; we ſhall now make a ſhort excurſion into the region of ſuppoſition and hypotheſis; briefly mentioning ſome of the ideas that have been entertained reſpecting the cauſes of thoſe phenomena. The abſurdity of moſt of thoſe ſuppoſitions, and the inſufficiency of others, render them undeſerving of any ſerious conſideration. Amongſt the moſt enlightened philoſophers who have conſidered the ſubject, ſome have attributed the coheſion of the particles, &c. to an immaterial power; others, with J. Bernoulli at their head, have attributed it to the external preſſure of the aërial, or an etherial, atmoſphere. (See J. Bernouilli De Gravitate Ætheris.) The firſt of theſe ſuppoſitions is utterly unintelligible; the ſecond, when brought to the teſt of experiment and computation, is found to be utterly inadequate to the effect. Sir Iſaac Newton, without attempting to inveſtigate the nature of the power, judiciouſly contents himſelf with calling it a mutual attraction peculiar to the particles of matter. His words are as follow:

"The particles of all hard homogeneous bodies, which touch one another, cohere with a good force; to account for which ſome philoſophers have recourſe to a kind of hooked atoms, which, in effect, is nothing elſe but to beg the thing in queſtion. Others imagine, that the particles of bodies are connected by reſt, *i. e.* in effect, by nothing at all; and others by conſpiring motions, *i. e.* by a relative reſt among themſelves. For myſelf, it rather appears to me, that the particles of bodies cohere by an attractive force, whereby they tend mutually towards each other; which force, in the very point of contact, is very great; at little diſtances is leſs; and at a little farther diſtance is quite inſenſible."

But what ſort of attraction can this be, which decreaſes and vaniſhes at diſtances ſo very ſmall?—Break a glaſs rod, then apply the parts to each other as cloſe as you will, ſo that the fracture can hardly be diſcerned; yet the adheſion is inſenſible. Deſaguliers, without giving any proof of the fact, conjectures, that the coheſive power decreaſes in the ratio of the fourth power of the increaſed diſtance; ſo that at twice the diſtance, it acts 16 times weaker; at three times the diſtance it acts 81 times weaker, and ſo forth. That a power (like the attraction of gravitation,) ſhould decreaſe according to the ſquares of the diſtances, may be eaſily comprehended; it being demonſtratively true, that all powers or emanations, which proceed from a centre, and expand always ſpherically, muſt become more and more rare, in the proportion of the ſquares of the diſtances from the centre of emanation. But it is extremely difficult to form any idea of a power that decreaſes in the ratio of the fourth, or any higher power of the diſtances.

When every thing is duly conſidered, it appears much more rational to ſuppoſe, that each particle of matter is endowed with a polarity analogous to that of a magnet, *viz.* that with one of its ſides or ends, a particle of matter can attract the ſame end of another particle, but that it will repel it with its oppoſite ſide or end. This, as has been obſerved above, ſeems to be indicated by a variety of phenomena; and it may be eaſily illuſtrated by a magnetic experiment. Take, for inſtance, four or ſix magnetic bars, or needles, place them ſo that all their poles of the ſame name may lie on one ſide, and you will find, that inſtead of attracting, they will repel each other; ſecondly, place them ſo that two or three north poles may be together with one ſouth pole, on one ſide, and the attraction between the bars will be ſlight or partial. Laſtly, place them in regular order, ſo that the north pole of one bar may be contiguous to the ſouth pole of the next, and that to the north pole of a third bar, and ſo forth; and you will find that the bars cohere with conſiderable force. Upon this hypotheſis, the above-mentioned experiment of the broken glaſs rod may be explained in a more ſatisfactory manner; for though the fractured parts may appear to be replaced in their original ſituation; yet it is ſcarcely poſſible to attain that immenſe accuracy, which is required to diſpoſe the friendly poles or ends of the minute particles contiguous to each other. The leaſt abraſion of ſurface, the leaſt interpoſition of any matter, deranges the whole. Upon this hypotheſis it is alſo eaſy to comprehend how the different hardneſs and configuration of the ſame kind of body are produced; for when the particles are ſuddenly depoſited from any ſolution, or ſuffer a quick tranſition from the ſoft to the hard ſtate, they have no time to arrange themſelves in the proper order; conſequently the aggregate becomes leſs compact and irregular, than when by a ſlow depoſition, or gradual tranſition from the ſoft to the hard ſtate, ſufficient time is allowed for the particles of matter to place themſelves in their proper ſituations.

COHIBUS, ſo called by Tacitus, but by Arrian *Chôbus*, in *Ancient Geography*, a river of Aſia near the Euxine ſea.

COHOBATION, in *Chemiſtry*, is the repeated expoſure of any ſubſtance to the chemical action of a liquid, either by returning the latter when driven off by diſtillation, or by ſupplying a freſh quantity after the action of the firſt has been exhauſted.

CO-HONG, in *Geography*, a town of Aſia in Thibet; 20 miles S.W. of Tſien-tſang.

COHONGORONTO, the name of the American river Potowmack, before it breaks through the Blue Ridge in N. lat. 39° 45′. Its whole length to this place is about 160 miles.

COHORN, Memnon, in *Biography*, a celebrated engineer in Holland, the ſtrong places of which are generally indebted to him for their fortifications. At the ſiege of Namur, he defended a fort, named after himſelf, againſt the attack of Vauban. Cohorn refuſed to ſurrender till he had received a wound, which was deemed mortal at the time, but from the effects of which he recovered. In 1703, the elector of Cologne, eſpouſing the cauſe of France, admitted a French garriſon into Bonn; Cohorn attacked the place with ſo much vigour, that the commandant ſurrendered in three days. He died the following year at the Hague, leaving behind him a treatiſe on his method of fortification. Nouv. Hiſt. Dict. Du Freſnoy.

COHORS *equitata*, in old inſcriptions, has perplexed ſeveral antiquaries, who have been taught to conſider the *cohorts* as appropriated to the foot ſervice, as the *alæ* and *turmæ* were to the horſe. Mr. Horſeley, in particular, imagines, the *cohors prima Claudia equitata*, which he had met with, was intended to intimate that this cohort had been promoted from the horſe ſervice; but when, by another inſcription, he was led to conſider that corps as conſiſting of a thouſand horſe, his difficulty is increaſed to that degree, that he knows not what to affirm upon it. But the learned Dr. Taylor thinks there is an eaſy ſolution of this difficulty.

The auxiliary, or provincial cohorts, were either entirely, or purely foot, like the legionary, or ordinary *cohorts*; or elſe they had a mixture of both kinds of militia, as appears from Gruter, Dlxxiv. 5. This latter ſort, as they could not properly be ranked under either denomination of horſe, or foot, being made up of both, ſeem to have appropriated to themſelves the diſtinguiſhing title of *cohortes equitatæ*, corps of infantry with a mixture of horſe. And of this term we find frequent mention in inſcriptions.

Hyginus alſo, "De Caſtrametatione," gives us a full and deciſive proof of this denomination, and of the number of which ſuch cohorts conſiſted. Theſe troops conſiſted of a thouſand men, part horſe, and part foot, and were hence called *milliariæ*. The proportion of the horſe to the foot was 240 to 760. His words are, "Habet *cohors equitata* milliaria pedites ſeptingentos ſexaginta, centurias decem, equites ducentos quadraginta, turmas decem." Vid. Phil. Tranſ. N° 482. ſect. 3.

Cohors *milliaria*. See above Cohors *equitata*.

COHORT, Cohors, in *Roman Antiquity*, a body of infantry, conſiſting of five or ſix hundred men; anſwering in moſt reſpects to our *battalion*.

The cohort was divided into three manipules, or companies; the manipule into two centuries; and the century into an hundred men.

The firſt centurion in the firſt cohort was called *primipilus*; and had the charge of the eagle or ſtandard of the legion.—A legion conſiſted of ten cohorts. The firſt cohort, which always claimed the poſt of honour, was formed of 1105 ſoldiers, the moſt approved for valour and fidelity. The remaining nine cohorts conſiſted each of 555. See Legion.

When the army was ranged in order of battle, the cohorts were diſpoſed in the following manner: The firſt cohort took up the right of the firſt line, as the companies of grenadiers do in our regiments; the reſt followed in their natural order; ſo that the third was in the centre of the firſt line of the legion, and the fifth on the left; the ſecond between the firſt and third; and the fourth between the third and fifth. The five remaining cohorts formed a ſecond line in their natural order: thus the ſixth was behind the firſt, and ſo of the reſt.

The firſt, third, and fifth cohorts were eſteemed the beſt; at leaſt it appears ſo from the poſts they took up, which were looked on by the Romans as the moſt important.

Marius is by ſome ſaid to have been the firſt who divided the Roman forces into cohorts: which opinion ſeems confirmed by Roſinus; "Non enim in tota Livii hiſtoria cohortium fit mentio. Ideoque docti viri ſentiunt a C. Mario primum cohortes eſſe inſtitutas." But yet this is a great miſtake; for the cohorts are often mentioned in Livy, and particularly, lib. xxvii.; c. 13. "Marcellus—cohortibus quæ ſigna amiſerant hordeum dari juſſit: centurioneſque manipulorum quorum ſigna amiſſa fuerant diſtrictis gladiis diſtinctos deſtituit." This happened A. U. C. 543, and conſequently ſeveral years before Marius was born. *Cohorts* were diſtinguiſhed according to their appointment and office, into *auxiliary*, which were ſent by allies; *equitata*, ſee above; *peditata*, which conſiſted of foot-ſoldiers only; *prætorian*, which was formed of the beſt ſoldiers, and ſerved to guard the *prætor* or general. This cohort was inſtituted by Publius Poſthumus, the dictator. Auguſtus likewiſe formed a cohort under this appellation, conſiſting of nine thouſand men: which was afterwards increaſed by Septimius Severus. There were alſo the *cohors togata*, a kind of militia, which guarded the ſtreets of Rome; the *cohors vigilum*, inſtituted by Auguſtus, which ſerved on occaſion of fires; and the *cohors urbana*, eſtabliſhed by Auguſtus, to guard the city.

COHOZ, or Cohoes, in *Geography*, a ſmall village of North America, near which is the remarkable fall of the Mohawk river, about three miles from its mouth, by which it diſembogues itſelf into the Hudſon or North river, about ten miles above Albany. The breadth of the river is 300 yards; a ledge of rocks extends quite acroſs, and from the top of them the water falls about 50 feet perpendicular, or, as ſome ſay, between 70 and 80 feet; the line of the fall from one ſide of the river to the other being nearly ſtraight. The appearance of this fall or caſcade is very different, according to the quantity of water; when the river is full, the water deſcends in an unbroken ſheet from one bank to the other, whilſt, at other times, the greater part of the rocks is left uncovered. The rocks are of a very dark colour, as is alſo the earth on the banks, which riſe to a great height on either ſide. A bridge, 1100 feet long, and 24 feet wide, reſting on 13 piers, was erected, at the expence of 12,000 dollars, in 1794, about three quarters of a mile below the cataract, from which it exhibits a grand view to the ſpectator; though the moſt romantic appearance is obſerved from Lanſinburgh-hill, about five miles to the eaſt of it.

COHUAGIUM, in *Antiquity*, a tribute paid by thoſe who meet promiſcuouſly in a market, or fair; *cohua* ſignifying a promiſcuous multitude of men in a fair or market, probably from the French *cohue*.

COHUIXCAS, in *Geography*, a country of New Spain, in which there is a conſiderable mountain of loadſtone, between Tcoiltylan and Chilapan.

COIBA, or Quibo, a ſmall iſland in the Pacific ocean, near the coaſt of Veragua. N. lat. 8°. W. long 82° 26′.

COIF, the badge of a ſerjeant at law; who is hence alſo called ſerjeant of the coif.

The coif is of lawn, and is worn on the head, under the cap, when they are created, and ever after.

The uſe of the coif was to cover the *tonſura clericalis*, or clerical crown; becauſe the crown of the head was originally cloſe ſhaved, and only a border of hair left around the lower part, which gave it the appearance of a crown. We have an example of its antiquity in M. Paris's "Hiſtory of England," A.D. 1259, when one William de Buſſy claimed the benefit of his clergy, and hence ſir H. Spelman conjectures (Gloſſ. 355.) that coifs were introduced to hide the tonſure of ſuch renegade clerks, as were ſtill tempted to remain in the ſecular courts in the quality of advocates or judges, notwithſtanding their prohibition by canon. See Tonsure, &c.

COIFFE-Jaune, in *Ornithology*, the name given by Buffon to the *oriolus icterocephalus*.

Coiffe-*Noir*, of Buffon, is the hooded tanager; *Tanagra pileata*, Linn.

COIFFY-la-Ville, in *Geography*, a town of France, in the department of the Upper Marne; three miles S.W. of Bourbonne.

COIGNET, Gilles, in *Biography*, called likewiſe *Giles of Antwerp*, from the place of his nativity, was born in 1530, and in his youth received employment for ſome time in the houſe of Antonio Palermo, a picture merchant of that city. He afterwards travelled through the greater part of Italy and Sicily, and in many places left ſpecimens of his abilities, as well in freſco as in oil. At Terni, a ſmall town in the Papal territory, he painted a room entirely with whimſical groteſques, and likewiſe an altar picture; in this laſt, however, he was aſſiſted by a ſcholar of his, named Stella, who afterwards died in Rome. From Italy he repaired to Amſterdam, where he painted many works highly creditable to his talents, and at laſt ſettled at Hamburgh, where he died in the year 1600. Coignet is deſcribed as an univerſal artiſt, ſufficiently ſkilled in hiſtory, landſcape, and indeed every department of painting; but his excellence was moſt remarkable in his ſmall pictures of conflagrations, or where his figures were illumined by the moon, or by torches, lanthorns, or other artificial flame. He not unfrequently worked upon the copies made by his ſcholars, and, by means of a few maſterly touches of his pencil, gave them, at firſt ſight, ſo much the appearance of originals, that many were deceived. Many of the back grounds and architectural parts of Cornelius Molinaer's pictures were painted by him. Baldinucci.

COIL, denotes a rope laid in regular folds for the convenience of ſtowage, and hanging upon cleats, to prevent its being entangled. See Quoil.

COILANTHA, in *Botany*. Renal. Sp. See Gentiana *purpurea*.

COILON, in *Antiquity*. See Cavea.

COILOPHYLLUM, in *Botany*, Moriſ. See Sarracenia *purpurea*.

COILOTAPALUS, Brown. See Cecropia *peltata*.

COILPETTA, in *Geography*, a town of Hindooſtan in the Carnatic; 54 miles S.W. of Madura, and 18 N. of Palamcotta.

COIMBETORE, a province of Hindooſtan, in the Myſore, and in the ſouthern part of the territories formerly belonging to Tippoo Sultan. This country is ſeparated from Calicut and Cochin towards the weſt by a ridge of lofty mountains named the "Gauts," a continuation of which bounds it on the north; on the eaſt it is bounded by the Carnatic; and on the ſouth by the province of Dindigul. In the continuity of the ridge of mountains on the weſt, oppoſite to Paniany, there is a break about 16 miles wide, which appears to border on what d'Anville calls "Annamally," or the "Elephant Mountains," and is occupied chiefly by a foreſt of timber trees, having the fort of Annamally on the eaſt, and Palicaudcherry on the weſt. The valley or opening extends 14 or 15 miles between the termination of the Northern Gauts, and the commencement of the Southern ones; before it opens finally into the low country on the Malabar coaſt. It is well known, ſays major Rennell, that ſhips which navigate the Malabar coaſt during the N.E. monſoon, commonly experience a ſtronger gale in the neighbourhood of Paniany than elſewhere; and he is of opinion, that this opening in the Gauts is a very ſufficient cauſe of ſuch an effect. The major has alſo been told, that the lower part of the Coimbetore country partakes of the rainy, or S.W. monſoon of the Malabar coaſt, which may be referred to the ſame cauſe. The river of Paniany takes its courſe from the Coimbetore country, through this opening; and is ſaid to be navigable in the rainy ſeaſon for ſmall boats, to the foot of the Gauts. This circumſtance, together with the inundated ſtate of the country at that ſeaſon, may ſerve to ſhow, that the country, weſt of the Gauts, has no great declivity, in a courſe of near 60 miles. Coimbetore is a fertile country, and well watered by ſeveral rivers; its principal towns are Coimbetore, Erroad, Carroor, and Daraporam.

Coimbetore, a town of Hindooſtan, and capital of the province to which it gives name, ſituated at the foot of the weſtern Gauts, on the river Noyel. This town was taken poſſeſſion of by general Meadows in July 1790, after having been evacuated by Tippoo Sultan, who left behind him a quantity of grain and military ſtores. The mud fort by which it was defended was incapable of making any long reſiſtance. Tippoo retook it in the following year, and it was confirmed to him by the peace; but by the partition treaty, made by marquis Welleſley in 1799, Coimbetore, and alſo Sattimungalum, Erroad, Perentory, Oudcul, Showoor, Chingery, Caugiam, Carroor, Vizimungle, and Daraporam, were annexed to the Britiſh poſſeſſions. N. lat. 10° 58′. E. long. 77° 7′.

COIMBRA, a large, handſome, and celebrated city of Portugal, the capital of the province of Beira, ſituated on a mountain near the river Mondego, in a country abounding with vineyards, olive-trees, and fruits. It was built by the

Romans about 300 years before Chriſt. It is a biſhop's ſee, ſuffragan of Liſbon, and has an ancient univerſity, containing, according to Link, about 800 ſtudents, a cathedral, and fountains that are very magnificent. N. lat. 40° 18'. W. long. 8° 30'.

COIN, *Matrice*, in the manufacture of money, medals, and counters, is a piece of ſteel well tempered, four or five inches deep, ſquare at bottom, and round at top; whereon are engraved, dent-wiſe, with puncheons, and other inſtruments, the ſeveral figures, marks, &c. to be ſtruck on the moneys, &c. See COINAGE.

For the manner of engraving coins, ſee ENGRAVING *on ſteel*.

COIN is more generally uſed for a piece of metal, ſtamped with certain impreſſions, which are intended to give it a legal and current value; and alſo to ſerve as a guarantee for its weight and purity.

According to L. Coke, the term *coin* is French, ſignifying a corner, and hence has its name; becauſe in ancient times money was ſquare, with corners. 1 Inſt. 297. Others derive it, by a kind of forced analogy, from the Greek κοινος, *common*, becauſe money is the common medium or inſtrument of commerce. Others again deduce it from *cuneus*, a wedge, tracing its origin either to the form of a wedge, ingot, or lingot (linguetta), in which bullion has been tranſported from the remoteſt ages; or to the wedge, or chiſſel, an inſtrument with which theſe lingots were occaſionally cut to the weight required, as they do at this day in the Eaſt Indies with ſheers.

Coins conſtitute the ſtandard or ſcale, by which the prices of all things bought and ſold are aſcertained. See MONEY, CURRENCY, and COMMERCE.

Coin differs from money, as the ſpecies from the genus. Money is any matter to which public authority has affixed a value, and which ſerves as a circulating medium, whether it be metal, paper, leather, ſhells, &c.; but coin is a particular ſpecies of money, always made of metal, and ſtruck according to a certain proceſs. See COINAGE.

The origin of coins, like that of moſt other uſeful things, is involved in great obſcurity. Whether coins be of equal antiquity with money, may admit of ſome doubt; eſpecially as moſt of the ancient writers are ſo frequent and expreſs in their mention of leathern money, paper money, wooden money, &c. Some, however, notwithſtanding all this, are of opinion, that the firſt moneys were of metal; the reaſons they give are the firmneſs, neatneſs, cleanlineſs, durableneſs, and univerſality of metals; which, however, do rather conclude, that they ought to have been ſo, than they actually were ſo.

In effect, the very commodities themſelves were the firſt moneys, *i. e.* they were current for one another by way of exchange; and it was the difficulty of cutting, or dividing certain commodities, and the impoſſibility of doing it without great loſs, that firſt put men on the expedient of a general medium.

Indeed, thus much may be ſaid in behalf of coins, that, on this view, it was natural for men to have their firſt recourſe to metals, as being almoſt the only things whoſe goodneſs, and as it were integrity, is not diminiſhed by partition; beſides the advantages above expreſſed, and the conveniences of melting, and returning them again into a maſs of any ſize or weight.

It was probably, then, this property of metals which firſt accuſtomed people, who trafficked together, to account them in lieu of quantities of other merchandizes in their exchanges, and at length to ſubſtitute them wholly in their ſtead; and thus aroſe money; as it was their other property to preſerve any mark or impreſſion a long time, which confirmed them in the right; and thus was the firſt riſe of coins.

In the firſt ages, it is probable, that each perſon cut his metal into pieces of different ſizes and forms, according to the quantity to be given for any merchandize, or according to the demand of the ſeller, or the quantity ſtipulated between them; to this end they went to market, loaden with metal, in proportion to the purchaſe to be made, and furniſhed with inſtruments for proportioning it, and with ſcales for dealing it out, according as occaſion required.

By degrees it was found more commodious to have pieces ready weighed; and as there were different weights required, according to the value of the different wares, all thoſe of the ſame weight began to be diſtinguiſhed by the ſame mark, or figure; thus were coins carried one ſtep further.

At length, the growing commerce of money beginning to be diſturbed with frauds, both in the weights and the matter, the public authority interpoſed; and hence aroſe the firſt ſtamps or impreſſions of money; to which ſucceeded the names of the moneyers, and at length the effigy of the prince, the date, legend, and other precautions to prevent the alterations of the ſpecies; and thus were coins completed.

Herodotus aſcribes the invention of coins to the Lydians, and Pliny attributes it to Bacchus; but it is evidently too remote to be traced to any authentic ſource. Lycurgus ordered that iron money only ſhould be uſed at Sparta, which ſeems to imply, that a better kind had been known; and the introduction of copper coin into Italy, is aſcribed to Janus, or Saturn. We learn, however, from Pliny, and other good authorities, that ſilver was not coined at Rome until about the year 480 of the city, nor gold until about the year 640.

We do not find in Scripture that any coins were ſtruck by the Jews, until the time of the Maccabees; their money, before that period, being pieces of ſilver, of certain weights, ſuch as ſhekels, talents, and drams; a practice ſtill retained in China, and other countries; and which appears to have been univerſal in ancient commerce. It may be, therefore, preſumed, that when thoſe weights became altered and diſturbed by fraud, the neceſſity of ſtamping them with certain impreſſions became obvious; and hence may be ſuppoſed the origin of coins, with their effigies, legends, dates, &c. for which ſee MEDALS.

Coins have been generally made in all civilized nations, either of gold, ſilver, or copper, and frequently of all three: theſe metals have been found by long experience the fitteſt materials for money, particularly the two former, which we ſhall chiefly notice in the preſent article.

Gold and ſilver are each perfectly homogeneous, from whatever mines they may have been taken. Theſe metals are likewiſe malleable, and diviſible, into the moſt accurate proportions; from their ſcarcity and price, they are not too bulky for the common purpoſes of commerce; and, from their durability, they are leſs ſubject to decay than moſt other articles of value.

Gold and ſilver, in their pure or unmixed ſtate, are too flexible to make coins ſufficiently firm for general uſe; and hence the neceſſity of mixing with them a certain proportion of ſome harder metal; and this mixture is called the *alloy*. The quantity or proportion of alloy is various in different countries, and has varied conſiderably in different ages. Arbuthnot (ch. 6.) ſtates, that the ancient coins, particularly of gold, had very little alloy, in ſome not above a fiftieth part. The Romans, according to Pancton, were the firſt who taught the world the criminal art, as he calls it, of debaſing the purity of metals intended for coins, (ſee "Metrologie," p. 329.) Pliny informs us (lib. xxxiii. ch. 3.) that the Romans mixed an eighth part of alloy with their ſilver coin. "Livius Druſus in tribunatu plebis octavam partem æris argento miſcuit." The ſame author thus notices their illegal debaſement of money: "Miſcuit denario triumvir Antonius ferrum. Miſcuit æri falſæ monetæ." (lib. xxxiii. c. 9.)

The quality of alloy has been always conſidered of importance with reſpect to the durability of coins. The moſt common ſort is copper; and ſometimes for gold a mixture of ſilver and copper. In order to aſcertain the beſt kind of alloy for gold coins, a chemical proceſs was inſtituted in London in 1798, under the management of Henry Cavendiſh, eſq. F.R.S., and Charles Hatchet, eſq. F.R.S.; and the reſult of their experiments was, that gold coins are not ſo likely to wear by abraſion and friction, if they are alloyed with ſilver and copper, as with copper only; but that the difference between them, provided the copper be very pure, is ſo little, that there is no ſufficient reaſon for altering the preſent alloy, conſiſting alone of copper. The report of this ingenious and elaborate proceſs, may be ſeen in the Philoſophical Tranſactions for 1803.

In all well regulated governments, there has been a ſtandard for coins, fixed by law; that is, a certain proportion between the quantity of pure metal and its alloy. In England the ſtandard for gold is $\frac{11}{12}$, that is 11 parts of pure metal, and one part of alloy. The fineneſs of gold is moſtly expreſſed in carats; thus the whole weight is ſuppoſed to be divided into 24 equal parts, called carats, and the ſtandard for gold is ſaid to be 22 carats fine, that is to contain 22 parts of pure gold, and 2 of alloy, which gives $\frac{22}{24}$, or $\frac{11}{12}$. The Engliſh carat is divided into 4 parts, called grains.

The ſtandard for ſilver is $\frac{37}{40}$, that is, 11 oz. 2 dwts. of pure ſilver, and 18 dwts. of alloy, making together 1 lb. troy, which may be thus expreſſed, $\frac{222}{240} = \frac{37}{40}$. This proportion for ſilver is ſaid to have been fixed in the reign of Richard I., by certain perſons from the eaſtern parts of Germany, called *eaſterlings*; and hence the word *ſterling*, which was afterwards the name given to the ſilver penny, and which is now applied to all lawful money of Great Britain.

From the legal weight and fineneſs of coins, there is a certain allowance for deviation or error, according to the mint regulations of moſt countries; and this allowance is called the *remedy of the mint*. In England, the remedy for gold is the ſixth part of a carat, that is, the piece coined may fall the 144th part ſhort of its ſtandard weight and fineneſs; and the remedy for ſilver is 2 dwts. in the pound, that is, the 120th part of the ſtandard. In ſome countries, a certain remedy is allowed in the weight, and another in the fineneſs; and this allowance is often made a ſource of profit, beſides the ſeigneurage; but, according to our mint indentures, the remedy is only an allowance for accidental error; and, therefore, no account is taken of it in calculating the value of our coins. It may be here obſerved, that in England there is no ſeigneurage, or other advantage, derived from the privilege of coining, the whole expence of the mint being defrayed by the public. On the propriety, however, of this regulation, the ableſt politicians have differed: and there is a probability, that in the new coinage which is now in contemplation, a ſeigneurage will be eſtabliſhed, particularly in the ſilver and copper coins, which chiefly regard our internal traffic; but as foreign bills of exchange ſhould be always paid in gold coin of full value, no great change is likely to take place in this reſpect.

According to our preſent mint regulations, whoever takes a quantity of ſtandard bullion to the tower, whether gold or ſilver, will receive in return his full weight in new coins, in the following proportions: For every pound troy of ſtandard gold, he will receive 44½ guineas; and for every pound troy of ſtandard ſilver, 62 ſhillings. This regulation for ſilver, commenced in the reign of queen Elizabeth; and that for gold in the reign of Charles II.; the ſhilling always paſſed for 12 pence; but when the guinea was firſt ſtruck, it paſſed for about 20 ſhillings; but its value was not abſolutely fixed, being left to find its level, according to the market price of gold; and thus the guinea continued to fluctuate between 20 and 21 ſhillings, until the year 1728, when it was ordered to paſs current in all payments for 21 ſhillings; and this law had the effect of making gold a ſtandard, or meaſure of value, as well as ſilver.

From the foregoing regulation, it is obvious that the mint price of gold is 3*l.* 17*s.* 10*d.*½ per ounce, and the mint price of ſilver 62*d.* per ounce: for

As 12 *oz.* : 46*l.* 14*s.* 6*d.* :: 1 *oz.* : 3*l.* 17*s.* 10*d.*½; and
As 12 *oz.* : 62*s.* :: 1 *oz.* : 62*d.*

It alſo follows that the guinea ſhould weigh $129\frac{39}{89}$ grains of ſtandard gold, or $118\frac{58}{89}$ grains of pure gold; and that the ſhilling ſhould weigh $92\frac{28}{31}$ grains of ſtandard ſilver, or $85\frac{29}{31}$ grains of pure ſilver; for

As $44\frac{1}{2}$ grains : 1 *lb.* :: 1 *guinea* : $129\frac{39}{89}$ grains.
And as 24 carats : 22 carats :: $129\frac{39}{89}$: $118\frac{58}{59}$.
And for ſilver
As 62*s.* : 1 *lb.* :: 1*s.* : $92\frac{28}{31}$ grains.
And as 40 : 37 :: $92\frac{28}{31}$: $85\frac{29}{31}$.

From theſe proportions it appears, that the relative value between pure gold and pure ſilver is as $15\frac{2859}{13640}$ to 1, or as $15\frac{13}{62}$ to 1 nearly: for as $118\frac{58}{89}$: $85\frac{29}{21} \times 21$ :: 1 : $15\frac{2859}{13640}$. But the relative proportion of theſe two metals, according to the average market price for the laſt five years, is only as 14½ to 1, as will be ſeen by the ſtatement of the prices of gold and ſilver here given.

The comparative value of gold and ſilver has fluctuated conſiderably in different ages, and in different countries. The earlieſt account we have of it is given by Herodotus, (lib. iii. p. 95.) where he ſtates the proportion to have been in Perſia, in the time of Darius, the ſon of Hyſtaſpes, as 13 to 1. Other hiſtorians ſtate, that it was as 12 to 1 in Greece, in the early periods of her hiſtory; but that about the time of Alexander the Great, it was only as 10 to 1. And this was the proportion in Rome at that period, where it continued nearly the ſame until the reign of Julius Cæſar, when, on account of the quantity of gold brought from conquered countries, it was to ſilver only as 7½ to 1, a proportion, however, which was but temporary.

In England, from the time of the Saxons to the diſcovery of America, the relative value of gold and ſilver was about 11 to 1. In the reign of queen Elizabeth it was 13 to 1. In China and Japan in 1717, it was 9 or 10 to 1, (according to ſir Iſaac Newton's repreſentation to the lords of the treaſury at that period.) In Spain and Portugal it is, at preſent, as 16 to 1, and in moſt other parts of Europe, ſomething more than 15 to 1. Thus the extremes of fluctuation in the relative value of gold and ſilver, in all ages, may be comprehended within the limits of 17 and 7 to 1.

On a view of the Hiſtory of Coins, it appears that there has been, in general, a progreſſive reduction in their value, and that few inſtances have occurred of any advancement. The depreciation of money, in England, from the conqueſt to the beginning of the reign of Elizabeth, was occaſioned partly by the debaſement of the coin, and partly by the gradual increaſe of gold and ſilver from the mines of Europe; for the increaſe of the precious metals, like that of all other articles, tends only to diminiſh their value. From this period to the revolution a conſiderable reduction in the value of coins was occaſioned by the influx of gold and ſilver from the mines of America,

America; and from the revolution to the preſent time, the depreciation may be aſcribed both to the increaſe of the precious metals, and to the extenſive uſe of paper as a circulating medium.

The following ſtatement will ſhew the depreciation of our ſilver coin from the conqueſt to the end of the reign of queen Elizabeth. But in order to make the ſubject clear, it will be proper to obſerve, that troy-weight was not uſed in the Engliſh mint until the reign of Henry VIII. Before that period, gold and ſilver were weighed with what was called the Tower pound, or the moneyer's pound, which had been uſed by the Saxons, and which was lighter than the pound troy by ¾ of an ounce troy weight.

The Tower pound was coined

in the year	*s.*	*d.*		*s.*	*d.*
1066 into	20	0			
1300	20	3			
1344	22	2			
1346	22	6			
1353	25	0			
1412	30	0			
1464	37	6			
1527	42	2¼	pound troy	45	0
1560	56	3		60	0
1601	58	1½		62	0

The coinage of William the Conqueror was on the following ſimple plan. The pound in weight and the pound in tale (*i. e.* in reckoning) were the ſame. The pound in tale was divided into 20 ſhillings, and each ſhilling into 12 pence or ſterlings; and the pound weight was divided into 12 ounces, and each ounce into 20 dwts. Thus the weight of each penny or ſterling was one penny-weight, or 24 grains. This plan of coinage is ſaid to have been firſt adopted by Charlemagne, in France, in the eighth century.

The firſt Engliſh gold coin of which there is any account, was ſtruck in the year 1257, by order of Henry III. It was of pure gold, weighing two-pence, or ſterlings of ſilver, and was to paſs for 20 pence. This gold pennie, as it was called, was nearly the weight of a ſeven ſhilling piece of the preſent time, and it is ſaid, that "the king tried this expedient of coining gold through neceſſity;" and alſo, "that the city of London made a repreſentation againſt the meaſure." Sneiling, on Gold Coins, p. 2.

The next gold coinage was in the year 1344, when the gold florin was ſtruck, which took its name from Florence, where it had firſt been coined, in 1252. It was afterwards minted in moſt of the countries in Europe. In Germany it was called the gulden, on account of its quality; and in Holland the guilder. The florin, however, has been long a ſilver coin, and in many places it is adopted as the unit in keeping accounts under an imaginary value: this, as well as all imaginary monies, had their origin in real coins, like the florin and the pound ſterling.

Coin has been already defined the ſtandard by which the prices of all things bought and ſold are aſcertained; but coin is, beſides, an equivalent for which goods are exchanged; and, in this reſpect, it fails as a proper ſtandard, being liable to variations.

A ſtandard for weight or meaſures is ſuppoſed to be fixed; but coin, as a metal, is ſubject to fluctuation in its value, like every other ſaleable article.

Perhaps there is no ſubject of political economy ſo difficult, both in theory and practice, as the proper regulation of coins. For, beſides the fluctuation in price, and in the comparative value of the precious metals, coins are expoſed to many other imperfections and diſorders; ſuch as filing, fabrication, melting, and unavoidable wear.

The imperfection ariſing from the rivalſhip of gold and ſilver, might, it is thought, be removed, by making one metal only the meaſure of property. Sir William Petty, Mr. Locke, Mr. Harris, lord Liverpool, and other writers of high authority, concur in opinion, that the coin which is the principal meaſure of property, ought to be made of one metal only. But theſe authors do not agree whether it ſhould be gold or ſilver. Mr. Locke argues that it ſhould be ſilver, while lord Liverpool maintains, that gold has latterly conſtituted the ſtandard value. Theſe different opinions may be, however, in ſome meaſure reconciled. When Mr. Locke wrote on the ſubject, ſilver was certainly the legal meaſure of value; but in 1728, when the guinea was eſtabliſhed as a legal tender, gold became a meaſure, and, of late years, the principal one, particularly in large payments. Indeed, while mankind continue to ſet ſo high a value on both metals, it is not likely that either will be excluſively adopted as a meaſure of value. For the payment of bills of exchange, gold is preferred in moſt countries. In Leghorn, and other parts of Italy, it has been of late years made the legal money of exchange. In ſhort gold ſeems to be the meaſure of value in great concerns, and ſilver in the inferior departments of buſineſs; gold may, therefore, be conſidered as the integer, and ſilver the fraction.

It is worthy of obſervation, that the progreſs of metals, as repreſentatives of property, ſeems to have kept pace with the increaſe of wealth and commerce. Iron, braſs, and copper, firſt anſwered the purpoſes of money; ſilver next followed; and, as property increaſed, gold ſucceeded. But the great increaſe of riches and trade in modern times, has rendered even gold inſufficient as a circulating medium, and repreſentative of property. Paper has been, therefore, ſubſtituted, and it is generally found the moſt convenient. Where credit cannot be given, coins are neceſſary; but where well founded confidence exiſts, paper is certainly preferable. It is exempt from moſt of the imperfections and diſorders of coin; and, in many other reſpects, it greatly facilitates the operations of commerce.

Among the imperfections of coin, the difference which frequently exiſts between the mint and market prices of the precious metals, deſerves particular notice. It has been already ſhewn, that the mint price of gold is 3*l.* 17*s.* 10*d.*½ per ounce, and of ſilver 62*d.* per ounce; but the following ſtatement will ſhew how much the market prices have varied from theſe prices ſince the year 1792, and it ſhould be obſerved, that for many years before that period, gold was frequently above, and ſeldom below, the mint price; while ſilver was almoſt conſtantly above the mint price, and higher in proportion than gold.

MARKET PRICES *of* STANDARD GOLD *and* SILVER.

	Gold.			*Silver.*	
1792	4*l.*	1*s.*	0*d.*	5*s.*	5*d.* per ounce.
1793	3	17	6	5	1
1794	3	17	6	5	1
1795	4	0	0	5	3
1796	3	17	6	5	4
1797	3	17	6	5	1
1798	3	17	9	5	0
1799	4	0	0	5	7
1800	4	5	0	5	9
1801	4	6	0	6	0
1802	4	3	0	5	6
1803	4	0	0	5	7

MARKET PRICES *of* STANDARD GOLD *and* SILVER
(continued.)

		Gold.	*Silver.*
	1804	4*l.* 0*s.* 0*d.*	5*s.* 6*d.*
	1805	4 0 0	5 6
	1806	4 0 0	5 8
January	1807	4 0 0	5 7
June	1807	4 0 0	5 8

From the above ſtatement, it appears that, for the laſt five years, the precious metals have varied very little in their value, and probably this average price will be made a rate, or rule, for the new coinage. We find here that gold has continued, during that period, at 4*l.* per ounce, which is about 2¾ per cent. above the mint price, and ſilver has been at an average of 5*s.* 7*d.* per ounce, which is about 8 per cent. above the mint price. It is alſo obſervable, that in the years 1800 and 1801, gold was 12 per cent., and ſilver 16 per cent. higher than the mint price.

While ſuch a diſparity exiſts between the mint and market prices of the precious metals, it is manifeſt that, notwithſtanding the illegality of melting our coin, many of thoſe which are of full weight and fineneſs will be converted into bullion, when ſo conſiderable a profit is to be derived from the practice. Experience has too frequently ſhewn that, during the exceſs of the market above the mint price, our coins have diſappeared; and as various inconveniencies and difficulties were occaſioned by ſuch ſcarcity, attempts have been made to reduce the coins, particularly thoſe of ſilver, to a deterioration adequate to the market price; and to this may, in ſome meaſure, be aſcribed the preſent deficiency of our ſilver coins.

Attempts have been likewiſe made to reduce the gold coins, but without any conſiderable effect; a laudable attention having been always paid to their weight; but it has been found impracticable to pay the ſame attention to ſilver money; for whenever a ſcarcity of it prevails, great inconvenience is experienced, in all the inferior departments of buſineſs. The public offices, therefore, and the bank, have generally connived at the debaſement of our ſilver coins. The following was their reduced ſtate in 1798, as reported by certain officers of the mint, who had been appointed to take the ſame into conſideration.

Deficiency	of crowns -	3 per cent.
	of half-crowns -	9 per cent.
	of ſhillings -	24 per cent.
	of ſixpences -	38 per cent.

Since the above period, a ſtill greater deterioration has taken place, inſomuch, that it is generally ſuppoſed our inferior ſilver coins at preſent are worth very little more than half their nominal value.

Among the cauſes which have contributed to the depreciation of our coin, and to the advanced prices of bullion, ſome reckon the reſtriction, laid on the Bank of England, from paying in ſpecie; a meaſure which took place by order of government in 1797, and which, however, has hitherto proved ſalutary. But when and in what manner payment will be reſumed, is a queſtion of ſome difficulty, as well as importance. It is obvious, from what has been already ſtated, that good coins cannot be ſafely iſſued to any large amount, until a new rate of coinage ſhall have taken place; and the preſent political ſtate of Europe is another cauſe that renders the continuance of the reſtriction neceſſary.

In the year 1798, his majeſty appointed a committee of certain members of the privy council, to take into conſideration the ſtate of the coins of the kingdom, and the eſtabliſhment and conſtitution of the mint, and to propoſe ſuch improvements, in both theſe reſpects, as might to them appear neceſſary. At the head of this committee, was lord Liverpool, whoſe talents for buſineſs have been long acknowledged.

In 1805, his lordſhip publiſhed a "Treatiſe on the Coins of the Realm, in a Letter to the King," a work of great intelligence and reſearch, and which contains a very accurate hiſtory of the Britiſh coins, from the conqueſt to the preſent time; and alſo a learned and intereſting diſquiſition on the monetary regulations of the ancients.

Among the new principles which this publication is intended to eſtabliſh, are the following on coinage:

That the coins, which are the principal meaſure of property, ſhould be compoſed of one metal only.—That this metal ſhould be gold.—And that the expences of fabrication (*i. e.* the mint expences) ſhould be taken out of the ſilver and copper coins.

Theſe principles, as well as various other important queſtions in lord Liverpool's work, are ably inveſtigated by Mr. Wheatly in a recent publication, entitled "An Eſſay on the Theory of Money, and the Principles of Commerce." But as the plan of the new coinage is not yet finally ſettled, or, at leaſt, not made known to the public, we want data to proceed on the ſubject. We ſhall therefore cloſe the preſent article with the following tables of the principal coins now in circulation; and when our work arrives at the articles MINT and MONEY, we propoſe to give an account of whatever new coinages may have then taken place in England and elſewhere, and alſo to give full and accurate tables of all the real and imaginary monies of the Univerſe.

A TABLE of the principal Gold Coins now current, containing their Weight, Fineneſs, Pure Contents, Current Value, and Intrinſic Value in Sterling, according to the Mint Price.

		Weight.	Fineneſs.		Contents in pure Gold.	Current Value.	Value in Sterling.		
		Grs.	Carats.	Grs	Grs.		l.	s.	d.
Austrian Dominions,	Souverain, ſingle	85.50	22		78.37	6 florins 40 creutzers		13	10
	Ducat Kremnitz or Hungarian	53.85	23	3	53.29	4 florins 30 creutzers		9	5¼
Bavaria,	Carolin d'or	150.32	18	2⅚	117.18	10 florins 42 creutzers	1	0	9
	Max d'or	100.21	18	2⅚	78.12	7 florins 8 creutzers		13	10
Brunswick,	Carl d'or	102.36	21	3	92.76	5 rix-dollars		16	5¼
Bern,	Ducat	54.31	23	2	53.18	7 livres 4 ſous		9	5
Denmark,	Ducat current	48.21	21	0⅓	42.35	12 marks Daniſh		7	6
East Indies,	Mohur, or gold rupee	176.50	23		169.15	15 ſilver rupees	1	9	11¼
	Star pagoda	52.75	19	2	42.86	3¾ ſilver rupees		7	7
England,	Guinea	129.44	22		118.65	21 ſhillings	1	1	0
	Half guinea	64.72	22		59.32	10½ ſhillings		10	6
	Seven ſhilling piece	43.15	22		39.55	7 ſhillings		7	0
Flanders,	See Auſtrian Dominions.								
France,	Louis d'or, old, (coined before 1786)	125.51	21	2½	113.09	24 livres		19	11¾
	Louis d'or, new, (coined ſince 1786)	117.66	21	2½	106.02	24 livres		18	9¼
	Napoleon, or piece of 40 francs, (new coins)	199.25	21	0⅘	179.33	40 francs	1	11	8¾
Geneva,	Piſtole	87.08	22		79.82	10 livres		14	1½
Genoa,	Sequin	53.90	23	3½	53.62	13 lire 10 ſoldi		9	5¾
	Genovina d'oro	434.20	21	3½	396.74	100 lire	3	10	2½
	New piece of 96 lire	390.	21	3¼	354.45	96 lire	3	2	9
Germany,	Ducat *ad legem Imperii*	53.85	23	2⅔	53.10	varies in different places		9	4¾
Hamburgh,	See Germany.								
Hanover,	George d'or	103.03	21	3	93.37	5 rix-dollars		16	6¼
	Gold gulden	50.11	18		37.58	2 rix-dollars		6	8
Holland,	Ryder	153.55	22		140.75	14 florins	1	4	11
	Ducat	53.85	23	2⅓	52.91	5 florins 5 ſtivers		9	4½
Malta,	Louis d'or, double	260.24	20	2	222.25	20 ſcudi current, or 13⅓ ſcudi ſilver	1	19	5
Milan,	Doppia or piſtole	96.87	21	3⅓	88.13	25 lire 3 ſoldi		15	7
Naples	Double ounce, or ſix ducat piece	135.78	21		118.81	6 ducats	1	1	3
Piedmont,	Doppia or piſtole, old, (coined before 1785)	148.56	21	3	134.63	24 lire	1	3	9¾
	Ditto new (coined ſince 1785)	140.80	21	3	127.61	24 lire	1	2	7
	Sequin	53.50	23	3½	53.22	9 lire 15 ſoldi		9	5¼
Poland,	Ducat, ſee Germany.								
Portugal,	Joaneſe	221.40	22		202.95	6400 rees	1	15	11
	New cruſade	15.75	21	3½	14.36	480 rees		2	6
Prussia,	Frederick d'or.	103.03	21	3	93.37	5 rix-dollars 8 gros		16	6¼
Rome,	Sequin	52.90	23	2¼	51.94	21½ paoli		9	2½
	Doppia	84.46	21	2¾	76.32	31½ paoli		13	5¾
Russia,	Imperial of the coinage of 1763	202.18	22		185.33	10 rubles	1	12	9½
	Ditto of the coinage of 1801	188.27	23	2½	185.33	10 rubles	1	12	9½
Saxony,	Auguſte d'or	102.	21	2⅓	91.83	5 rix-dollars		16	3½
Sicily,	Ounce	68.75	21	0½	60.34	30 turi		10	8½
Spain,	Doubloon or piſtole, ſingle coined before 1772)	104.62	22		95.90	80 reals 10 maravedis		16	11¾
	Ditto (coined ſince 1772)	104.62	21	2	93.72	80 reals vellon		16	7
Sweden,	Ducat	53.70	23	2⅓	52.95	1 rix-dollar 46 ſhillings		9	4
Turkey,	Sequin Funduci of 1764	54.15	23		51.89	Theſe pieces paſs for a greater or leſs number of piaſtres, according to the frequent changes and degradations of the Turkiſh coins.		9	2¼
	Mahbub of 1781	40.61	19	1	32.57			5	9
	Niſſie of 1781	20.30	19	1	16.28			2	10½
	Roubbie do.	10.15	19	1	8.14			1	5¼
Tuscany,	Ruſpono	161.55	23	3½	160.71	40 lire	1	8	6
	Sequin gigliato	53.85	23	3½	53.57	13⅓ lire		9	6
Venice,	Sequin	54.	23	3½	53.72	22 lire piccole		9	6
United States of America,	Eagle	270.	22		247.50	10 dollars	2	3	8

A TABLE of the principal Silver Coins now Current, containing their Weight, Fineneſs, Pure Contents, Current Value, and Intrinſic Value in Sterling, according to the Mint Price of Silver.

		Weight.	Fineneſs.		Contents in pure Silver.	Current Value.	Value in Sterling.	
		Grs.	Ozs.	Dwts	Grs.		s.	d.
AIX-LA-CHAPELLE,	Rathſpruefentger	95.68	7	1	56.22	16 marks current	0	7¼
AUSTRIA,	See Germany, (convention coins)							
BASIL,	Rix-dollar (coined ſince 1764)	360.40	10	2½	304.10	30 batzes	3	6¼
BAVARIA,	See Germany.							
BERN,	Patacon	417.63	10	8	362.95	3 livres 10 ſous	4	2½
	10 Batzes piece	125.43	10	2½	105.84	20 ſous	1	2¼
	5 Batzes piece	69.27	9	3⅓	52.91	10 ſous	0	7
BOLOGNA,	See Rome.							
DENMARK,	Rix-dollar, ſpecie	447.90	10	10	391.91	7 marks, 6 ſhillings current	4	6¾
	Krohn, or crown, ſingle	344.	8	1	230.77	4 marks, 4 ſhillings current	2	8¼
ENGLAND,	Crown	464.50	11	2	429.66	5 ſhillings	5	
	Half crown	232.25	11	2	214.83	2½ ſhillings	2	6
	Shilling	92.90	11	2	85.93	12 pence	1	
EAST INDIES,	Rupee Sicca	179.55	11	15⅕	175.96	16 annas	2	0½
	Do. Bombay	178.31	11	14⅚	174.48	Do.	2	0¼
	Do. Surat	178.	11	2	164.65	Do.	1	11
	Do. Arcot	176.20	11	12	170.33	10 fanams	1	11¾
	Do. Madras	178.31	11	14⅚	174.48	Do.	2	0¼
FLANDERS,	Ducatoon	513.47	10	8¾	446.42	3 florins 11 ſtivers current	5	2¼
	Crown	456.91	10	8¾	397.43	3 florins 3 ſtivers current	4	7½
FRANCE,	Ecu, or crown	451.62	10	17½	409.29	6 livres	4	9¼
	5 franc piece, (new coin)	386.18	10	16	347.56	5 francs	4	0¼
GENEVA,	Ecu, or patagon	416.87	10		347.39	3 livres	4	0½
GENOA,	Scudo d'argento, or Genovina (full weight)	594.54	11	10	569.77	10 lire	6	7½
	Do. light	547.	11	10	524.21	9 lire 12 ſoldi	6	1¼
	Scudo di St. Giambatiſta	316.45	11	1	291.39	5 lire 4 ſoldi	3	4½
	Giorgino	87.30	10	6⅔	75.17	26 ſoldi	0	10½
	Madonnina	70.24	10	2	59.11	1 lira, or 20 ſoldi	0	8¼
	New piece of 8 lire, of 1789	500.	11		458.33	8 lire	5	4
GERMANY,	Rix-dollar, conſtitution, (coined after the rate of 1566.)	450.90	10	13⅓	400.81	Theſe coins bear an agio againſt the convention coins	4	8
	Florin, ditto	225.45	10	13⅓	200.40		2	4
	Rix-dollar, convention, (coined after the rate of 1753)	432.93	10		360.78	2 florins	4	2
	Florin, or piece of ⅔ do.	216.46	10		180.39	60 creutzers	2	1
	Copfſtück	103.70	7		60.49	20 creutzers	0	8½
HAMBURGH,	Rix-dollar, banco	444.30	10	12	340.63	3 marks banco	4	6¾
	Mark, current	141.50	9		106.13	16 ſhillings current	1	2¾
HANOVER,	See Germany, (conſtitution coins.)							
HOLLAND,	Ducatoon	504.20	11	5	472.69	63 ſtivers	5	6
	Three gilder piece	486.40	11		445.87	60 ſtivers	5	2¼
	Daalder	243.20	11		222.93	1½ florin	2	7
	Albert's dollar	433.17	10	8⅓	376.62	50 ſtivers	4	4½
	Gilder, or florin	162.70	10	18¾	148.29	20 ſtivers	1	8¼
	Rix-dollar, ſpecie or banco	443.80	10	11⅔	391.88	52 ſtivers	4	6½
	Lewendaler, or Lyondollar	422.70	8	17½	312.63	42 ſtivers	3	9¼
	Goldgilder	301.90	8	5	207.56	28 ſtivers	2	8½
LUBECK,	Rix-dollar, current	424.20	9		318.15	3 marks	3	8½
LUNEBURG,	Fine piece of two thirds	201.70	11	15½	197.92	24 mariengroſchen	2	3¾
MECKLENBURG,	See Hamburgh, mark current.							
MALTA,	Ounce	458.70	10		382.25	2½ ſcudi current	4	5½
	Scudo	183.48	10		152.90	12 tari	1	9¼
MILAN,	Filippo	430.	11	6⅔	406.11	7 lire 10 ſoldi	4	8¾
NAPLES,	Ducat	338.60	10	17½	306.85	10 carlini	3	7
PIEDMONT,	Scudo	543.05	10	17½	492.15	6 lire or livres	5	8¾

A TABLE of Silver Coins, &c.—*(continued.)*

		Weight.	Fineneſs.		Contents in pure Silver.	Current Value.	Value in Sterling.	
		Grs.	Ozs.	Dwts.	Grs.		s.	d.
POLAND, -	Rix-dollar (coined ſince 1787)	424.47	9	15	345.60	8 florins, Poliſh	4	0¼
	Double florin, Poliſh, id.	142.90	7		83.61	60 Poliſh groſchen	0	11¾
	Single florin, do. id.	81.31	6	7½	43.20	30 Poliſh groſchen	0	6
PORTUGAL, -	New cruſade, (coined ſince 1750)	265.68	10	16	239.11	480 rees	2	9¼
PRUSSIA, -	Rix-dollar -	343.40	9		257.55	24 good groſchen	3	
ROME, - -	Scudo - -	413.24	10	19⅙	378.83	10 paoli, or 5 lire	4	4½
RUSSIA, -	Ruble of the coinage of 1764	369.88	9		277.41	out of currency	3	3
	Do. of the coinage of 1801	277.55	10	8	240.54	100 copecks	2	9½
	Livoneſe of 1757 -	406.50	9		304.88	out of currency, it was originally worth 96 copecks	3	6¾
SAXONY, -	See Germany. -							
SICILY, -	Ounce - -	1045.85	10	14	932.55	30 tari	10	10
	Scudo - -	418.34	10	14	373.02	12 tari	4	4
SPAIN, -	Dollar (coined before 1772)	418.47	11		383.60	20 reals vellon	4	5½
	Do. (coined ſince 1772)	418.47	10	15	374.78	Do.	4	4½
SWEDEN, - -	Rix-dollar, ſpecie -	451.67	10	10⅚	396.78	48 ſhillings	4	7½
ST. GALL, -	Rix-dollar - -	430.70	10	7½	372.64	2 florins	4	4
TUSCANY, -	Franceſcone, or Leopoldone	426.14	10	18⅓	389.17	10 paoli or 6⅔ lire	4	6
	Tallaro, or Scudo -	418.55	10	18⅓	381.26	9 paoli, or 6 lire	4	5
TURKEY, -	Piaſtre of 1780 -	277.	6		138.50	40 paras	1	7¼
	Do. of 1801 -	198.	5	16	95.70	Do.	1	1⅛
UNITED STATES,	Dollar - -	416.	10	14	370.93	1 dollar	4	3¾
VENICE, -	Scudo della croce -	490.62	11		449.66	12 lire 8 ſoldi piccole	5	3
	Giuſtina - -	431.48	11		395.52	11 lire piccole	4	7¼
	Ducat - -	351.58	9	18⅓	291.04	8 lire piccole	3	4½
ZURICH, -	Ecu, or rix-dollar -	436.90	10	7	376.83	2 florins	4	4½

In the foregoing tables, double pieces, and the fractional parts of coins are generally omitted, eſpecially where they are of the ſame ſtandard, and of the due proportional weight. Thus, double and half Louis-d'ors are omitted, as their weight and value may be found from the ſingle Louis-d'or. The ſame may be obſerved of the Souverain, the Frederick, the Eagle, the Italian and Spaniſh piſtoles; the Portugal and Italian gold coins, and the ſilver coins of moſt countries. In ſome places, however, the inferior pieces are of inferior ſtandard; and ſuch are noticed in the table.

It ſhould be alſo obſerved that the fineneſs of gold and ſilver, in the foregoing tables, is expreſſed in the Engliſh manner; although a difference prevails in this reſpect in moſt countries.

Some nations expreſs the fineneſs of gold, like the Engliſh, by ſuppoſing the whole weight to be divided into 24 equal parts, or carats; but the diviſions of the carat vary. In America, Turkey, Spain, and Portugal, the carat is divided, as in England, into 4 grains; in Holland, Germany, Sweden, and Denmark, it is divided into 12 grains; in Genoa and Leghorn, it is divided into 8; in Rome, Milan, and other parts of Italy, into 24 parts; and in the old ſyſtem of France the carat was divided into 32 parts; but in all the above places, the number of carats is 24.

The fineneſs of ſilver in Holland, Portugal, Spain, and moſt parts of Italy, is expreſſed by dividing the unit or pound into 12 parts, called deniers, denari, or penny-weights; in Genoa, the pound of fine ſilver is divided into 12 ounces, and the ounce into 24 denari; in Germany, Switzerland, Denmark, and Sweden, the mark is divided into 16 loths, and the loth into 18 grains. In Turkey they reckon, for ſilver, 100 carats, and each carat is 4 grains.

In ſome countries, the expreſſion of fineneſs, both of gold and ſilver, is the ſame. Thus, in France, according to the new ſyſtem, any quantity of either metal is ſuppoſed to be divided into 1000 equal parts, called milliemes. In Ruſſia, they reckon the pound of each metal at 96 ſolotnicks; in Venice, at 1152 carats. In China, and the Eaſt Indies, pure gold or ſilver is ſaid to be 100 touch, and the degrees of fineneſs are expreſſed by the 100th parts; thus 90 touch means 90 parts of pure metal, and 10 of alloy, that is ⁹⁄₁₀ths fine.

It may alſo be uſeful to know that the aſſayers of gold and ſilver in England, in their reports, do not expreſs the fineneſs (as it is in theſe tables) by the whole proportion of pure metal, and its alloy; but by the quantity in which it differs from the Engliſh ſtandard. Thus, a Dutch ducat is ſtated to be 1 carat, 2 grains, B. that is, better than Engliſh ſtandard, which means that it is 23 carats, 2 grains fine; and a French ſilver piece of 5 francs is ſtated to be 7 dwts. W. that is, worſe than Engliſh ſtandard.

As the value of the coins in the foregoing tables is only computed at the Engliſh mint price; it will be proper to ſhew how their value may be found at any other price. Suppoſe, for example, it is required to find the value of a Portugal Joaneſe at 4*l.* per oz. The weight, per table, being 221.4 grs. and the fineneſs 22 carats.

Here the fineneſs being the ſame as the Engliſh ſtandard, the value of the price may be found by a ſingle ſtating: thus,

As 1 oz. or 480 grs. : 80*s.* :: 221.4. grs. : 36*s.* 10⅘*d.* the value required.

But if it be required to find the value of a Spaniſh dollar, of the weight of 418.47 grs. and 10 oz. 15 dwts. fine, the market price of ſtandard ſilver being 5*s.* 8*d.* per oz.

Here the fineneſs muſt be firſt reduced to the Engliſh ſtandard; thus,

As 11 oz. 2 dwts. : 10 oz. 15 dwts. or as 222 : 215 :: 418.47 grs. : 405.275 grs.; the quantity of ſtandard ſilver contained in the dollar.

Then, as 480 grs. : 405.275 grs. :: 68 *d.* : 4 *s.* 9½ *d.* the value required; which agrees with the preſent market price of new dollars, that is, 5 *s.* 6 *d.* per oz. for as 405.275 grs. : 4 *s.* 9½ *d.* :: 1 oz. : 5 *s.* 6 *d.*

Suppoſe it were required to find the value in ſterling of a French 5 franc piece, from the following report of the aſſayer, weight 16 dwts. 1 gr.—Fineneſs 7 dwts. W. Here 11 oz. 2 dwts. — 7 dwts. = 10 oz. 15 dwts.; then ſay,

As 11 oz. 2 dwts. : 10 oz. 15 dwts. or as 222 : 215 :: 385 grs. : 372.9 grs.; the quantity of ſtandard ſilver contained in the piece.

Then as 1 oz. or 480 grs. : 372.9 grs. :: 62 *d.* : 48.17 *d.* or 4 *s.* 0¼ *d.* nearly, the value of the piece according to the mint price; but according to the preſent market price, 5*s*. 8 *d.*, it is worth 4 *s.* 4¾ *d.*

The following are the principal writers on coins. Arbuthnot on ancient coins. Locke, Lowndes, Snelling, Folkes, and lord Liverpool on Engliſh coins. Simon on Iriſh coins. Le Blanc, and Bouteroue on French. Benaven on Italian. Bircherod on Daniſh, and Brenner on Swediſh coins. The following authors have written on coins in general, Krauſe of Hamburgh. Ricard of Amſterdam. Gerhart of Berlin. Marien of Spain. Richbourg and Bonneville of France, and Du Boſt of London. A general treatiſe on coins, including exchanges, weights, and meaſures, is now in the preſs, and will ſhortly be publiſhed, under the title of the "Univerſal Cambiſt," from the manuſcript of which the preſent article has been extracted.

Coin, *Laws relating to.* The coining of money is in all ſtates the act of the ſovereign power, that its value may be thus known on inſpection: and with reſpect to coinage in general, there are three ſubjects of conſideration, *viz.* the materials, the impreſſion, and the denomination.

With regard to the materials, ſir Edward Coke lays it down (2 Inſt. 577), that the money of England muſt be either of gold or ſilver; and none other was ever iſſued by the royal authority till 1672, when copper farthings and half-pence were coined by king Charles II., and ordered by proclamation to be current in all payments under the value of ſix-pence, and not otherwiſe. But this copper-coin is not upon the ſame footing with the other in many reſpects, particularly with regard to the offence of counterfeiting it. And, as to the ſilver coin, it is enacted by ſtatute 14 Geo. III. c. 42, that no tender of payment in ſilver money, exceeding 25 pounds at one time, ſhall be a ſufficient tender in law, for more than its value by weight, at the rate of 5*s.* 2*d.* an ounce.

As to the impreſſion, the ſtamping of it is the unqueſtionable prerogative of the crown; for, though divers biſhops and monaſteries had formerly the privilege of coining money, yet, as ſir Matthew Hale obſerves (1 Hal P. C. 191), this was uſually done by ſpecial grant from the king, or by preſcription, which ſuppoſes one; and, therefore, was derived from, and not in derogation of, the royal prerogative. Beſides that they had only the profit of the coinage, and not the power of inſtituting either the impreſſion or the denomination; but had uſually the ſtamp ſent them from the exchequer.

The denomination, or the value for which the coin is to paſs current, belongs likewiſe to the king's prerogative; and, if any unuſual pieces are coined, that value muſt be aſcertained by proclamation. In order to fix the value, the weight and fineneſs of the metal are to be jointly conſidered. When a given weight of gold or ſilver is of a given fineneſs, it is then of the true ſtandard, and called eaſterling, or ſterling metal. (See Coin *ſupra.*) And of this ſterling metal, all the coin of the kingdom muſt be made, by ſtat. 25 Edw. III. c. 13. So that the king's prerogative, as judge Blackſtone obſerves, ſeemeth not to extend to the debaſing or inhancing the value of the coin, below or above the ſterling value (2 Inſt. 577.); though ſir Matthew Hale (1 Hal P. C. 194.) appears to be of another opinion. The king may alſo, by his proclamation, legitimate foreign coin, and make it current here; declaring at what value it ſhall be taken in payments. (Ibid. 197.) But this, Blackſtone apprehends, ought to be by compariſon with the ſtandard of our own coin; otherwiſe the conſent of parliament will be neceſſary. There is at preſent no ſuch legitimated money; Portugal coin being only current by private conſent. ſo that every one who pleaſes may refuſe to take it in payment. The king may alſo at any time decry, or cry down, any coin of the kingdom, and make it no longer current. (1 Hal. P. C. 197.)

Two offences reſpecting the coin are made treaſon by the ſtatute 25 Edw. III. c. 2. Theſe are the actual counterfeiting of the gold and ſilver coin of this kingdom, or the importing of ſuch counterfeit money with an intent to utter it, knowing it to be falſe. The crime itſelf is made a ſpecies of high treaſon; as being a breach of allegiance by infringing the king's prerogative, and aſſuming one of the attributes of the ſovereign, to whom alone it belongs to ſet the value and denomination of coin made at home, or to fix the currency of foreign money; and, beſides, as all money, which bears the ſtamp of the kingdom, is ſent into the world upon the public faith, as containing metal of a particular weight and ſtandard, whoever falſifies this is an offender againſt the ſtate, by contributing to render that public faith ſuſpected. Upon the ſame reaſons, by a law of the emperor Conſtantine (C. 29. 24. 2. Cod. Theod. de falſa Moneta, l. 9.), falſe coiners were declared guilty of high treaſon, and were condemned to be burnt alive; as, by the laws of Athens (Potter, Antiq: B. i. c 26.), all counterfeiters, debaſers, and diminiſhers of the current coin were ſubjected to capital puniſhment. This method of reaſoning, however, ſays judge Blackſtone, is a little overſtrained; counterfeiting or debaſing the coin being uſually practiſed, rather for the ſake of private and unlawful lucre, than out of any diſaffection to the ſovereign. And therefore, both this and its kindred ſpecies of treaſon, that of counterfeiting the ſeals of the crown, or other royal ſignatures, ſeem better denominated by the later civilians a branch of the "crimen falſi," or forgery, (in which they are followed by Glanvil (l. 14. c. 7.), Bracton (l. iii c. 3. § 1 and 2.), and Fleta (l. 1. c. 22.), than by Conſtantine and our Edward III. a ſpecies of the "crimen læſæ majeſtatis," or high treaſon. For this confounds the diſtinction and proportion of offences; and, by affixing the ſame ideas of guilt upon the man who coins a leaden groat, and him who aſſaſſinates his ſovereign, takes off from that horror which ought to attend the very mention of the crime of high treaſon, and makes it more familiar to the ſubject. Before the ſtatute 25 Edw. III., the offence of counterfeiting the coin was held to be only a ſpecies of petit treaſon (1 Hal. P. C. 224.); but ſubſequent acts in their new extenſions of the offence have followed the example of that ſtatute, and have made it equally high treaſon with an endeavour to ſubvert the government, though not quite equal in its puniſhment. In conſequence of the principle thus adopted, the ſtatute 1 Mar. c. 1, having at one ſtroke repealed all intermediate treaſons created ſince the 25 Edw. III., it was thought expedient by ſtat. 1 Mar. ſt. 2. c. 6, to revive two ſpecies thereof, *viz.* 1. That if any perſon falſely forge or counterfeit any ſuch kind of coin of gold or ſilver, as is not the proper coin of this realm, but ſhall be current within this realm by conſent of the crown; or, 2. Shall falſely forge or counterfeit the ſign manual, privy ſignet, or privy ſeal; ſuch offences ſhall be deemed high treaſon. And by ſtatute 1 and 2 P. and M. c. 11., if any perſons do bring into this realm ſuch falſe or counterfeit foreign money, being current here, knowing the ſame to be falſe, with intent to utter the ſame in payment, they ſhall be deemed offenders in high treaſon. The money referred to in theſe ſtatutes muſt be ſuch as is abſolutely current here, in all payments, by the king's proclamation; of which there is none at preſent, Portugal money being only taken by conſent, as approaching the neareſt to our ſtandard, and falling in well enough with our diviſions of money into pounds and ſhillings; therefore, to counterfeit it is not high treaſon, but another inferior offence.

Clipping or defacing the genuine coin was not hitherto included in theſe ſtatutes; though an offence equally pernicious to trade, and an equal inſult upon the prerogative, as well as perſonal affront to the ſovereign; whoſe very image ought to be had in reverence by all loyal ſubjects. And, therefore, among the Romans, (Ff. 48. 4. 6.), defacing or even melting down the emperor's ſtatues was made treaſon by the Julian law; together with other offences of the like ſort, according to that vague concluſion, "aliudve quid ſimile ſi admiſerint." And now, in England, by ſtatute 5 Eliz. c. 11, clipping, waſhing, rounding, or filing, for wicked gain's ſake, any of the money of this realm, or other money ſuffered to be current here, ſhall be adjudged high treaſon; and by ſtatute 18 Eliz. c. 1, the ſame ſpecies of offence is deſcribed in other more general words, *viz.* impairing, diminiſhing, falſifying, ſcaling, and lightening, and made liable to the ſame penalties. By ſtat. 8 and 9 W. III. c. 26, made perpetual by 7 Ann. c. 25, whoever, without proper authority, ſhall knowingly make or mend, or aſſiſt in ſo doing, or ſhall buy, ſell, conceal, hide, or knowingly have in his poſſeſſion, any implements of coinage ſpecified in the act, or other tools or inſtruments proper only for the coinage of money; or ſhall convey the ſame out of the king's mint; he, together with his counſellors, procurers, aiders, and abettors, ſhall be guilty of high treaſon. The ſtatute proceeds to enact, that to mark any coin on the edges with letters, or otherwiſe, in imitation of thoſe uſed in the mint; or to colour, gild, or caſe over any coin reſembling the current coin, and even round blanks of baſe metal, ſhall be conſtrued high treaſon. But all proſecutions on this act are to be commenced within *three* months after the commiſſion of the offence; except thoſe for making or mending any coining tool or inſtrument, or for marking money round the edges; which are directed to be commenced within *ſix* months after the offence committed. (Stat. 7 Ann. c. 25.) And, laſtly, by ſtatute 15 and 16 Geo. II. c. 28, if any perſon colours or alters any ſhilling or ſix-pence, either lawful or counterfeit, to make them reſpectively reſemble a guinea or half-guinea; or any half-penny or farthing to make them reſpectively reſemble a ſhilling or ſix-pence; this is alſo high treaſon; but the offender ſhall be pardoned in caſe (being out of priſon) he diſcovers and convicts two other offenders of the ſame kind. For the puniſhment of this ſpecies of treaſon; ſee Treason.

Offences relating to the coin, not amounting to treaſon, to which claſs we may refer ſome inferior miſdemeanors that do not amount to felony, are thus declared by a ſeries of ſtatutes, which we ſhall recite in the order of time. By ſtat. 27 Edw. I. c. 3. none ſhall bring pollards and crockards, which were foreign coins of baſe metal, into the realm, on pain of forfeiture of life and goods. But by ſtat. 9 Edw. III. ſt. 2. no ſterling money ſhall be melted down, upon pain of forfeiture thereof. By ſtat. 17 Edw. III. none ſhall be ſo hardy as to bring falſe and ill money into the realm, on pain of forfeiture of life and member by the perſons importing, and the ſearcher permitting ſuch importation. By ſtat. 3 Hen. V. ſt. 1. to make, coin, buy, or bring into the realm, any gally-halfpence, ſuſkins, or dotkins, in order to utter them, is felony; and knowingly to receive or pay either them or blanks, (ſt. 2 Hen. VI. c. 9.) is forfeiture of 100*s*. By ſtat. 14 Eliz. c. 3. ſuch as forge any foreign coin, although it be not made current here by proclamation, ſhall (with their aiders and abettors) be guilty of miſpriſion of treaſon. By ſtat. 13 and 14 Car. II. c. 31. the offence of melting down any current ſilver money ſhall be puniſhed with forfeiture of the ſame, and alſo the double value; and the offender, if a freeman of any town, ſhall be disfranchiſed; if not, ſhall ſuffer ſix months' impriſonment. By ſtat. 6 and 7 Will. III. c. 17. if any perſon buys or ſells, or knowingly has in his cuſtody, any clippings or filings of the coin, he ſhall forfeit the ſame, and 500*l*.; one moiety to the king, and the other to the informer; and be branded in the cheek with the letter R. (See *Benefit of* Clergy.) By ſtat. 8 and 9 Will. III. c. 26. if any perſon ſhall blanch or whiten copper for ſale, (which makes it reſemble ſilver), or buy or ſell, or offer for ſale, any malleable compoſition, which ſhall be heavier than ſilver, and look, touch, and wear like gold, but be beneath the ſtandard; or if any perſon ſhall receive or pay at a leſs rate than it imports to be of, (which demonſtrates a conſcioušneſs of its baſeneſs, and a fraudulent deſign), any counterfeit or diminiſhed milled money of this kingdom, not being cut in pieces, an operation which is expreſsly directed to be performed when any ſuch money ſhall be produced in evidence, and which any perſon, to whom any gold or ſilver money is tendered, is empowered, by ſtats. 9 and 10 Will. III. c. 21. 13 Geo. III. c. 71. and 14 Geo. III. c. 70. to perform at his own hazard, and the officers of the exchequer, and receivers-general of the taxes, are particularly required to perform; all ſuch perſons ſhall be guilty of felony, and may be proſecuted for the ſame at any time within three months after the offence committed.

But theſe precautions not being found ſufficient to prevent the uttering of falſe or diminiſhed money, which was only a miſdemeanor at common law, it is enacted by ſtatute 15 and 16 Geo. II. c. 28. that if any perſon ſhall utter or tender in payment, any counterfeit coin, (give in exchange, pay, or put off, 37 Geo. III. c. 126.) knowing it ſo to be, he ſhall, for the firſt offence, be impriſoned ſix months, and find ſecurity for his good behaviour for ſix months more; for the ſecond offence, ſhall be impriſoned two years, and find ſureties for two years longer; and, for the third offence, ſhall be guilty of felony without benefit of clergy. By the ſame ſtatute it is alſo enacted, that if any perſon counterfeits the copper coin, he ſhall ſuffer two years impriſonment, and find ſureties for two years more. By ſtat. 11 Geo. III. c. 40. perſons counterfeiting copper half-pence or farthings, with their abettors, or buying, ſelling, receiving, or putting off any counterfeit copper money (not being cut in pieces, or melted down) at a leſs value than it imports to be of, ſhall be guilty of a ſingle felony. This ſtatute alſo enacts, that one juſtice, on complaint upon oath that there is juſt cauſe for ſuſpicion againſt any perſons being concerned in counterfeiting the copper monies of this realm, may, by his warrant, cauſe the dwelling-houſe, &c. of ſuch ſuſpected perſon

ſon to be ſearched for coining tools and inſtruments; and if they be found, they ſhall be ſeized and produced in evidence againſt the proſecuted perſon, and afterwards defaced or deſtroyed, or diſpoſed of at the pleaſure of the court or juſtice. By 14 Geo. III. c. 42. which act was at firſt temporary, and was ſuffered to expire, but revived and made perpetual by 39 Geo. III. c. 75. if any quantity of money, exceeding the ſum of five pounds, being or purporting to be the ſilver coin of this realm, but below the ſtandard of the mint in weight or fineneſs, ſhall be imported into Great Britain or Ireland, the ſame ſhall be forfeited, and proſecuted in any court of record at Weſtminſter; but if it do not amount in value to 20*l.*, the ſame may be proſecuted in a ſummary way before two juſtices, at the election of the commiſſioners of the cuſtoms; and after condemnation, melted down or otherwiſe defaced, and ſhall be divided in equal moieties to the crown and proſecutor. By 37 Geo. III. c. 126. ſo much of the above-mentioned acts of 15 Geo. II. c. 28. and 11 Geo. III. c. 40. and all other acts concerning the copper monies, called an half-penny and a farthing, or any other copper money of this realm, ſhall extend to all copper money which ſhall be coined and iſſued by order of his majeſty. By the ſame ſtatute, if any perſon ſhall make, coin, or counterfeit any coin, not the proper coin of this realm, nor permitted to be current in it, but reſembling, or made with intent to reſemble any gold or ſilver coins of any foreign ſtate, or to paſs as ſuch, or if any perſon ſhall bring into this realm any falſe or counterfeit foreign coin, knowing the ſame to be ſo, with the intent of uttering the ſame within this realm; he ſhall, in either caſe, be guilty of felony, and may be tranſported for a term not exceeding ſeven years. By the ſame ſtatute, if any perſon ſhall have in his cuſtody, without lawful excuſe, more than five pieces of any falſe or counterfeit foreign coin, or made with intent to reſemble or paſs as ſuch foreign coin, he ſhall, upon conviction, on the oath of one witneſs, before one juſtice, forfeit the ſame, which ſhall be cut in pieces and deſtroyed by order of ſuch juſtice, and ſhall alſo forfeit not exceeding 5*l.* nor leſs than 40*s.* for every piece found in his cuſtody; half to the informer, and half to the poor; and if not forthwith paid, ſuch offender may be committed to the gaol, or houſe of correction to hard labour, for three calendar months, or till ſuch penalty ſhall be paid. By 43 Geo. III. c. 139. the counterfeiting of foreign coin is a miſdemeanor and breach of the peace; and the perſon that is convicted, ſhall, for the firſt offence, be impriſoned not exceeding a year, and for the ſecond offence be tranſported for ſeven years. The ſame ſtatute enacts penalties on perſons having more than five pieces of ſuch coin in their poſſeſſion, and directs the houſes of ſuſpected perſons to be ſearched, and counterfeit coin ſeized, &c. &c. By the ſame ſtatute, amending ſo much of ſeveral acts of 6 and 7, 7 and 8 Will. as relates to the exportation of ſilver bullion, the treaſury may grant licences for the exportation of molten ſilver and bullion; and perſons ſo licenſed may export ſuch bullion without the uſual certificates. But if any bullion is entered to be exported, otherwiſe than in the name of the true owner or importer, the exporter ſhall forfeit the ſame, or value, half to the king, and half to him who ſhall ſeize or diſcover the ſame.

By 3 Edw. I. c. 15. perſons taken for falſe money are not bailable by juſtices of the peace. It is not neceſſary there ſhould be two witneſſes in caſes of counterfeiting the coin, as it is in other high treaſons; but perſons may be convicted according to the courſe of the common law, by one witneſs only. The reward for apprehending and convicting an offender againſt the ſtatutes relating to gold and ſilver coin, is 40*l.* in order to obtain which, the judge ſhall give a certificate of the conviction, and the ſheriff, on its being tendered, ſhall pay the ſame without fee, within one month after tender and demand, on pain of forfeiting to the party, double the ſum with treble coſts: and the ſheriff ſhall be repaid out of the treaſury, 6 and 7 W. c. 17. 15 Geo. II. c. 28. In like manner, a reward of 10*l* ſhall be paid for apprehending and convicting one who counterfeits the copper money. 15 Geo. II. c. 28. The commiſſioners of the treaſury may iſſue a ſum not exceeding 600*l.* yearly, for the charge and expences of the officers, and others employed in the proſecution of offences of this kind. 7 Ann. c. 24. 15 Geo. II. c. 28.

In Scotland, by the articles of the Union, it is appointed, that all the coins be reduced to the Engliſh, and the ſame accompts obſerved throughout. Till that period the Scots had their pounds, ſhillings, and pence, as in England; but their pound was twenty pence Engliſh, and the others were in proportion: accordingly, their mark was $13\frac{1}{3}$*s.* Scots, current in England at $13\frac{1}{2}$*d.* their noble in proportion. Beſides theſe, they had their Turnorer pence, and half-pence; their penny, one twelfth of that of England; beſides baſe money of achiſons, baubees, and placks: the boddle, one ſixth of the penny, one fourth of the achiſon, one third of the baubee, and one half of the plack.

In Ireland, the coins are as in England; viz. ſhillings, pence, &c. with this difference, that their ſhilling or harper, is but equal to $11\frac{3}{40}$*d.* ſterling; or a ſhilling Engliſh is equal to twenty-ſix half-pence: whence their pound is only 18*s.* $4\frac{1}{2}$*d.* of Engliſh money. For an account of the coins of different parts of the world, with their proportions or values, we refer to the article MONEY. See alſo COIN *Supra.*

COINS, *Shells current for.*—Theſe ſerve in many places for money; and are brought from the Maldives, and called in the Indies *cowries:* on the coaſts of Africa, they change their names, and are called *bouges.*

In America they take a third name, *viz. porcelains.* Indeed thoſe laſt do come from the Maldives; there being ſhells found in the Weſt Indies much like thoſe of the Eaſt.

In the knigdom of Congo there is another kind of ſhells, called *zimbi;* though ſome will have them the ſame with the cowries. Cowries, coris, or bouges, are white ſhells, current particularly in the ſtates of the Great Mogul: ſixty-five are uſually reckoned equivalent to the done; a ſmall copper coin, worth about a halfpenny ſterling; which brings each cowry to $\frac{1}{130}$th of a penny ſterling.

Porcelains are nearly on the ſame footing with the cowries. See PORCELAIN.

*Z*imbi are current, particularly in the kingdoms of Angola and Congo. Two thouſand zimbis make what the negroes call a *maciute*, or *macoute;* which is no real money, whereof there is none in this part of Africa, but only a manner of reckoning: thus, two Flemiſh knives they eſteem a macoute; a copper baſon, two pounds weight, and twelve inches diameter, three macoutes; a fuſee ten, &c.

COINS, *Fruits current for.*—There are kinds of fruits current for coins; two in America, particularly among the Mexicans, which are the cacao and maiſe: the other in the Eaſt Indies, *viz.* almonds, brought thither from Lar, and growing in the deſarts of Arabia.

Cacao, fifteen of theſe are eſteemed equivalent to a Spaniſh rial, or ſeven-pence ſterling. See CACAO.

Maiſe has ceaſed to be a common money ſince the diſcovery of America by the Europeans.

Almonds are chiefly uſed where the cauris are not current. As the year proves more or leſs favourable to this fruit, the value of the money is higher or lower: in a common year, forty almonds are ſet againſt a percha, or halfpenny ſterling; which brings each almond to $\frac{1}{20}$th of a farthing.

Coins, *Ancient*, are thoſe chiefly which have been current among the Greeks, Jews, and Romans.

For Jewiſh Coins, *their Values and Proportions ſtand thus:*

				(Sterling.)	*l.*	*s.*	*d.*
				Gerah	0	0	$1\frac{50}{100}$
10				Bekah,	0	1	$1\frac{11}{16}$
20	2			Shekel,	0	2	$3\frac{3}{8}$
1200	120	50		Maneh, Mina Hebraica,	5	14	$0\frac{3}{4}$
60000	6000	3000	60	Talent,	342	3	9
				Solidus aureus, or ſextula, worth	0	12	$0\frac{1}{2}$
				Siclus aureus, worth	1	16	6
				A talent of gold, worth	5475	0	0

Value and Proportion of the ancient Grecian Coins.

										(Sterling.)	*s.*	*d.*	*qrs.*
										Lepton,	0	0	$0\frac{31}{330}$
7										Chalcus,	0	0	$0\frac{31}{48}$
14	2									Dichalcus,	0	0	$1\frac{7}{24}$
28	4	2								Hemiobolam,	0	0	$2\frac{7}{12}$
56	8	4	2							Obolus,	0	1	$1\frac{1}{6}$
112	16	8	4	2						Diobolum,	0	2	$2\frac{1}{2}$
224	32	16	8	4	2					Tetrobolum,	0	5	$0\frac{2}{3}$
336	48	24	12	6	3	$1\frac{1}{2}$				Drachma,	0	7	3
662	96	48	24	12	6	3	2			Didrachmon,	1	3	2
1324	112	96	48	24	12	6	4	2		Tetradrachm- ſtater,	2	7	0
1660	384	120	60	30	15	$7\frac{1}{2}$	5	$2\frac{1}{2}$	$1\frac{1}{4}$	Pentadr.	3	2	3

Note. Of theſe the drachma, didrachma, were of ſilver, the reſt, for the moſt part, of braſs. The other parts, as tridrachm, triobolus, &c. were ſometimes coined.

Note alſo, the drachma is here, with the generality of authors, ſuppoſed equal to the denarius: though there is reaſon to believe, the drachma was ſomewhat the weightier. See Drachma and Denarius.

(Sterling.)	*l.*	*s.*	*d.*
The Grecian gold coin was the ſtater aureus, weighing two Attic drachms, or half of the ſtater argenteus; and exchanging uſually for 25 Attic drachms of ſilver; in our money,	0	16	$1\frac{3}{4}$
According to our proportion of gold to ſilver	1	0	9
There were likewiſe the ſtater Cyzicenus, exchanging for 28 Attic drachms, or Stater Philippicus, and ſtater Alexandrinus, of the ſame value.	0	18	1
Stater Daricus, according to Joſephus, worth 50 Attic drachms, or Stater Crœſius, of the ſame value.	1	12	$3\frac{1}{2}$

Value and Proportion of the Roman Coins.

					(Sterling.)	*s.*	*d.*	*qrs.*
					Teruncius,	0	0	$0\frac{775}{1000}$
2					Sembella,	0	0	$1\frac{55}{100}$
4	2				Libella, As,	0	0	$3\frac{1}{10}$
10	5	$2\frac{1}{2}$			Seſtertius,	0	1	$3\frac{3}{4}$
20	10	5	2		Quinarius, Victoriatus,	0	3	$3\frac{1}{2}$
40	20	10	4	2	Denarius,	0	7	3

Note. Of theſe the denarius, victoriatus, ſeſtertius, and ſometimes the as, were of ſilver, the reſt of braſs.

There were ſometimes alſo coined of braſs the triens, ſextans, uncia, ſextula, and dupondius.

(Sterling.)	*l.*	*s.*	*d.*
The Roman gold coin was the aureus, which weighed generally double the denarius; the value of which, according to the firſt proportion of coinage, mentioned by Pliny, was,	1	4	$3\frac{3}{4}$
According to the proportion that obtains now amongſt us, worth,	1	0	9
According to the decuple proportion mentioned by Livy and Julius Pollux, worth,	0	12	11
According to the proportion mentioned by Tacitus, and which afterwards obtained, whereby the aureus exchanged for 25 denarii, its value,	0	16	$1\frac{3}{4}$

Theſe tables are formed on the ſuppoſition that ſilver is worth five ſhillings, and gold four pounds an ounce. See Arbuthnot's Tables of Ancient Coins. See alſo on this ſubject an excellent paper by M. Raper, eſq. intitled "An Enquiry into the Value of the Ancient Greek and Roman Money, in the Phil. Tranſ. vol. lxi. part ii. art. 48. p. 462. See Denarius and Drachm. For a more particular and ample account of ancient coins and coinage; ſee the article Medal. See alſo Money.

Coin, in *Architecture*, a kind of dye, cut diagonal-wiſe, after the manner of the flight of a ſtair-caſe; ſerving at bottom to ſupport columns in a level; and at top to correct the inclination of an entablature, ſupporting a vault.

Theſe coins have alſo the ſame effect with round baluſters, which are not inclined according to any flight.

Coin *d'Artillerie*. Coins in gunnery are wedges which artilleriſts lay under the breeches of guns, for the purpoſe of raiſing or depreſſing and pointing them. They are commonly notched at the ſides, that they may the more eaſily be puſhed forward or drawn back.

Coin *de Manœuvre Militaire*, a certain diſpoſition or arrangement of troops, which the ancients made uſe of for penetrating into and breaking an enemy's line. It conſiſted of a corps, or body of troops, formed with a conſiderable depth, and very ſmall extent of front.

Coin is alſo uſed for a ſolid angle, compoſed of two ſurfaces

faces inclined towards each other; whether that angle be exterior, as the coin of a wall, a tree, &c. or interior, as the coin of a chamber, or chimney: from the word *cuneus*, wedge. See Quoin.

Coins, on board a man of war. See Quoins.

Coin-*moulds*. See Moulds.

Coins, *Canting*, on board a ſhip, little ſhort pieces of wood, or billets, cut wedge-like, to lie betwixt the caſks.

Coins, *Standing*, on board a ſhip, billets, or pipe-ſtaves, to keep the caſks from ſtirring, or giving way.

Standing-coins are made of barrel boards, about four inches broad, and of a fit length to be driven in between the ends of a caſk, about two or three hoops from the chine hoops, to keep the butts from jogging.

COINAGE, or Coining, or the art of making money, has hitherto been chiefly performed either by the hammer or the mill. The firſt method is now, and has, indeed, been long generally diſuſed, though it was the only one known till the reign of Henry II. of France, when the coining-mill was invented by Antoine Brucher, a French engraver, and the firſt money was ſtruck with it in that kingdom in the year 1553. The uſe of it continued there till 1585, when, in the 12th year of Henry III. it was laid aſide, on account of its great expence in compariſon of the coinage with the hammer; nor was it revived till the year 1645, when, by an edict of Louis XIV., it was eſtabliſhed for perpetuity. Queen Elizabeth had milled money, ſtruck in England ſo early as the year 1562; but it did not continue for more than 10 years; and the hammer was again adopted as leſs expenſive. This example was ſoon followed in France, till the ſubſequent ſucceſs of the mill in England was probably the cauſe of its re-eſtabliſhment in that kingdom, in 1645. Briot, a French artiſt, failing to induce the government of France to adopt the uſe of the mill, came to England in 1623.

Thus, this machine, like moſt new inventions, met at firſt with various fate, it being ſometimes uſed, and at others laid aſide; but in the 14th year of Charles II., that is, in the year 1662, the uſe of the mill and ſcrew (hereafter to be deſcribed) was finally eſtabliſhed in the mint of this kingdom.

Soon after the revival of the mill in this kingdom by Briot, the coinage of England arrived at a degree of perfection to which it had never before attained. This was owing in a great degree to the ingenuity of Thomas Simon, ſuppoſed to be a native of Yorkſhire, who, upon the return of Briot to France in 1646, ſucceeded him as chief engraver at the mint.

It was at this period, alſo, that graining was firſt placed on the edges of all our coins, and ſuch confidence was then placed in this new device, that it was deemed impoſſible for the coins of this kingdom to be injured by clipping or wearing. Experience, however, in a very ſhort time, proved that milled money, either of gold or ſilver, could be diminiſhed with great facility and expedition. This fraudulent practice was well known and carried on in the reign of king William.

In coining, either by the hammer or mill, the pieces of metal are ſtamped, or ſtruck, with puncheons or dyes, in which are engraved the ſovereign's effigies, with arms, legend, &c.

The ancients uſed neither the puncheon nor the matrice, but merely cut the impreſſion upon a ſteel dye; both are now uſed. The puncheon is a high-tempered piece of ſteel, upon which the coin is engraven in relievo, and then ſtamped upon the matrice, which is a piece of ſteel four or five inches long, ſquare at the bottom, and round at the top. The moulding of the border, and letters, are added on the matrice, with ſmall, ſharp, ſteel-puncheons. When thus completed, it is called a dye. The puncheon thus ſaves much labour in repeatedly engraving the ſubject of the coin; for a dye will ſometimes break with ſtriking one coin, the neceſſary force being ſo great.

It is not certain when this improvement commenced. It is believed that Simon, already mentioned, firſt introduced the idea of marking the crown and half-crown with a legend on the edge, as an ornament and protection to the coin; but the original inventor of this art is unknown. The firſt piece, yet known as an inſtance of it, is a ſilver "piedfort" of Charles IX. of France, dated 1573. The firſt medal is one in ſilver, of George Frederic, marquis of Brandenburg, dated 1589. Briot gave the firſt ſpecimen of it in Great Britain upon his Scottiſh coronation medal in 1633; and Simon, as we have juſt mentioned, introduced it into the larger coin, with great propriety, as it is both ornamental and preſerves ſuch pieces from being clipped. This operation is performed, ſince the year 1685, by means of a very ſimple, but ingenious machine, invented by M. Caſtaing, and then introduced into the French mint; and ſince that time into all the mints of Europe. It is deſcribed in the ſequel of this article.

The firſt operations are, the mixing and melting of the metal, becauſe there is no ſpecies of coin of pure gold or ſilver, but always a quantity of alloy of copper is mixed with them, or for the gold coin, the alloy is a mixture of ſilver and copper, as ſilver alone would make the coin too pale, and copper would give too high a colour. The alloy is uſed to render the coins harder, and leſs liable to be diminiſhed by art. See Alloy and Coin.

When the gold and ſilver are completely melted and mixed, they are poured into moulds, or frames, for caſting them into long flat bars: the method of doing this is preciſely the ſame with that uſed by founders, in ſand; both with regard to the frame, the manner of working the earth, and that of ranging the models, or patterns. Theſe patterns are flat plates of copper, about fifteen inches long, and nearly of the thickneſs of the ſpecies to be ſtruck. The only difference between caſting the bars of gold, and thoſe of other metals, conſiſts in this: that the latter are taken out of the crucibles with ladles, and poured into the aperture of the mould; and that for gold, the crucible is taken off from the fire with a pair of tongs, made for the purpoſe, and the metal is thence poured into the mould.

In coining by the mill, or milled money, the bars are taken out of the moulds, and ſcraped and bruſhed; they are then flattened in a mill, and brought to the proper thickneſs of the ſpecies to be coined. There is, however, this difference, that the plates of gold are heated again in a furnace, and quenched in water, before they undergo the operation of the mill; but the plates of ſilver are paſſed through the mill without any additional heating. The plates, whether of gold, ſilver, or copper, thus reduced as nearly as poſſible to their proper thickneſs, are cut into round pieces, called blanks, or planchets, with an inſtrument faſtened to the lower extremity of an arbor, whoſe upper end is formed into a ſcrew, which being turned by an iron handle, turns the arbor, and lets the ſteel, well ſharpened, in form of a punch cutter, fall on the plates; and thus a piece is punched out. See *Plate* (*Coinage*) *fig.* 1.

The pieces are now to be brought to the ſtandard weight by filing or raſping, and what remains of the plate between the circles is melted again, under the denomination of ſizel.

The pieces are now weighed in a very accurate balance, and thoſe that prove too light are remelted, but thoſe that are too heavy are filed to the ſtandard weight. When the blanks are adjuſted, they are carried to the blanching-houſe, that is, the place where the gold blanks are brought to their proper colour, and the ſilver ones are whitened; which operation is performed by heating them in a furnace, and when cooled, boiling them ſucceſſively in two copper veſſels, with water, common ſalt, and tartar, and after that ſcouring them well with ſand, and waſhing them with clear water, drying them over a wood fire, in a copper ſieve, in which they are put when taken out of the boiler. Formerly the planchets, as ſoon as blanched, were carried to the preſs to be ſtruck, and receive their impreſſions; but now they are firſt milled. The machine uſed for this purpoſe conſiſts of two plates of ſteel in form of rulers, on which the edging is engraved, half on the one, and half on the other. One of theſe plates is immoveable, being ſtrongly bound with ſcrews to a copper plate on a board or table; the other is moveable, and ſlides on the copper plate by means of a handle, and a wheel, or pinion, of iron, the teeth of which catch in other teeth, on the ſurface of the ſliding plate. The planchet, being placed horizontally between theſe two plates, is carried along by the motion of the moveable one; ſo as by the time that it has made half a turn, it is found marked all round. See *fig.* 2. Laſtly, the planchets, being thus edged, are to be ſtamped: that is, the impreſſion is to be given them in the mill, (ſee *fig.* 3,) by the French denominated *balancier*. The chief parts of this machine are, a beam, ſcrew, arbor, &c. all contained within the body of it, except the firſt, which is a long iron bar, with a heavy ball of lead at each end, and rings, to which are faſtened cords to give it motion. This bar is placed horizontally over the body of the machine; in the middle of the beam is faſtened a ſcrew, which, by turning the beam, ſerves to preſs the arbor underneath it; to the lower extremity of the arbor, placed perpendicularly, is faſtened the dye or matrix, of the reverſe or arm ſide, in a kind of box, or caſe, in which it is retained by ſcrews: and under this is a box containing the dye of the image ſide, firmly fixed to the lower part of the engine. See *fig.* 4. When the planchet is to be ſtamped, it is laid on the image-matrix, upon which two men draw one of the ropes of the beam, and turn the ſcrew faſtened in it; which, by this motion, lowers the arbor to which the dye of the arms is faſtened: thus the metal, being in the middle, at once receives an impreſſion on each ſide, and becomes money, but they have not currency till they have been weighed and examined. For the coining of medals, the proceſs is nearly the ſame with that of money. The principal difference conſiſts in this: that money, having but a ſmall relievo, receives its impreſſion at a ſingle ſtroke of the engine; whereas for medals, the height of their relievo makes ſeveral ſtrokes neceſſary. For this purpoſe, the piece is taken out from between the dyes, heated, and returned again; which proceſs, in medallions, is ſometimes repeated as many as fifteen or twenty times, before the full impreſſion is given. Medallions, and medals of high relievo, are uſually firſt caſt in ſand, and then put in the preſs to perfect them. Medals, therefore, receive their form and impreſſion by degrees; money all at once.

In coining with the hammer, the bars of metal being taken out of the moulds, are heated and ſtretched on an anvil; they are then cut to pieces, farther ſtretched, and rounded with ſheers; thus, by cutting and rounding they are reduced to the ſtandard weight, and to the ſize of the ſpecies to be coined. The blanks, or planchets, thus formed, are carried to the blanching-houſe, where they undergo the ſame preparation as the milled money deſcribed above, and are ſent to the minter to be ſtamped with the hammer. For this laſt operation, two puncheons, or matrices, are uſed: the one called the *pile*, and the other the *truſs*, or *quiver*; each engraven dent-wiſe; the pile bearing the arms, and the truſs the image; both their legend, date, &c. The pile, which is about eight inches high, has a kind of talon or heel in the middle, and ends in a point; this kind of figure was given, for the ſake of being more eaſily ſunk, and more firmly faſtened to the block on which the money is ſtruck. The minter, then, laying the planchet horizontally on the pile, and covering it with the truſs, which he holds ſteadily in his left hand, gives ſeveral ſmart blows on the truſs with an iron mallet held in the right; more or leſs, as the graving of the dyes is more or leſs deep. Thus the coinage is finiſhed, and the blanks converted into money, which, after they have been examined, become current.

We have now given a brief account of the modes of coining hitherto adopted in this country.

About 16 or 17 years ago the ingenious Meſſrs. Boulton and Watt of Birmingham began to apply the power of their ſteam-engine at the Soho manufactory, to the operations of coining, and have ſince coined a large quantity of two-penny, and penny pieces, of copper, and half-pence and farthings, for government, which are in general circulation; a few years ago, alſo, on the appearance of ſcarcity in the circulating medium, theſe gentlemen re-coined a large quantity of Spaniſh dollars for the Bank of England, without their being firſt melted, or the Spaniſh impreſſion obliterated, by rolling, or otherwiſe. The Daniſh government being deſirous of introducing the approved coining apparatus of Boulton and Watt, at the royal mint at Copenhagen, ſent over Olaus Warberg, one of the profeſſors in the univerſity of that city, to contract for, and ſuperintend the making of, and to learn the uſe of a complete ſet of ſteam-wrought coining apparatus; under the authority of a ſpecial act of parliament for that purpoſe, Meſſrs. Boulton and Watt have almoſt completed the apparatus for the Daniſh mint; and ere long it is expected to be ſhipped off for its deſtination. A plan has been adopted by the Britiſh government, for removing the royal mint out of the confined and inconvenient apartments in the Tower, where it has for ſuch a length of time been carrried on, to an entire new edifice erected for the purpoſe, on the ſcite of what was formerly the victualling office, and ſince the tobacco warehouſes, on the eaſt ſide of Tower-hill. The erections for the engines and apparatus, to be conſtructed by Boulton and Watt, on their moſt improved plan, have been begun upon a large ſcale, and the whole will, when finiſhed, preſent a ſpectacle worthy of the nation. A great ſecret has hitherto been made of the operations in the Soho mint, the motives for which we profeſs not fully to underſtand; it cannot, we think, ariſe, as ſome have imagined, from the idea of preventing the clandeſtine counterfeiting of the coin of the kingdom; becauſe, large and expenſive engines and apparatus like theſe, are not likely to be erected or uſed in a private manner; and, granting the poſſibility of counterfeitors accompliſhing this, under cover of ſome other mechanic art or trade, then we conceive, that men of ſufficient ſkill and ingenuity to carry ſuch a work into effect, would not long be at a loſs to find out the principles of action adopted at Soho, from a ſtudy of the impreſſions on the coin in circulation. To us, it appears, from ſuch an examination, that the impreſſion is not given by a blow, or by the accelerated motion of a ſcrew, as in the common methods, but by the ſimple and powerful action of a crank, worked by the ſteam-engine, and that the milling on the edge is done by the threads of an endleſs revolving ſcrew, againſt which the coin rolls; the rolling, or flatting and punching (or perhaps rolling) out the round pieces or blanks for coining, is probably effected by methods well known in other branches of the metallic arts.

This machinery works the ſcrew-preſſes for cutting out the circular pieces of copper, and coins both the faces and edges of the money at the ſame time, with ſuch ſuperior excellence and cheapneſs of workmanſhip, as well as with marks of ſuch powerful machinery, as muſt totally prevent clandeſtine imitation. By this machinery, four boys are capable of ſtriking 30,000 pieces of money in an hour; and the machine acts at the ſame time as a regiſter, and keeps an unerring account of the number of pieces ſtruck.

By the time that our work has advanced to the word Mint, we hope to be allowed to give an account of the new national mint, which will then probably be in action, or to obtain ſufficient information thereof, for the gratification of our curious readers.

To this grand invention, the earl of Liverpool refers in his letter to the king, with ſurpriſe that it has not been already introduced into the practice of coining in this country: "But the new machinery," ſays his lordſhip, "now employed in the manufactory of every ſort of metal, in which the mechanics of this country far ſurpaſs thoſe of any other, has not in general been admitted into your majeſty's mint. It is an acknowledged principle, that machines that act with a given force, can work with more truth and accuracy than the arm of man, the force of which neceſſarily varies occaſionally, from ſeveral cauſes; another practice has been invented, that of ſtriking coins in a ſteel collar, ſo as to make them perfectly round, and all preciſely of the ſame diameter, an improvement which certainly contributes to the beauty of the coin; new modes of putting what is called the grainery on the edges of the coins, have alſo been invented, which, at the ſame time that they protect the coins from being filed, equally with the preſent mode, do not occaſion thoſe rough edges which expoſe them to wear by abraſion or friction. For theſe, and many other valuable improvements, the public are indebted to the ingenuity of Mr. Boulton of Soho, near Birmingham. It is ſingular, that though the manufacturers of England have greatly profited by theſe inventions, the officers of your majeſty's mint have never, or not ſufficiently, availed themſelves of them; the mints in foreign countries are in ſearch of them, and their governments, in more than one inſtance, have employed Mr. Boulton in erecting mints on his new principle; and parliament has authoriſed the ſame." Earl of Liverpool's "Treatiſe on the Coins of the Realm." Martin Folkes, eſq. "On Engliſh Coins." Darwin's "Bot. Garden."

The coinage of England is now performed wholly in the Tower of London; where there is a corporation for it, under the title of the *mint*.

Formerly there were here, as there are ſtill in other countries, what we call the *rights of ſeignorage and braſſage;* but ſince the eighteenth year of king Charles II. there is nothing taken, either for the king, or for the expences of coining; it having been ſettled by act of parliament, that all money ſhould be ſtruck at the public expence; ſo that weight is returned for weight, to all perſons who carry their gold and ſilver to the Tower. See Coin.

There is a duty of ten ſhillings per ton on wine, beer, and brandy imported, called the coinage duty, granted for defraying the expence of the king's coinage, but not to exceed 3000*l.* per annum, by ſtat. 18. Car. II. cap. 5. and continued and advanced by ſubſequent ſtatutes, 4 and 5 Anne, cap. 22 1 Geo. I. cap. 43. 4 Geo. II. cap. 12 1 Geo. III. cap. 16, &c. By ſtatute 27 Geo. II. c. 11. (explained by ſtat. 27. Geo. III. c. 13. ſ. 64.) the treaſury is to apply 15,000*l.* a year to the expences of the mints in England and Scotland. The ſtatute 14 Geo. III. c. 92. regulates the ſtamping of money-weights, the fees for which are ſettled by ſtat. 15 Geo. III. c. 30. at 1*d.* for every 12 weights.

The ſpecies coined in England are eſteemed contraband goods, and not to be exported; all foreign ſpecies are allowed by act of parliament, made in 1673, to be ſent out of the realm; as well as gold and ſilver in bars, ingots, duſt, &c.

Coinage *of Fez and Tunis* is not under any diſcipline; each goldſmith, Jew, and even every private perſon, undertaking it at pleaſure; which renders their money exceedingly bad, and their commerce very unſafe. See Morocco.

Coinage, *Muſcovite.*—The czar Ivan Vaſſillievitch inſtituted the firſt regular coinage, towards the middle of the ſixteenth century, and ſet up a mint at Moſcow. In the reign of this prince the Ruſſian coinage began to acquire a new form, and coins of different denominations were ſtruck after a certain alloy and weight. Peter I. made various alterations in the coinage. All mints were aboliſhed, except thoſe at Moſcow. A mint was afterwards ſet up at Peterſburg, and this is at preſent the only one where gold and ſilver coins are ſtruck. At this time there are in Ruſſia one mint for ſilver, and ſix for copper coin. See Russia.

Coinage, *Perſian.*—All the money made in Perſia is ſtruck with the hammer; and the ſame may be underſtood of the reſt of Aſia and America, and the coaſts of Africa, and even Muſcovy; the invention of the mill not being yet gone out of Europe, nor even eſtabliſhed in every part of it. The king's duty, in Perſia, is ſeven and a half per cent. for all the monies coined; which are now reduced to ſilver and copper; there being no gold coined there, except a kind of medals at the acceſſion of a new ſophi.

Coinage, *the Spaniſh*, is eſteemed one of the leaſt perfect in Europe; it is ſettled at Seville and Segovia, the only cities where gold and ſilver are ſtruck. It is true, there are brought from Mexico, Peru, and other provinces of the Spaniſh America, ſuch vaſt quantities of pieces of eight, and other ſpecies both of gold and ſilver, that, in this reſpect, it muſt be owned, there is no ſtate in the world where ſo much money is coined, as in that of the king of Spain. See Spain.

To take the repreſentation of a coin on paper, card, or paſteboard. See Medal.

CO-INDICATIONS, in *Medicine*, ſigns which do not indicate by themſelves alone, but together with other circumſtances, &c. help the phyſician to form a judgment.

COINING, in the *Tin-works*, is the marking of the tin, when caſt into blocks, or ſlabs, with the figure of the lion rampant. This is done by the king's officer. The king's cuſtom is four ſhillings for every hundred weight.

COINTE, Charles Le, in *Biography*, was born at Troyes in the year 1611. After having received a good education, he was employed in inſtructing others in grammar, the claſſics, and rhetoric. He had not devoted many years to this occupation before he was called to aſſiſt in diplomatic affairs, and in 1643, he rendered his country conſiderable ſervice, in conjunction with M. Servien, at Munſter, in ſettling the preliminaries of peace. For his zeal and fidelity in this buſineſs he was rewarded with a penſion, which enabled him to devote his whole time to theological ſtudies. Between the years 1665, and 1679, he publiſhed his great work, entitled "Annales Eccleſiaſtici Francorum," in eight folio volumes. This vaſt compilation contains almoſt every thing that relates to the Gallican church, previouſly to the period in which he wrote. He died at Paris, where he had ſpent the laſt thirty years of his life, in the year 1681, regretted by his numerous friends, as well for the excellence of his character, as for his talents, which, though not of the firſt order, he had rendered uſeful to his country and the intereſts of literature. Nouv. Dict. Hiſt. Du Freſnoy.

COIPATLIS, in *Botany*, Hernand. See Calea *oppoſitifolia*.

COIR, in the *Manufactures*, the Aſiatic name of a ſtrong vegetable fibre, prepared from the huſks of the cocoa-nut, and much uſed in the Eaſt Indies in the manufacture of cables and cordage. Dr. William Roxburgh, a correſponding member of the Society of Arts, London, reſiding at Calcutta, in 1801, tranſmitted to that learned body, the detail of his experiments on hemp, and twenty other different ſorts of vegetable fibre, with the view of aſcertaining their relative ſtrength, when white, when tanned, and when tarred; theſe will be found in the 22d volume of their Tranſactions. In 1806, the ſame ingenious gentleman tranſmitted to the ſociety the reſults of his further experiments, on the above mentioned 21 vegetable fibres, in the three ſtates above named, both when freſh, and after 116 days maceration in water, during the hot ſeaſon; theſe were for aſcertaining the effects of tanning and tarring ropes made of theſe ſubſtances, both as the ſame affected their ſtrength at firſt, and preſerved them from decay by wet. See Tranſ. Soc. Arts xxiv. 143.

COIRE, or Chur, in *Geography*, a town of Swiſſerland, in the department of the Griſons, ſituated at the foot of the Alps, in a rich plain between two and three miles wide. This town lies partly in the plain, and partly upon the ſteep ſide of a rock, and is ſurrounded with ancient brick walls, ſtrengthened with ſquare and round towers, according to the ſtyle of fortification before the invention of gun-powder; the ſtreets are narrow and dirty; it contains about 3000 perſons. It probably owes its origin to the emperor Conſtantius, who, in the 355th year of the Chriſtian era, penetrated into Rhætia, and fixed his ſtation for ſome time near the ſcite of this town, which was conſtructed near the camp, and deriving from the imperial reſidence the name of Curia, its appellation was afterwards changed into Coira and Coire. The remains of two or three towers, evidently of Roman conſtruction, atteſt its antiquity, and ſerve to eſtabliſh the truth of the above-mentioned conjecture concerning its origin. Coire was formerly a city of the German empire, ſubject to its own courts, and in the ninth century became ſubject to the dominion of the biſhop. Like many other cities of Germany, it obtained conſiderable privileges from the different emperors; and the inhabitants, having gradually circumſcribed the authority of the biſhop, at length eſtabliſhed an independent republic. The government of Coire is ariſto-democratical; the ſupreme legiſlative authority reſides in the citizens, whoſe number amounts to 294, divided into five tribes. The executive power is entruſted to the council of 70, compoſed of 14 members annually elected from each tribe. This council is divided into ſeveral leſſer departments, the chief of which is the ſenate, or council of fifteen, who have the principal direction of affairs, either ſolely or conjointly with other members of the ſovereign council. The chiefs of Coire are two burgomaſters, taken from the members of the ſenate, who continue in office for life, though liable to a removal. They enjoy the ſupreme dignity by rotation, each for a year. The criminal tribunal is compoſed of the ſenate and 15 other members of the ſovereign council. The priſoners are examined and the proceſs drawn up by a ſecret council, formed of the ſeven eldeſt members of the ſenate, the majority of whom muſt concur to order the infliction of torture. After the conviction, proceſs is laid before the criminal tribunal, which ultimately paſſes ſentence, and all offences, excepting great crimes, are commonly puniſhed by fines. Coire ſends two deputies to the general diet of the Griſons, held here every three years. Theſe are generally the two burgomaſters. Upon the higheſt part of the town ſtands the biſhop's palace, the cathedral, and the houſe belonging to the chapter.

The biſhopric of Coire was probably erected ſoon after the firſt eſtabliſhment of Chriſtianity in theſe parts, under Conſtantine, or his ſon. The dioceſe once extended over the whole Roman province of Rhætia, which comprehended the preſent country of the Griſons, the Valteline, Chiavenna, and Bormio, together with the eaſtern diſtrict of Swiſſerland as far as the lake of Conſtance, and part of Tyrol; the biſhop's territorial poſſeſſions were alſo conſiderable, and his revenues by no means inadequate to his power and dignity. The principal diminution of his power was occaſioned by the formation of the league of God's Houſe, and the limitation of his prerogatives in 1527. The introduction of the Proteſtant religion gave the final blow to his power; for his revenue ſuſtained great diminution by the loſs of the tythes, which were ſeized by the reformed communities. The biſhop is ſuffragan of Mentz, and prince of the Roman empire, which dignity was annexed to the ſee in 1170 by the emperor Frederic I., and he is ſtyled lord of Furſtenberg and Furſtenau. His annual revenues, which amount to about 2,000*l.*, ariſe chiefly from eſtates near Coire, and in the Tyrol; he receives alſo the annual ſum of about 70 *l.* from the cuſtoms of Chiavenna, in return for having ceded his claims over the Valteline, Chiavenna, and Bormio, to the republic of the Three Leagues. The only prerogatives remaining are the right of coining money, and an abſolute juriſdiction both in civil and criminal affairs within the ſmall diſtrict in which his palace and the chapter are ſituated. The biſhop is choſen by the chapter. The epiſcopal diſtrict is only a few hundred paces in circumference, and is ſurrounded by high walls; the greater part of the palace is modern, except a ſquare tower, ſuppoſed to have been conſtructed by the Romans. The chapter conſiſts of twenty-four canons, ſix of whom are reſident; the inhabitants of this diſtrict are all Catholics. Above the palace, and at the higheſt extremity of the town, is the convent of St. Lucius, deriving its name from a ſmall chapel dedicated to that ſaint, who, according to the legends of the Romiſh church, was a king in Britain towards the latter end of the ſecond century. After embracing Chriſtianity he is ſaid to have quitted his throne, and, wandering in theſe parts, to have built an hermitage upon the ſpot where the chapel now ſtands; and by his preaching and example, to have converted numbers to the Chriſtian faith. He is ſtyled the apoſtle of the Griſons, and held in high veneration as a ſaint by the Catholics; while the Proteſtants of the town pay him not the leaſt veneration.

There is a Latin ſeminary at Coire for the children of the burghers, and another, inſtituted in 1763, for the education of perſons intended for the church; theſe eſtabliſhments, though poorly endowed, have been of ſome literary advantage to the country. Coire has alſo a typographical ſociety for Latin, German, and Romanſh.

The environs of Coire are delightful; the plain is richly diverſified with corn and paſture, the hills gradually ſloping to the foot of the mountains are covered with vines, which yield wine of a pleaſant flavour, but not ſtrong. The Rhine, which flows rapidly through the plain, begins here to be navigable by rafts, and merchandize is tranſported towards Lindau and Zuric. N. lat. 46° 54′. E. long. 9° 29′.

COISLANS, a Dutch factory on the coaſt of Malabar; 23 leagues N.W. of Cape Comorin.

COISLIN'S MSS., *Codices Coiſliniani*, in *Biblical Hiſtory*, take their name from Coiſlin, biſhop of Metz, to whom they were bequeathed by the celebrated chancellor Seguier, who died in 1672. They are preſerved at preſent in the Benedictine library of St. Germain des Prez, and are deſcribed in the following ſcarce work, *viz.* "Bibliotheca Coiſliniana, olim Seguieriana, ſeu MStorum omnium Græcorum, quæ in ea continentur, accurata deſcriptio, ubi operum ſingularum notitia datur, ætas cujuſque MSti indicatur, vetuſtiorum ſpecimina exhibentur, aliaque multa annotantur quæ ad palæographiam Græcam pertinent, Studio et opera B. de Montfaucon, Pariſiis, 1715, fol." They are likewiſe enumerated in Montfaucon's "Bibliotheca bibliothecarum," tom. ii. One of theſe MSS. is referred by Montfaucon and Wetſtein to the 7th century; others of them were written in the 11th, 12th, and 13th centuries; and moſt of them were brought from mount Athos. One of them contains a part of the O. T. without any proper reference to the N.; five contain the four Goſpels; others contain the Acts of the Apoſtles, and the Catholic Epiſtles; various commentaries on St. Matthew and St. Mark; commentaries on the Acts of the Apoſtles; the Epiſtles of St. Paul, with commentaries; the whole N. T.; the N. T., except the book of Revelations; the Acts, Epiſtles, and Revelations; fragments of the Epiſtle of St. Paul; and the Acts, Epiſtles, and Revelations. From 14 of theſe MSS. Wetſtein, in his N. T. has made extracts. See Marſh's Michaelis, Introd. to the N. T., vol. ii. and iii.

COITER, Koyter, Volcher, in *Biography*, a celebrated phyſician, ſurgeon, and anatomiſt at Groningen, where he was born in the year 1534; ſhewing early a diſpoſition to the ſtudy of medicine, he was ſent by his father to Padua, and placed under the direction of Fallopius, by whom he was initiated into the knowledge of anatomy, in which he was further improved by Euſtachius, during a reſidence of ſome months at Rome. He then went to Bologna, and was introduced to the celebrated naturaliſt, Aldrovandus, with whom he continued his ſtudies. Not ſatisfied with his attainments, he went to Montpellier, and afterwards, with the view of obtaining a greater number of human ſubjects for diſſection, for he had hitherto operated principally on brute animals, he accepted the poſt of one of the phyſicians to the army of the king of France, which he attended through a campaign. The numerous obſervations he made on the effects or alterations produced by certain diſeaſes, in the ſtructure of the viſcera, ſhew how well he was qualified for this poſt. On quitting the army, he went to Nuremburg, where he ſettled and continued to the time of his death, which happened about the year 1576.

Though his life was ſhort, yet, from the activity and powers of his mind, he was enabled to make conſiderable improvements, both in anatomy and ſurgery; among the former are to be noted, his obſervations on the brain, the motion of which, he found, was occaſioned by the motion of the arteries. He alſo diſcovered that the brain was not abſolutely neceſſary to life, which in ſome animals remained after it was taken away. He firſt deſcribed the corpora lutea, in the ovaria; alſo the order in which the parts of the chick are unfolded in the egg; and in the heart he obſerved, that the contraction of the ventricle preceded that of the auricle. He deſcribed the frontal ſinuſes; and though he did not diſcover any of the parts of the organ of hearing, that had not been before noticed, they are more accurately deſcribed by him, Douglas obſerves, than they had been by any preceding writer. He added two muſcles to the face, which are called by anatomiſts corrugators of the eye-lids, but from their uſe, Douglas ſays, they might more properly be called depreſſores ſuperciliorum; alſo two muſcles performing a ſimilar office for the lips. Among his chirurgical obſervations, are, that wounds or hurts of the brain are more dangerous, when the dura mater remains entire than when it is ruptured; in theſe caſes, he boldly opened that membrane, to give vent to the effuſed humour. When fungi from the brain ariſe, they may be ſafely, he ſays, pared down. He cured a patient of a wound in the brain, extending to the ventricles, but the patient was ever after afflicted with alienation of his mind. The works in which theſe, and numerous other valuable obſervations are contained, are "De cartilaginibus tabulæ quinque," fol. Bononiæ, 1566. "Externarum et internarum principalium corporis humani partium tabulæ atque anatomicæ exercitationes, obſervationeſque variæ novis et artificioſiſſimis figuris illuſtratæ," Norib. 1573, fol. In the introduction he gives a brief hiſtory of anatomy, and traces the order in which it ſhould be ſtudied. He here firſt gave a complete ſet of plates, depicting the ſkeleton of a fœtus. "Diverſorum animalium ſceletonum explicationes, cum lectionibus Fallopii de partibus ſimilaribus," Norib. 1575, fol. containing well depicted ſkeletons of various quadrupeds, birds, and amphibious animals. Boerh. Math. Studii Med. Douglas Bib. Anat. Haller Bib. Anat., &c.

COITION, the intercourſe between male and female in the act of generation. It is obſerved that frogs are forty days in the act of coition. Bartholine, &c. relate that butterflies make an hundred and thirty vibrations of the wings in one act of coition.

Coition is alſo ſometimes uſed for that mutual attraction, or tendency toward each other, which is found between iron and the magnet.

COIT-MOSS Colliery. This mine is ſituated near the borders of Cheſhire, and to that ſingular mountain Axe Edge, in the neighbourhood of Buxton, in Devonſhire, which is formed by the weſtern edge of the ſilicious grit rock, covering the lime-ſtone, in this diſlocated part of the country. The ſurface, for a conſiderable diſtance round the pit, is moſs or bog, and which extends ſeveral feet beneath the ſurface; the coal lies from 30 to 40 fathoms deep, and is covered by a ferruginous clay ſchiſt, which decompoſes on expoſure to the air. This mine is drained by a ſough of conſiderable length, in an eaſterly direction.

COJUMERO, in *Zoology*, the name given by ſome to the manati. See Trichechus *manatus*.

COIX, in *Botany*, (Κοιξ, Gr. a name given by Theophraſtus to one of his Καλαμοφυλλοι, or reed-leaved plants, allied to the palms.) Linn. Gen. 1043. Schreb. 1405. Willd. 1638. Juſſ. 34. Vent. 2. 112. (Lachryma Job. Tourn. 306. Lithagroſtis. Gært. Larmille. Encyc.) Claſs and order, *monœcia triandria*. Nat. Ord. *Gramineæ*, Linn. Juſſ. Vent.

Obſ. Gærtner objects to the Linnæan name, as not denoting the plant intended by Theophraſtus and other ancient writers.

Gen. Ch. *Male flowers* in a looſe ſpike. *Cal.* Glume two-flowered, two-valved; valves oblong-egg-ſhaped, obtuſe, awnleſs; the outer one thicker. *Cor.* two-valved, valves ovate-lanceolate, nearly the length of the calyx, thin, awnleſs. *Stam.* Filaments three, capillary; anthers oblong. *Female flowers* few, ſituated below the male ſpike. *Cal.* Glume two-flowered, two-valved; valves rounded, thick, ſhining, hard; the outer one larger, ſhining. Linn. Schreb. Mart. Glume one-flowered, one-leafed, ovate-conical, open at its ſummit, thick, coriaceous, ſhining; compoſed of two valves, which are united the greateſt part of their length. Lam. Glume one-flowered, three-valved; exterior valve larger, thick, coriaceous, ſhining; calyx two-valved, ſmaller. Juſſ. Vent. Female flowers two, one conſtantly abortive; incloſed in a one-leafed, permanent involucrum, which, as the ſeed ripens, becomes hard as ſtone. Gært. *Cor.* Glume two-valved; outer valve egg-ſhaped; inner one narrower, ſmaller; both awnleſs. *Piſt.* Germ egg-ſhaped, very ſmall; ſtyle ſhort, two-cleſt; ſtigmas two, horned, much longer than the flower, pubeſcent. *Peric.* none, except the outer glume of the calyx, which falls off with the ſeed without opening. *Seed* ſolitary, roundiſh.

Eſſ. Ch. Male flowers in looſe ſpikes. Calyx and corolla awnleſs. Female flowers, calyx and corolla awnleſs. Style two-cleft. Seed covered by the oſſified calyx.

Sp. 1. C. *lacryma.* Job's-tears. Linn. Sp. Pl. Mart. 1. Lam. 1. Willd. 1. Lam. Illuſt. tab. 750. (Lacryma Jobi. Cluſ. Hiſt. 2. p. 216. Tourn. 306. J. Bauh. 2. p. 449. Dod. Pemp. 506. Lob. Ic. 44. Lithoſpermum arundinaceum forte Dioſcoridis et Plinii. Bauh. Pin. 258. Moris. Hiſt. 3. p. 249. Salee. Rumph. Amb. 5. tab. 75. fig. 2. Catriconda. Rheed. Mal. 12. tab 70. Lithagroſtis lacryma Jobi. Gært. tab. 1. fig. 10.) "Seeds egg-ſhaped." Linn. "Spikes axillary, ſeveral, peduncled." Lam. "Culm ſemicylindrical above, obtuſe; flowers naked; fruit egg-ſhaped." Willd. *Root* fibrous, annual, at leaſt in our climate. *Stems* two or three feet high, leafy. *Leaves* more than an inch broad, alternate, arundinaceous, ſheathing, ſmooth, with a white midrib. *Flowers* from the ſheaths of the upper leaves, in ſeveral faſcicled unequal racemes, which are ſhorter than their reſpective leaves. *Seeds* blueiſh white, rounded at the baſe, ſomewhat pointed at the ſummit, very hard, even-ſurfaced, ſhining like pearls. A native of the Eaſt Indies, cultivated in Spain and Portugal, where, in times of ſcarcity, a coarſe kind of bread is made of its ſeeds, and eaten by the poor. It is applied to the ſame purpoſe in the Levant, and in China. Its ſeeds are ſometimes bored and threaded for necklaces, and other female ornaments. 2. C. *angulata.* Linn. Hort. Cliff. 438. Mart. 2. (C. arundinacea. Lam. 2. Lacryma Jobi Americana altiſſima, arundinis folio et facie. Plum. Cat. Lithoſpermum arundinaceum alium. Hern. Mex. p. 282, the inner figure?) "Seeds angular." Linn. "Spikes axillary, ſolitary, nearly ſeſſile." Lam. *Root* perennial. *Stems* ſeven or eight feet high, hard, branched. Nearly allied to the preceding, perhaps only a variety. 3. C. *agreſtis.* Mart. 3. Willd. 2. Lour. Cochin. 551. (Salke-Utan. Rumph. Amb. 6. 22. tab. 9. fig. 1. Lacryma Jobi paludoſa minor; Burm. Zeyl. 138.) "Culm quite ſimple; leaves even-ſurfaced; ſeeds roundiſh." Lour. "Culm cylindrical; flowers naked; ſeeds roundiſh." Willd. *Root* perennial, creeping. *Culms* three feet high, ceſpitoſe, ſolid, jointed. *Leaves* lanceolate-linear, acuminate, alternate, ſheathing. *Peduncles* long, three or four together from the ſame axil, erect, many-flowered. *Seeds* brown, ſhining, ſmall. A native of moiſt places in Ceylon, Amboina, and Cochin-china. 4. C. *arundinacea.* Willd. 4. Koenig. "Culm ſemicylindrical above, acute; flowers involucred; ſeeds elliptical." Willd. *Root* perennial. *Stem* very lofty, branched. *Leaves* aculeate-ſerrated. *Peduncles* in pairs, ſurrounded by inverſely egg-ſhaped obtuſe involucres, which are linear-cuſpidate at the tip. *Fruit* four times ſmaller than that of C. lacryma, white, ſhining. A native of the Eaſt Indies, near Tranſchaur, but very rare.

Propagation and Culture. The ſeeds of C. lacryma may be procured from Portugal, and ſhould be ſown in a moderate hot-bed in the ſpring: they may afterwards be tranſplanted into a warm border, two feet at leaſt diſtant from each other, and will require no farther trouble. C. angulata will not bear the open air in England. but muſt be plunged into the bark-bed, where it will produce ripe ſeeds the ſecond year.

COKE, Sir Edward, in *Biography*, a lawyer of great celebrity in the ſixteenth and ſeventeenth centuries, was the only ſon of Robert Coke, eſq. of Mileham, in Norfolk, a barriſter of conſiderable practice. He was born in 1550, and received the early part of his education at the free ſchool of Norwich; after which he completed his academical ſtudies at Trinity College, Cambridge. From Cambridge he went to Clifford's Inn; and in the following year he entered as ſtudent in the Inner Temple. He ſoon diſcovered great penetration, and a ſolid judgment in caſes that belonged to his profeſſion; and we are told by himſelf, that he pleaded his firſt cauſe in the court of King's Bench, in Trinity term, 1578. About the ſame time, he was appointed reader of Lyon's Inn, an office which he held for three years, during which his lectures were much reſorted to; his reputation increaſed, and his buſineſs as a barriſter found him ample employment for the exerciſe of his great talents. In a few years he married the daughter and co-heireſs of John Paſton, eſq. with whom he had a large fortune; and by means of her connections, in conjunction with his own abilities, he made the moſt rapid advances in his profeſſion. He was choſen recorder of the cities of Norwich and Coventry; he was engaged in almoſt every cauſe of importance at Weſtminſter Hall: and was frequently conſulted in the affairs of the crown. His property and influence in Norfolk pointed him out as a fit repreſentative of the county; he was accordingly elected member; and, in the 35th year of Elizabeth, was choſen ſpeaker of the Houſe of Commons, being at the ſame time ſolicitor-general to the queen; an office which he ſhortly exchanged for that of attorney-general.

As ſpeaker of the houſe, in the year 1593, he made the three uſual requeſts, of freedom from arreſts, of acceſs to the royal perſon, and of liberty of ſpeech; to which the queen replied, that liberty of ſpeech was granted to the commons, but they muſt know what liberty they were entitled to; not a liberty for every one to ſpeak what he liketh, or what cometh in his brain to utter; their privilege extended no farther than a liberty of *aye* and *no.* That ſhe would not impeach the freedom of their perſons; and that ſhe would not refuſe them acceſs to her perſon, provided it were upon urgent and weighty cauſes, and at times convenient, when ſhe might have leiſure from other important affairs.

The death of Mr. Coke's lady, by whom he had ten children, afforded him an opportunity of augmenting the number of his alliances, by a ſecond marriage with lady Hatton, the widow of ſir Chriſtopher, and ſiſter to lord Burleigh, afterwards earl of Exeter. The marriage ceremony, in this inſtance, having been performed with ſome irregularities, he was proſecuted in the archbiſhop's court, and obliged to make the requiſite ſubmiſſion, in order that he might eſcape excommunication, and the penalties attached to it.

It has been remarked, that few reigns have produced ſo many and able lawyers as that of queen Elizabeth; yet of them all, no one was ſo much diſtinguiſhed as Mr. Coke, whom miniſters conſulted in all points of difficulty; and who, it is ſaid, never failed to furniſh them with legal colours for all their proceedings; which, though many of them were very extraordinary, yet being ſo guarded, were beheld by the people as juſt and honourable.

One of the moſt intereſting proſecutions, which was aſſigned to him as attorney-general, was that of the earl of Eſſex, who, with the earl of Southampton, were indicted for the crime of high-treaſon. The attorney-general, "Coke," ſays Mr. Hume, "opened the cauſe againſt him, and treated him with the cruelty and inſolence which that great lawyer uſually exerciſed againſt the unfortunate." At the concluſion of his ſpeech he ſaid that, "by the juſt judgment of God, he of his earldom ſhould be Robert the Laſt, that of a kingdom thought to be Robert the Firſt." Almoſt immediately after the acceſſion of James to the throne, Mr. Coke received the honour of knighthood; and in the July following, ſir Walter Raleigh was accuſed and proſecuted for a ſuppoſed plot againſt government. Sir Edward Coke managed this trial entirely, and diſplayed ſo much rancour againſt the priſoner, as may be deemed not only a great reflection, on his own memory, but even on the manners of the age. Traitor, monſter, ſpider of hell, are terms which he employed againſt an illuſtrious character, who was under trial for life and fortune, and who defended himſelf with an even temper and heroical courage. Nor was the attorney-general leſs blameable with reſpect to the high court before whom he ſtood; his arrogance was ſo conſpicuous, that lord Cecil demanded, *if he came thither to direct them?* Upon which he ſat down, and refuſed to utter another word, till he was ſolicited by all the commiſſioners, when he roſe, and recapitulating his arguments, ſir Walter was found guilty.

On the diſcovery of the gun-powder plot, ſir Edward Coke obtained great credit for the ſagacity and vigilance which he ſhewed in unravelling the facts relating to that extraordinary affair. Upon one of the trials a high compliment was paſſed upon him by lord Cecil, who ſaid, "that the evidence had been ſo well diſtributed, and opened by the attorney-general, that he never heard ſuch a maſs of matter, better contracted, or made more intelligible to a jury." It was in reward for his ſignal ſervices on this occaſion, that he was raiſed to be chief juſtice of the court of Common Pleas, an office which he appears to have filled with high reputation and honour. In 1613, he was made chief juſtice of the King's Bench, and one of the members of the privy council, but without enjoying any conſiderable portion of the king's confidence. He had already choſen as his motto, "lex tutiſſima caſſis;" and it was a maxim to which he determined to adhere; he was, therefore, ill fitted to ſerve the high prerogative notions of James; he alſo ſhewed marks of indignation, when his ſovereign, through the attorney-general, undertook to find out his opinion of a cauſe likely to be brought before him as judge; declaring, that it was a principle from which he would not depart, "that he was a judge in a court, and not in a chamber." As his temper had nothing in it that was conciliating, and as he felt the dignity of his high office, which he conſidered as held for the benefit of the people, rather than for the pleaſure of the crown, he involved himſelf not unfrequently with a court governed by favourites, and fond of a higher degree of power than was allowed by the conſtitution. When the earl of Somerſet's guilt in the murder of ſir Thomas Overbury was diſcovered, the king ſent to the chief juſtice, ſir Edward Coke, and earneſtly recommended to him the moſt rigorous and unbiaſſed ſcrutiny; an injunction which he executed with the greateſt induſtry and ſeverity. With the ſmall clue given him, he unravelled moſt carefully the whole labyrinth of their guilt; but his zeal on the trials of the perſons concerned in this affair, was mingled with a bitterneſs and fury that ſeem to have ill accorded with the decorum and dignity of a judge. On the trial of Mrs. Turner, Coke ſcrupled not to affirm that ſhe was guilty of the ſeven deadly ſins; ſhe was a whore, bawd, a ſorcerer, a witch, a papiſt, a felon, and a murderer. In the ſummer of 1616, he was ſuſpended from his office, and from his ſeat at the council board, the occaſion of which was owing to ſome difference with the new favourite, Villiers, afterwards duke of Buckingham; but in little more than a year, he was received at court, and reinſtated in the privy council. He now took an active part in proſecuting various perſons for corruption in office, and other offences, by which means many heavy fines were levied, and the treaſury repleniſhed. In this he ſeemed to favour the intereſts of the crown; but in parliament, of which he was a diſtinguiſhed member, he maintained the rights and privileges of the commons, againſt the proclamations of the ſovereign; and was, on that account, in the year 1621, committed to the Tower, and his papers ſeized. He did not long remain a priſoner, though he was again expelled from the privy council, and ſtigmatized by the king, as "being the fitteſt inſtrument for a tyrant that ever was in England;" a character to which he had no juſt title, nor would it have been applied to him by James had he become ſuch an inſtrument in his own hands.

In the ſucceeding reign he was nominated ſheriff of Buckinghamſhire, to prevent him from being choſen member of the houſe of commons; he was, however, elected to repreſent that county in the parliament which met in the year 1628, and was diſtinguiſhed for his zeal in attempting to redreſs the grievances, and ſupport the rights and liberties of the people. The moſt important ſervice which he rendered to his fellow citizens, was in framing and propoſing the "petition of rights;" this was the laſt of his public acts, and was juſtly eſteemed the moſt explicit declaration of Engliſh liberty which had, at that time, appeared. Parliament was in a very ſhort time after diſſolved, and ſir Edward Coke retired to his ſeat in Buckinghamſhire, where he ended his days in tranquillity, and in high eſtimation and reſpect. He died September 3, 1634, in the eighty-fifth year of his age, leaving behind him a numerous family, and a very large eſtate. In his laſt moments he exhibited the utmoſt reſignation to the divine will, and finiſhed his courſe with uttering the words, "thy will be done."

The character of this great lawyer has been variouſly repreſented; but it cannot be denied that he was at once a zealous and faithful ſervant of the crown, maintaining its juſt prerogatives; and as a ſenator, he exhibited a laudable zeal for correcting abuſes, from which nothing could ever deter him. His works are, "Reports," in 13 parts, folio. "A Book of entries." "Inſtitutes of the Laws of England;" conſiſting of, (1.) a tranſlation and a comment upon ſir Thomas Littleton's Tenures; which is his moſt celebrated work, and contains an immenſe body of legal erudition: (2.) Magna Charta, and other ſelect ſtatutes, with a comment: (3.) The Criminal Law, or Pleas of the crown: (4.) An account of the juriſdiction of all the courts in the kingdom. "A Treatiſe of Bail and Mainprize." "Reading on the State of Fines, 27 Ed. i." Complete copyholder. Biog. Brit. Hume.

COKE, or *Coak,* denotes pit-coal or ſea-coal charred. For the exciting of intenſe heat, as for the ſmelting of iron-ore, and for operations where ſmoak would be detrimental, as the drying of malt, foſſil coals are previouſly charred, or reduced to coaks, that is, they are made to undergo an operation almoſt ſimilar to that by which charcoal is made. By this proceſs coals are deprived of their volatile parts, nothing remaining except the carbon and earthy impurities. The great quantities of coal duſt, or ſmall coal, collected at the numerous pits in the neighbourhood of Newcaſtle, would ſoon become a great incumbrance, were it not that an admirable method has been diſcovered, not only to prevent the inconvenience, but to turn it, with a little modification, into an article of commerce and advantage, by preparations as ſimple as they are ingenious. Coal, in this pulverized ſtate, is not proper for chamber fires, becauſe it falls through the bars of the grates, or extinguiſhes the fire by falling upon the ignited cinders, in ſuch a maſs, that no air can get between to aſſiſt the combuſtion. This ſmall coal is, therefore, proper in this ſtate only for ſome purpoſes in glaſs-houſes, lime or brick kilns, forges, &c. The conſumption for theſe purpoſes is indeed very conſiderable, but is not nearly equal to the quantity produced by the pits, notwithſtanding the great care that is taken to keep the coal in large pieces; beſides, ſome kinds are liable to crumble into ſmall-coal upon receiving the leaſt ſhock: means have, therefore, been ſought to render this coal proper for other purpoſes. That property, which belongs to the beſt coal, of agglutinating and forming a ſingle maſs, when in a ſtate of combuſtion, naturally ſuggeſted the idea of endeavouring to conſolidate conſiderable quantities of this coal duſt, or ſmall-coal, by means of a great fire. To effect this it is put into a kiln, in a great degree ſimilar to a lime-kiln, which is previouſly well heated with large pieces of coal. The ſmall-coal then runs together, and forms a maſs, without loſing any large portion of its valuable qualities. When the ignited maſs is completely red, large pieces of it are pulled out with iron rakes (ſuch as are uſed in the copperas works), and laid ſeparately on the ground, where they are very ſoon extinguiſhed; theſe pieces are firm, though porous, and are excellently adapted for ſmelting iron, and other ores, in high furnaces. This ſimple and ingenious contrivance has given birth to ſeveral new branches of induſtry and commerce. The coal, thus prepared, is uſed in a great number of manufactories, where a draft or blaſt is uſed, as a ſubſtitute for charcoal, to which it is in moſt inſtances ſuperior, as it produces a ſtronger, more equal, and longer continued heat. Such is the method of coak-making at Newcaſtle, and other places. That purſued in the great iron-works at Carron, near Falkirk, in Scotland, being ſo completely different, our readers will excuſe our giving an account of this alſo. The buſineſs is conducted there in the open air, and in the moſt ſimple manner; a quantity of large coal is placed on the ground in a round heap, of from 12 to 15 feet in diameter, and about two feet in height; as many as poſſible of the large pieces are placed on their ends, to form paſſages for the air; above them are thrown the ſmaller pieces and coal duſt, and in the midſt of this circular heap, is left a vacancy of a foot wide, where a few faggots are depoſited to kindle it. Four or five apertures of this kind are formed round the ring, particularly on the ſide expoſed to the wind; there is, however, ſeldom occaſion to light it with wood, for other maſſes being generally on fire, the workmen moſt frequently uſe a few ſhovels of coal already burning, which acts more rapidly than wood, and ſoon kindles the ſurrounding pile; as the fire ſpreads the maſs increaſes in bulk, puffs up, becomes ſpongy and light, cakes into one body, and at length loſes its volatile parts, and emits no more ſmoke. It then acquires an uniform red colour, inclining a little to white, in which ſtate it begins to break into gaps and chinks, and to aſſume the appearance of the under part of a muſhroom; at this moment the heap muſt be quickly covered with aſhes, of which there is always a ſufficient proviſion around the numerous fires, where the coak is prepared. This method of throwing a large quantity of aſhes on the fire, to deprive it of the approach of air, is ſimilar to that uſed in making charcoal, which is covered over with earth; the reſult is alſo pretty much the ſame, the pit-coal thus prepared being light and porous, and producing the ſame effect in high furnaces as charcoal. This is a quality of extreme value; ſince, by means of charred pit-coal, founderies may eaſily be eſtabliſhed, in places where the want of wood for charcoal, would otherwiſe render it neceſſary to abandon even the richeſt mines of iron.

The ſimple method above deſcribed being found to conſume much of the beſt qualities of the coke, owing to the too free acceſs of air during the proceſs; many years ago a method was introduced, of diſtilling, or charring coals in cloſe veſſels, by the heat of another fire externally applied, and by which alſo the liquid bituminous matter, or coal-tar, was ſeparated and condenſed; the value of which, as a ſubſtitute for paint in rough works, contributed to render this a profitable mode of preparing ſtrong cokes, for the ſmelting of metals, and other purpoſes in the arts, where, with greater plenty of wood, charcoal formerly was uſed; and which coke, from its ſuperior inflammability, could be uſed in common grates and ſtoves, where the draft or influx of air is inſufficient to burn the common coke. On the 13th of November, 1800, Mr. David Muſhet of Glaſgow took out a patent for various improvements in metallurgy, and, among others, for an improved coking furnace, built of fire-brick, or iron-plates, and made to exclude the external air from the coals to be coked while they are heated to incandeſcence, by a fire underneath with flues enveloping the coking veſſel. In his ſpecification (ſee Repertory of Arts, xiv. 182.), different conſtructions of theſe furnaces are deſcribed, ſome to condenſe the tar and ſoot, or lamp-black, and ſome for letting theſe eſcape, if their condenſation ſhould not be found advantageous. On the 18th May, 1804, Mr. Frederick Albert Winſor took out a patent for combining the ſaving and purifying of the inflammable gas (for producing light and heat), the ammonia, tar, and other products of pit-coal, with the manufacture of a ſuperior kind of coke (ſee Repertory, 2d Series, v. 172.). And, lately, the ſame gentleman has taken out a ſecond patent, for further improvements in theſe proceſſes, but this ſpecification not being yet filed (June 1807), we are unable here to deſcribe minutely, and give drawings of the oven, or carbonizing furnace, as we wiſhed to do, which he uſes for preparing his patent coke, of a ſuperior quality, as the reſiduum of the gas, ammonial liquor, and oil-tar, ſeparated in his proceſſes (ſee GAS *lights*, and TAR *coal*), in which 300 yards in length of the wall of Carlton-Houſe gardens, next to the Mall in St. James's Park, were, on his majeſty's birth-day evening laſt, lighted up with gas-lamps, and burners, of various conſtructions, and with tranſparencies, and other devices, illuminated by brilliant gas-lights. This patent coke, from the experiments which we have ſeen, ſeems perfectly applicable to burning in our rooms and apartments; making a lively and pleaſant fire, with a very ſmall degree of draught up the chimney, and producing no ſmoke. Two pecks of coals, weighing 36 lb. coked in one of Mr. Winſor's ſmall carbonizing furnaces, produced 24⅛ lb. of coke (or 67 per cent.), which, when broke into moderate ſized pieces, meaſured three pecks. Dr. Watſon obtained 58, Mr. Jars 63, and M. Hielm 73 per cent. of the weight of coals, in ſimilar experiments.

In the ſmelting of ores in Sileſia, it was found (1. Bergm. Journ. 1790. p. 320.) that 92 lb., or one meaſure of cokes, were equivalent to 180 lb., or three meaſures of charcoal; and, in another place (ibid. 1792. p. 60.), one meaſure of cokes is ſaid to equal the effects of five meaſures of charcoal, or three of pit-coal.

From the experiments of M. Lavoiſier, in the Stockholm Memoirs, 1781, p. 187, it appears, that the heats produced, as meaſured by the evaporation of equal quantities of water, under equal ſurfaces, and the times of conſumption, to produce the ſame effect by four different kinds of fuel, were as follow, *viz*

Combuſtibles.	Weight.	Meaſure.	Duration.
Pit-coal,	600 lbs.	10 cubic feet.	20 hours.
Cokes,	403	17	12½
Charcoal,	600	40	5
Oak wood.	1089	33	4.4

Whence it appears, that if coal produces a certain quantity of heat in a given time, coke, in a much ſmaller quantity, will produce the ſame effect in little more than half the time ; an equal weight of charcoal in one-fourth of that time ; and oak wood, of nearly double the weight of coal, in about one-fifth of that time.

The coke-ovens, mentioned in a former part of this article, began about 30 or 40 years ago, to be applied to other purpoſes beſides the making of coke. About the year 1780, we remember to have ſeen a coke-oven, opening with a door almoſt like a large baker's oven, applied to heating the boilers of the ſteam-engines of the Chelſea or Pimlico water-works, but which has long ſince been diſuſed. On the 23d June 1789, the right honourable Henry Seymour Conway took out a patent (ſee Repertory of Arts, iii. 75.) for improved methods of conveying and adapting the heat of coke ovens to the working of ſteam engines, baking of bread, calcining and fuſing of metals and ores, &c. We are told in this ſpecification, that three biſcuit-ovens were erected and worked from the fire of one coke-oven thus conſtructed, the heat from it being regulated by openings and regiſters, with perfect ſucceſs. See Oven. Others of theſe coke-ovens were adapted for heating boilers, and for working ſtills.

The earl of Dundonald's method of making cokes, or cinders, after he had extracted the coal-tar from coals, for which he obtained a patent, 30th April, 1781, and the time of which was afterwards extended by act of parliament to the 1ſt of June 1806, required the admitting of the external air into his furnace, in ſufficient quantities to carry on the combuſtion of the coals operated upon (ſee Repertory of Arts, i. 145.), by which the neceſſity of a ſecond, or external fire, for heating the furnace was avoided ; but the cokes, produced by this means, are inferior in quality to thoſe produced in cloſe veſſels, as in the proceſſes of Muſhet, Winſor, &c. above mentioned.

COKER, in *Geography*, a river of England, in the county of Lancaſter, which runs into the Iriſh ſea, 5 miles N.W. of Garſtang.

CO-KIANG, a town of China, of the third rank, in the province of Se-tchuen ; 20 miles E.S.E. of Tche-li-keou.

CO-KING, a city of China, of the firſt rank, in the province of Yun-nan ; 1160 miles S.S.W. of Pekin. N. lat. 26° 35′. E. long 99° 16′.

COKZIM. See Choczim.

COL, or Coll, one of the weſtern iſlands of Scotland, about 13 miles long, and 3 broad. Col, ſays Dr. Johnſon, is one continued rock, of a ſurface much diverſified with protuberances, and covered with a thin layer of earth, which is often broken, and diſcovers the ſtone. Such a ſoil is not adapted to plants that ſtrike deep roots, nor do they riſe to any great height. The uncultivated parts are cloathed with heath, among which induſtry has interſperſed ſpots of graſs and corn ; but no attempt has yet been made to raiſe a tree. The lord of Col has lately introduced the culture of turnips, to provide food for his cattle in the winter. This iſland has many lochs, ſome of which have trouts and eels. The quadrupeds are horſes, cows, ſheep, and goats. It has neither deer, hares, nor rabbits. Rats are its only vermin, and they have been brought thither by ſea ; they have no ſerpents, frogs, or toads. The number of inhabitants is eſtimated at ſomewhat more than 800. It is 11 miles N.W. from the iſland of Mul. N. lat. 56° 38′. W. long. 6° 42′.

Col of Arez, a paſſage of the Pyrenées, in the road from Prats de Molo, in France, to Campredo, in Spain.

Col of *Argentiere*, a paſſage of the Alps, between Nice and Saluzzo.

Col *de Balme*, an eminence of the Alps, in the vicinity of Mont Blanc, lying in the way from Trient to Chamouny. It is very ſteep, but not dangerous, and the path, which is in no point bare rock, runs through a thick wood cloathing the ſides of the mountain.

Col of *Limon*, a paſſage of the Alps, between Soſpella and Coni.

Col of *Paracols*, a paſſage of the Pyrenées, between Ceret, in France, and Ampurdan, in Spain.

Col of *Pertus*, a paſſage of the Pyrenées, between Boulou and Junquere.

Col of *Tenda*, a paſſage of the Alps, between Piedmont and Nice, over the mountains of Tenda.

COLA dell'Amatrice, in *Biography*, a painter and architect, ſo called from the place of his birth, a ſmall town near Aquila, in the ſtate of Naples. At Aſcoli, and in all that province, where he ſpent the latter part of his life, Cola enjoys the reputation of having been an excellent painter, as well as a great architect. In ſome of his early pictures, there is a degree of dryneſs in the ſtyle, but, in his latter works, his drawing is in a grand taſte, and his pictures in every reſpect worthy of admiration. His moſt celebrated picture at Aſcoli, repreſents our Saviour diſtributing the euchariſt to the apoſtles, in the Oratorio del Corpus Domini. His greateſt work of architecture is the façade of the magnificent church of St. Bernardino, at Aquila, which was begun in 1525, and finiſhed in 1542 ; it bears this inſcription on the architrave : Cola. Amatricius. Architector. Instruxit. This artiſt is likewiſe ſpoken of as a ſculptor. Lanzi. Storia Pitt. Milizia. Mem. degli Arch.

Cola, Gennaro Di, one of the painters who flouriſhed in Naples in the 14th century. He was born about 1320, and was the ſcholar of Maeſtro Simone, an artiſt of ſome eminence in the city. There are ſeveral ſtories of the life of the Madonna, painted by this maſter, in company with another Neapolitan painter called Slefanone, in the church of St. Giovanni da Carbonara ; they are executed with great diligence. This artiſt died about the year 1370. Lanzi. Storia Pitt. Domenici.

COLAIR Lake, a lake of Hindooſtan, which, during the inundations in the ſeaſon of the periodical rains, is 40 or 50 miles in extent, and at all times a conſiderable piece of water, and lies about midway between the Godavery and Kiſtnah, in the new ſoil gradually formed by the inundations of theſe rivers, about 12 Britiſh miles to the N. of Maſulipatam. The origin of this lake may be referred to the ſame cauſe as that which produces the lakes and moraſſes of the Egyptian and Bengal deltas ; which is, that the depoſition of mud by the two rivers (or the two branches of one river) at the time when they overflow, is greateſt near the banks ; and thus the ground acquires the form of an inclined plane from each river bank towards the interior part of the country, where a hollow ſpace will be left. The ſubſequent inundations finding their way into this hollow place, from the lower part of the river, will gradually fill up with mud that part of the lake which lies towards the ſource of it ; and as the new land continues to encroach upon the ſea, the lake will travel downwards in the ſame proportion. A plan has been propoſed for opening a communication at all ſeaſons between the Colair lake and its parent rivers, with a view to the improvement of the adjacent lands, which form a part of the circars, and of the inland navigation. But though the propoſal was made in 1779, it does not ſeem to have been adopted. Rennell's Mem. p. 256.

COLAIRCOTTA, a town of Hindooſtan, in the circar of Ellore; 10 miles E. of Ellore.

COL. Ital. *with*, in *Muſic*, a contraction of con-la, con-le, con-lo, as *col-baſſo*, with the baſe; *col cembalo*, with the harpſichord; *colla parte*, with the voice-part; *coll'organo*, with the organ, &c.

COLACA, in *Ancient Geography*, a town of India, on this ſide of the Ganges. Ptolemy.

COLÆPIANI, a people of Pannonia, who, according to Pliny, inhabited the country near the Savus; ſuppoſed to have derived their name from the river Colapis.

COLAN, in *Geography*, a ſmall town ſituated near the South Sea, on the bay of Paita, in the kingdom of Peru, and juriſdiction of Piura. Near this town runs the river Chera, the ſame ſtream which waters Amotape. The inhabitants cultivate grain and breed cattle, with which they ſupply Paita, at the diſtance of about four leagues towards the ſouth, and alſo other towns. The Indians of this town are under an obligation of daily ſending to Paita one or two balzas loaded with water, which is diſtributed among the inhabitants by ſtated proportions. The nature of the ſoil, and the ſituation of the place, render it extremely hot. Its inhabitants, compoſing about 35 or 40 families, and conſiſting of Spaniards, Mulattoes, and Meſtizos, live chiefly by paſſengers going or returning from Panama to Lima. The town thus owes its whole ſupport to the harbour, which is the place where the cargoes of goods ſent from Panama are landed, together with thoſe coming from Callao to the juriſdiction of Piura and Loja. Here they alſo conſtruct large rafts of logs, which will carry 60 or 70 tons of goods: with theſe they make long voyages, even to Panama, at the diſtance of five or ſix hundred leagues. They bear a maſt with a ſail attached to it, and they always go before the wind, being unable to ply againſt it, ſo that they are adapted to theſe ſeas in which the wind is always nearly in the ſame direction. Their cargo is uſually wine, oil, ſugar, Quito cloth, ſoap, and dreſſed goat-ſkins. The float is commonly navigated by two or three men, who ſell their float when they diſpoſe of their cargo, and return as paſſengers to the port from which they came. The Indians go out at night by favour of the land-wind, with fiſhing floats, more manageable than the others, though theſe have maſts and ſails too, and they return again in the day-time with the ſea-wind.

COLANA, in *Ancient Geography*, a town of the Greater Armenia, near the Euphrates. Ptolemy.

COLANCORUM, a town of Germany, according to Ptolemy.

COLANIA, or COLONIA, a town of the iſle of Albion, aſſigned by Ptolemy to the Damnii, and ſuppoſed by Camden and Baxter to be the preſent Coldingham; but this being at too great a diſtance, and belonging to another nation, others have thought it more probable that it was ſituated at or near Lanark, the ſhire-town of Clydeſdale.

COLANTONIO, MARZIO DI, in *Biography*, a painter of conſiderable merit, who flouriſhed towards the latter part of the 16th century. He was born at Rome, and was inſtructed in the art by his father, an indifferent painter of groteſques. Marzio ſoon made a rapid progreſs, and excelled in freſco, in which way he was employed, upon many conſiderable works, in the churches and palaces of Rome: amongſt others he painted a chapel dedicated to St. Andrea, in the church of the Madonna della Conſolazione, with ſtories of that apoſtle. He afterwards painted many ſmall pictures of battles and landſcapes, in the ſtyle of Tempeſta, for which he was much admired. The laſt years of his life were ſpent in Piedmont, in the ſervice of the prince of Savoy. He died in the prime of life, in the pontificate of Paul V. Baglione. Lanzi. Storia Pitt.

COLAPIANI. See COLÆPIANI.

COLAPIS, a river of Pannonia, which diſcharged itſelf into the Savus, near Siſcia, according to Pliny: Strabo and Dion Caſſius mention this river; but the latter calls it Colops.

COLAPTICE, the art of carving, or cutting, the reſemblances and figures of natural things in ſtone. The term for the artiſt is *lithoxos*.

COLAR, in *Geography*, a town of Hindooſtan, in the Myſore country; 35 miles E.N.E. of Bangalore, and 135 W. of Madras. N. lat. 13° 9'. E. long. 78° 19'.

COLARBASIANS, or COLORBASIANS, in *Eccleſiaſtical Hiſtory*, a ſect of Chriſtians in the ſecond century; ſo called from their leader, Colarbaſus, a diſciple of Valentinus; who, with Marcus, another diſciple of the ſame maſter, maintained the whole plenitude and perfection of truth and religion, to be contained in the Greek alphabet; and that it was upon this account that Jeſus Chriſt was called the *alpha* and *omega*. This ſect was a branch of the VALENTINIANS. See alſo MARCOSIANS.

COLARIN. See COLLARINO.

COLARNI, in *Ancient Geography*, a people of Spain, in Luſitania, according to Pliny. Ptolemy calls their town *Colarnum*.

COLARUS, in *Geography*, a town of Hindooſtan, in the circar of Gohud; 30 miles S.S.W. of Narwa, and 125 S. of Agra.

COLATTO, a town of Italy, belonging to the ſtate of Venice, in the Treviſan; 6 miles S.S.W. of Ceneda.

COLATURE. See FILTRATION.

COLBA, a town of Germany, in the circle of Upper Saxony, and territory of Neuſtadt; 3 miles W.S.W. of Neuſtadt.

COLBATCH, JOHN, in *Biography*, an apothecary and ſurgeon, and in his later years member of the college of phyſicians, London, a man of much induſtry and ingenuity, and author of numerous publications on medical ſubjects. He appears to have practiſed medicine in London, and to have been in conſiderable repute from the beginning to nearly the middle of the laſt century. His firſt work was entitled "A New Light of Chirurgery," publiſhed in London in 8vo. 1695. He ſhews the miſchief occaſioned by uſing tents, and injecting acrid ſubſtances into wounds, and inſtead of them recommends a powder of his compoſing, which he diſſolved in water and applied. It reſtrains hæmorrhage, he ſays, ſooths pain, and diſpoſes ulcers and wounds to heal. As this excited oppoſition, in an edition of the ſame work publiſhed ſome years after he vindicated his doctrine, and adds a variety of caſes and experiments, in which his method had been attended with complete ſucceſs. In 1696, he publiſhed "A Phyſico-Medical Eſſay concerning Alkali and Acid," 8vo. He attributes moſt diſeaſes to a predominant alkali in the conſtitution, and ſays they are to be moſt efficaciouſly relieved by adminiſtering acids. Lemon juice, cream of tartar, and the acid of vitriol, were found by him to be ſovereign remedies againſt moſt diſeaſes. Among other complaints, they cured the gout, on which he wrote a treatiſe the following year. His laſt publication was on the "Miſletoe of the Oak," London,

don, 1719. He found it efficacious againſt the epilepſy, chorea ſancti viti, and other diſeaſes of the nervous ſyſtem. He gives half a drachm of the powder of the miſletoe, every three or four hours. The book contains full directions for collecting and preparing the plant, which is equally efficacious, he ſays, gathered from any other tree, as from the oak. His opinion of the efficacy of the plant is confirmed by the recital of ſeveral caſes in which he had given it with ſucceſs. Notwithſtanding the high character he gives of the miſletoe, it has long ſince fallen into diſuſe. Dr. Fraſer has lately endeavoured to recal the attention of phyſicians to the ſubject, but he ſeems rather to have been led to it, by reading the account given by Colbatch, than from his own experience ; at the leaſt, the few caſes he recites are not in point. Of the time when Colbatch died we have no account. Haller Bib. Chir. &c.

COLBERG, in *Geography*, a well fortified Pruſſian town in that part of Pomerania anciently called Caſſubia, is ſituated on the river Perſante; which, not far from hence, falls into the Baltic ſea, and forms a convenient harbour. It has a few linen and woollen manufactures, a good ſalmon and lamprey fiſhery, and a tolerable trade. Some ſalt is made, on account of the crown, out of a ſalt ſpring cloſe to the town. In 1758 Colberg was bombarded by the Ruſſians without effect. Under the command of the brave colonel Loucadou, the garriſon oppoſed an equally ſucceſsful reſiſtance to the French, who inveſted the place in November, 1806, and raiſed the ſiege in April, 1807. Colberg is diſtant 98 miles N.N.E. from Kuſtrin, and 124 N.E. from Berlin. N. lat. 54° 8′. E. long. 15° 27′.

COLBERT, JOHN BAPTIST, marquis Seignelai, in *Biography*, one of the greateſt ſtateſmen that ever had the management of the affairs of France, was born at Rheims, in 1619. His father was Nicholas Colbert, whoſe family was originally from Scotland. The ſubject of this memoir ſhewed an early attachment to commercial and financial purſuits, and to gratify his inclinations, in this reſpect, he made a tour through the provinces of France, which were the moſt famous for trade and manufactures. At Paris he was introduced to the prime miniſter, cardinal Mazarin, who admitted him to his confidence, and in a ſhort time entruſted to his management the moſt important concerns. The cardinal, during his laſt illneſs in 1661, recommended Colbert to his ſovereign, as a man qualified for the higheſt office, and appointed him one of the executors to his laſt will. Louis XVI. attended to his late miniſter's recommendation and appointed Colbert as intendant of the finances. He immediately ſet about reforming abuſes, and aboliſhing a number of uſeleſs places which, in that, as in other ſtates, had been created for the purpoſe of ſerving individuals, rather than of benefiting the public. He quickly re-eſtabliſhed order in the receipts and payments, and by a ſtrict regard to the principles of economy, was enabled to augment the public treaſury, while at the ſame time he actually diminiſhed the taxes impoſed on the people. He eſtabliſhed a court of juſtice to examine and decide on all matters relating to finance, and thus recovered many alienations of the revenue, and ſuppreſſed annuities to a great amount, which had been acquired unjuſtly, and for which the original price was repaid. In 1664 he was appointed ſuperintendant of the public buildings, and invited architects, ſculptors, and other artiſts of real eminence, from all parts, whom he employed, on the moſt liberal terms, to decorate the palaces, and to render the capital worthy of the greatneſs of the kingdom. It was about this time that he turned his attention to commerce, and by his prudence and activity, raiſed, as a preparatory ſtep, the royal navy to a moſt reſpectable ſtate, ſo as to enable it to protect the deſigns which he had in view. He conceived the project of reviving the French Eaſt India Company, notwithſtanding all the misfortunes which had diſappointed the ſkill and diligence of his predeceſſors ; for this purpoſe he made himſelf acquainted with ſuch merchants and ſeamen as were moſt converſant with the buſineſs. From them he learnt that a ſcheme of this magnitude could not ſucceed, without a very large fund eſtabliſhed for the purpoſe : a peremptory excluſion of foreigners ; and ſuch a degree of liberty and independence being ſecured to the company as might be ſatisfactory to every one, whether native or foreigner, of the ſafety of the property entruſted to them. To attain theſe objects it was neceſſary to give a ſtimulus to the nation ; accordingly the pens of the moſt able academicians were employed to recommend them to public notice. Colbert ſucceeded, and he eſtabliſhed alſo the Weſt India and African companies, which gave to France many important advantages. Nor was the miniſter leſs attentive to the internal manufactures of the country ; thoſe of ſilk, of wool, of glaſs, and of ſteel, were either introduced or liberally encouraged, and foſtered by his care and ſolicitude ; and it is ſaid that there was ſcarcely a year of his miniſtry in which he did not introduce ſome new and uſeful manufacture to excite the induſtry, and augment the wealth of his countrymen.

Colbert was the zealous patron of the arts and literature ; he prevailed upon Caſſini to quit Italy, and to place himſelf under the protection of the king of France, by whom he was penſioned. The French academy of painting was likewiſe founded by Colbert ; he was greatly inſtrumental in the eſtabliſhment of the Academy of Sciences, and that of inſcriptions took its riſe from an aſſembly in his own houſe for the purpoſe of furniſhing deſigns for the king's medals. To encourage national induſtry he projected the grand canal of Languedoc, thereby uniting the two ſeas by which France is bounded. This undertaking, which was completed in about fourteen years, has afforded prodigious advantages to the enterprizes of the French nation, which would have been raiſed to a much higher degree of opulence had not the ſovereign's inclination for war, and for expences of every kind, brought on embarraſſments, which not only thwarted the deſigns of the miniſter, but finally deſtroyed many of his beſt plans. He himſelf has been accuſed of a too great regard to ſhow and parade, and with a deſire of encouraging the induſtry of towns, to the detriment of the agricultural intereſts. To render proviſions cheap to the inhabitants of towns, and thereby encourage manufactures and commerce, he prohibited the exportation of corn, and thus excluded the inhabitants of the country from every foreign market for the produce of their induſtry. This great man, after having paſſed through many offices of the firſt importance in the ſtate, died of the ſtone in September, 1683, in the ſixty-fifth year of his age, leaving behind him ſix ſons and three daughters. He was a man of great probity, extenſive knowledge, in whatever concerned his own ſituation, and of the moſt indefatigable induſtry. His well timed, and neceſſary reforms, created him enemies, but his name has deſcended to poſterity, accompanied with the plaudits of the wiſe and good of every nation. Nouv. Dict. Hiſt. Univer. Hiſt. Hiſtoire de France.

COLBERT, JOHN BAPTIST, marquis de Torci, and ſon of the above, was born in 1665. In 1686 he was appointed ſecretary of ſtate for the foreign department, and in 1699 director-general of the poſts. He is ſaid to have ſurpaſſed his father in the extent of his abilities and in the cultivation of his faculties : but in imitation of him he was a zealous promoter of commerce and the arts, and raiſed the French navy to a ſuperiority over every other in Europe. He died in 1746, having attained the reputation of an able ſtateſman, and an excellent man. He left behind him memoirs of the negociations from the treaty of Ryſwick to the peace of Utrecht, which were publiſhed in 1756 in three vols. 12mo.

Colbert's MSS. *Codices Colbertini*, in *Biblical Hiſtory*, were collected by the celebrated Colbert, miniſter of the marine to Louis XIV. and are at preſent in the royal library in Paris, for which they were purchaſed by cardinal Fleury. They are deſcribed in general in the "Bibliotheca Colbertina," Pariſiis, 1728, p. ii. 8vo. and in Montfaucon's "Bibliothecarum" tom. ii. But ſeveral of Colbert's MSS. and eſpecially thoſe of the Greek Teſtament, appear to have been ſeparated from thoſe of the Colbert library, and placed among the MSS. which were before in the royal library. The Colbert MSS. of the Greek Teſtament muſt therefore be ſought among the Codices Regii, in the ſecond volume of the "Catalogue MSS. Bibl. Regiæ." Five of theſe MSS. which contain the four goſpels, of which two are referred to the 11th century, were collated by Simon, and their readings noted in the margin of Curcellæus's edition of the Greek Teſtament. Of ſeven other MSS. given in Mill's Greek Teſtament as eight, that learned critic has given a collection of readings, made by Larroque in a very ſuperficial manner, and communicated by Allix. One of theſe divided by Mill into three ſeparate MSS. contains the whole New Teſtament, except the book of Revelation, and was in Mill's time ſuppoſed to be 600 years old. This important MS. is deſcribed by Grieſbach in his "Symbolæ," who defends it againſt the ſuſpicion of its having been altered from the Latin, relates that its readings harmonize with thoſe of Origen, refers it to the 11th or 12th century, and eſtimates it as a MS. of great value. Twelve other Codices Colbertini are ſimply Lectionaria of the four goſpels, which Wetſtein collated in 1715. See Michaelis's Introd. to the N. T. by Marſh, vols. ii. and iii.

COLBUSA, in *Ancient Geography*, a town of Bithynia. Pliny.

COLCHAGUA, or Collagua, in *Geography*, a town of South America, in the kingdom of Chili, and capital of a juriſdiction containing about 1500 families.

COLCHESTER is a large market and borough town of Eſſex, England, and, as its name imports, was formerly a Roman ſtation. From an examination of the beſt authorities it appears to have been the Camalodunum of the Romans; and Tacitus, with ſome other ancient hiſtorians, relate that it was the principal military colony of the legions under Claudius. That emperor, having ſubjugated the Trinobantes, took poſſeſſion of this ſtrong hold, and garriſoned it with the ſecond, ninth, and fourteenth legions, whom he flattered with the pompous appellation of "conquerors of Britain," and named the place Colonia; probably as a pre-eminent memorial of its being the firſt Roman colony eſtabliſhed in this iſland. In the Itinerary of Antoninus, it is diſtinguiſhed both by that appellation, and by its original one of Camalodunum. It appears alſo, from the coins of Claudius, mentioned by Camden, to have been called Colonia-Camalodunum. Claudius, after eſtabliſhing this colony, reduced the adjacent country into a Roman province; and having appointed Plautius, proprætor, returned to Rome, where a magnificent triumph was decreed to him by the ſenate, an anniverſary ſolemnity inſtituted to commemorate his victory, and the ſurname of Britannicus entailed on his family. His ſucceſs cauſed equal rejoicing at Camalodunum, where a temple was erected to his memory, and he was worſhipped as the tutelar deity of the place. This proſperity was not deſtined to laſt; for though the oppreſſed Britons were conquered, they were not ſubdued; and after ſeveral unſucceſsful efforts to regain this ſtation, they at length effected it under Boadicea. This Amazonian princeſs, taking advantage of a favourable opportunity, when the chief part of the veteran legions was withdrawn, directed her force againſt this devoted colony; fire and ſlaughter marked her progreſs; and Camalodunum, the ſeat of Roman tyranny in Britain, was overwhelmed in its own ruins, after a feeble reſiſtance from the remaining ſoldiers, who defended themſelves for two days in the temple. From the authority of Pliny, and the evidence of Roman coins, with other antiquities, it is, with high probability, deduced that Camalodunum was ſoon rebuilt.

"There are more Roman remains in and about this town than in any other part of South Britain. Immenſe quantities of Roman bricks and tiles are to be ſeen incorporated, or rather are the chief materials in all the moſt ancient and public edifices. The town-walls, the caſtle, and the churches are half built with them; and in ſeveral parts even the Roman workmanſhip is copied. The bricks are generally about 14 inches by 13, ſome 18 by 14; exceedingly hard and well baked. The *ſupellex Romana* of all kinds ſtill abounds here; hardly any place being dug up, without urns, vaſes, and pottery of all ſorts, or at leaſt, fragments of them being diſcovered. Sepulchral urns, with the aſhes therein, are likewiſe frequently found; as well as lamps, rings, intaglios, chains, &c. A remarkable ſepulchral urn, in particular, was taken up here a few years ago. It was a large veſſel, made of thick, coarſe, light clay, containing twenty gallons; within was an urn of black earth, holding about two gallons, and having in it the aſhes of a Roman lady, as may be ſuppoſed, becauſe there were alſo with it two bottles of clay for incenſe, two clay lamps, one metal veſſel for ointment, and a ſpeculum of poliſhed metal, anciently uſed for a looking-glaſs." Morant's Eſſex.

The teſſelated pavements are generally found at the depth of between three and four feet beneath the ſurface. There appear to have been ſeveral in the church-yard of St. Mary's at the Wall; teſſeræ having been frequently dug up in different places. Many Roman pateræ, fragments of ſculptured veſſels, ſacrificing inſtruments, Roman bracelets, and other antiquities have alſo been found here; and lately in a field near the weſt end of the town, part of a Roman hypocauſt was diſcovered. The continued reſidence of the Romans at Colcheſter is farther confirmed by the many ſtrong entrenchments, ſtretching from north to ſouth, weſtward of the town. Theſe are conjectured to be the remains of the Caſtra, Caſtella, and Præſidia, which, we learn from Tacitus, were formed about this ſtation.

Ancient tradition gives to the town the honour of being the birth-place of Conſtantine, the firſt Chriſtian emperor, and his mother Helena; the ſubſtance of this legend, which has frequently engaged the attention of the learned, is briefly this; that Coel, a Britiſh prince, was inveſted by the Romans with the government of this diſtrict; where, taking advantage of the diſtraction of the Roman empire, he aſſumed independence, repaired the public works, and gave his capital the name of Caer-Coel; that Conſtantius, empowered with ſovereign authority by Diocleſian and Maximilian, was ſent to Britain to reduce the revolters, and that he laid ſiege to Caer-Coel as the centre of the inſurrection; that during the ſiege, which continued three years, Conſtantius became acquainted with Helena, the daughter of Coel, was captivated by her perſonal charms and mental endowments, and made peace with Coel, on condition of receiving his accompliſhed daughter in marriage; and that Conſtantine was the iſſue of this union, and was born at

Caer-Coel. This tradition, which originated with Britiſh writers, is wholly unnoticed by Roman hiſtorians, and contradicted by the concurrent evidence of the beſt informed writers on Roman hiſtory. (See Gibbon's "Decline and Fall of the Roman Empire.") The real birth-place of Conſtantine is generally ſuppoſed to have been Naiſſus in Dacia. Though the tradition which aſſigns it to Colcheſter is found to be unworthy of credit, yet it probably owed its riſe to ſome occurrences in the hiſtory of this city, particularly connected with his family. Conſtantius reſided in Britain a conſiderable time, accompanied by his ſon Conſtantine, and probably by his wife Helena; and Colonia being then a flouriſhing ſtation, he may be ſuppoſed to have made it, at leaſt, an occaſional reſidence. Conſtantius was a ſecret promoter of Chriſtianity; and Conſtantine and Helena being avowedly ſo, obtained the veneration of the inhabitants, who aſcribe to her, among other pious labours, the foundation of St. Helen's chapel.

Under the Saxon government, Colcheſter, then called Colon-ceaſter, or Colne-ceaſter, loſt much of its ancient conſequence, by the increaſed importance of the Engliſh metropolis, which aroſe from its more favourable ſituation for trade and commerce. The Danes afterwards obtained poſſeſſion of Colcheſter, and, by a treaty with Alfred, were eſtabliſhed here and in the adjacent country; but recommencing their uſual ſyſtem of deſtruction and plunder, Edward the Elder laid ſiege to this town, which was taken by aſſault, and the Danes were all put to the ſword. Edward is ſuppoſed to have repeopled the deſolated city by a colony of Weſt-Saxons, and in 922, according to the Saxon Chronicle, he rebuilt or repaired the walls. Colcheſter appears to have been a conſiderable town at the time of the Domeſday Survey; the number of burgeſſes, who then held houſes under the king, was 276; the number of houſes in their poſſeſſion 355, beſides many others occupied by different proprietors. At the commencement of the civil commotions in the reign of Charles I., the inhabitants of Colcheſter coaleſced with the parliament and petitioned that the town might be better fortified; in conſequence of which 1500*l.* was accordingly granted for that purpoſe. Unwarranted acts of outrage were ſoon committed by the lower claſſes againſt the Lucas family; but the horrors of civil war were not felt in all their ſeverity till the year 1648, when the memorable ſiege of this town reduced the inhabitants to the greateſt diſtreſs.

Colcheſter is ſituated principally on the ſummit and northern aſpect of a gentle eminence, riſing from the river Colne, which flows on the north and eaſt ſides, and is navigable to the ſpot called the New-Hythe, in the eaſt quarter of the town. The ſpace incloſed by the remains of the ancient walls, forms a parallelogram, having its longeſt ſides towards the north and ſouth; the buildings without the walls, chiefly on the ſouth and eaſt, are very irregularly diſpoſed. The principal ſtreet, which runs nearly eaſt and weſt, contains many reſpectable houſes and large ſhops; but is disfigured by the old market-houſe and other ſmall buildings, which, occupying the middle of the ſtreet, obſtruct the paſſage. Part of the town was firſt paved in the year 1473: in the reign of James I. an act was obtained for paving the whole, and its proviſions were enforced by another act paſſed in 1750. By theſe ſtatutes, the land-owners and proprietors of buildings, are compelled to pave and repair all the ways contiguous to their reſpective poſſeſſions. The preſervation of the walls was formerly an object of great attention, but they are now nearly deſtroyed; and what remains is only kept in repair by thoſe who have gardens or grounds adjoining. The walls conſiſt of ſtone and Roman brick, united by a very ſtrong cement; their circumference is one mile and three quarters, incloſing an area of rather more than 108 acres. Edward the Elder, as already mentioned, rebuilt or repaired them after the defeat of the Danes in 921; and Richard II. is recorded to have exempted the burgeſſes from the charge of ſending members to three parliaments, on account of the great expence they were at "in repairing their wall with lime and ſtone againſt all invaders." Similar exemption was granted by the two ſucceeding ſovereigns; but ſince the ſiege in 1648 no public attention has been paid to the walls. When in their perfect ſtate, the entrance to the town was by four principal gates and three poſterns; moſt of which are now deſtroyed. The walls were ſtrengthened by ſeveral baſtions, and defended on the weſt by a ſmall ancient fort of Roman workmanſhip, conſtructed with the walls originally called Co'kynge's caſtel; the arches that remain are formed of Roman brick; on the north and weſt ſides were deep ditches in the places moſt open to attack.

On an elevated ſpot, north of the High ſtreet, and commanding a proſpect of the winding valley to the north and eaſt, ſtand the ruins of a very ancient caſtle. The outer walls of the keep are nearly perfect, and by their vaſt thickneſs and ſolidity, evince the importance that in the early ages was attached to this ſituation. The whole building is conſtructed with a mixture of ſtone, flint, and Roman bricks; but the latter are chiefly in ſuch pieces as convey an idea of being taken from ſome more ancient building. The erection of this fortreſs is aſcribed by Norden to Edward the Elder; but the Monaſticon refers it to Eudo Dapifer, ſewer or ſteward to William the Conqueror; it is evidently Norman in its general ſtructure; yet it ſeems probable, from the great number of Roman bricks worked up in the walls, that it was raiſed on the ſite of ſome Roman building, and with a large portion of its materials. The tradition recorded in the Colcheſter Chronicle, preciſely points out a more ancient edifice on this ſpot; "in fundo palatii Coelii quondam regis;" now if, according to Mr. Gough's ſuppoſition, Coel or Coelius was a Roman name, the origin of the fortreſs ſeems to be aſcertained; and unleſs ſome ſpacious ſtructure had previouſly occupied this ſite, there would be great difficulty in accounting for ſo large a ſpace as the caſtle and its ramparts include, ſo near the centre of the town, remaining unoccupied till the time of the Normans. For a more particular account of the caſtle, vide "Architectural Antiquities of Great Britain," vol. i.

The town and ſuburbs of Colcheſter comprehend ſixteen pariſhes; ſome of the churches are deſtroyed; the remainder, with the ruins of St. John's abbey, St. Botolph's priory, and the Moot-Hall, conſtitute the chief of the ancient and public buildings. St. John's abbey, ſo called from its dedication to St. John the Baptiſt, was a very magnificent ſtructure, founded by Eudo Dapifer, in the year 1097; it occupied a pleaſant eminence without the walls on the ſouth ſide; but only the entrance gateway, and ſome fragments of other parts, now remain. The gateway is built with hewn ſtone and flint, and the workmanſhip is very uniform and ſtable. The abbey church was of ſingular conſtruction, having a tower in the centre, with circular angles, terminated by ſmall conical ſpires; the weſt front alſo was furniſhed with circular turrets. The abbey had the privilege of ſanctuary. At a ſmall diſtance, north-eaſt, are the remains of St. Botolph's priory, generally ſuppoſed to have been founded by a monk named Eynulph or Ernulph, early in the twelfth century; though ſome portions of the ruins imply a far anterior date. Ernulph was the firſt prior, and placed on his foundation regular canons of the Auguſtine order. The priory church, which was parochial as well as conventual, continued nearly perfect till the ſiege in 1648, when it was in a great meaſure deſtroyed; the contending parties charge each other with having wantonly occaſioned its demolition. Its ruins are peculiarly intereſting to the architectural antiquary, as preſenting ſome curious ſpecimens of brick ornaments, and of interlaced arches, from which the idea of the pointed arch is ſuppoſed to have originated. The length of this edifice within the walls, was, in its priſtine ſtate, 108 feet; its breadth, including the naves and ailes, nearly 44. The weſt-front was highly decorated; on this ſide was the principal entrance, which is ſtill extant. The door-way is a fine ſemicircular retiring arch, having various zig-zag mouldings conſtructed with ſmall thin bricks and hewn ſtone in alternate ſucceſſion. Theſe venerable remains are particularly deſcribed in the "Architectural Antiquities of Great Britain," vol. i.

Eaſt of St. Botolph's, is St. Mary Magdalen's hoſpital, originally founded for perſons afflicted with leproſy, by Eudo Dapifer, temp. Henry I. To Eudo alſo the Moot-Hall owes its origin, where the courts are held, and the public buſineſs tranſacted. Adjoining to it are the town gaol and theatre. A free ſchool and ſeveral charity ſchools have been eſtabliſhed, and various meeting-houſes built for different religious ſects. Colcheſter was incorporated by charter of Richard I. dated 1189; and the burgeſſes were at the ſame time inveſted with many valuable privileges, particularly the excluſive right of fiſhery on the Colne, from the north bridge to Weſt-Neſſe. Theſe privileges have been confirmed and extended by ſeveral ſubſequent ſovereigns, eſpecially by Henry V., the initial letter of whoſe charter repreſents St. Helena before the croſs, finely illuminated. The laſt charter, under which the town is now governed, was granted by George III. in 1763. Its proviſions are nearly ſimilar to thoſe of the former charters granted by Charles II. and William and Mary, which have on different occaſions been ſurrendered. The corporation conſiſts of a mayor, recorder, town-clerk, twelve aldermen, eighteen aſſiſtants, eighteen common-councilmen, and ſome inferior officers. The right of returning repreſentatives to parliament is veſted in the corporation and free burgeſſes not receiving alms; the number of voters is about 1400. The earlieſt return was made 25 Edward I.

Colcheſter has been a market-town time immemorial; but this privilege was confirmed by Richard the Firſt's charter. The market is held on Saturday. The number of inhabitants returned under the late act, as reſiding within the town and liberties, was 10,089; the number of houſes 1793. A conſiderable portion of the trade of the town ariſes from the oyſter fiſhery: Colcheſter oyſters having been long celebrated for their goodneſs and flavour. This town is diſtant from London 51 miles N.E.

Mile End, ſo named from being nearly that diſtance north of Colcheſter, is an extenſive pariſh, chiefly belonging to the burgeſſes of that town, by a grant either from Henry I. or Stephen, which was renewed by Henry VIII. Morant's Hiſtory of Eſſex, 2 vols. fol. Hiſtory of Colcheſter, 2 vols. 8vo.

The top of the ſtaircaſe of St. Mary's church ſteeple in this town, was, about the year 1798, ſelected as one of the ſtations in the Government Trigonometrical Survey, and its ſituation was determined by an obſervation from Great Tay ſteeple diſtant 33,056 feet, and bearing 84° 22′ 42″ N.W. from the parallel to the meridian of Greenwich, and another from Stoke ſteeple diſtant 36,796, and bearing 1° 47′ 26″ N.W. from the ſame parallel, whence was deduced its latitude 51° 53′ 17″.7 N. and its longitude 0° 53′ 33″.7 E. of Greenwich. The obſervations from this place were uſed with thoſe of Great Tay for ſettling the ſituation of Weſt Bergholt; and with thoſe of Stoke, for Earl's Colne and Little Bromley churches. The Colne river is navigable for ſmall ſea-built veſſels up to this town. See Canal.

Colcheſter, a townſhip of America, in Ulſter county, New York, ſituated on the Popachton branch of Delaware river, S.W. of Middletown, and about 50 miles S.W. by S. of Cooperſtown.—Alſo, a large townſhip in New London county, Connecticut, ſettled in 1701; about 15 miles weſtward of Norwich, 25 S.E. of Hartford, and 20 N.W. of New London city.—Alſo, the chief town of Chittenden county, Vermont, ſituated on the eaſt bank of lake Champlain, at the mouth of Onion river, and N. of Burlington, or Colcheſter bay, which ſpreads N. of the town.—Alſo, a poſt-town of Fairfax county in Virginia, ſituated on the N.E. bank of Ocquoquam creek, three or four miles from its confluence with the Potowmack; and here about 100 yards wide, and navigable for boats. It contains about 40 houſes, and lies 16 miles S.W. of Alexandria, 106 N. by E. of Richmond, and 172 from Philadelphia.

COLCHICUM, in *Botany*, (ſuppoſed to be ſo called from Colchis, where it is ſaid to grow in great abundance,) Linn. Gen. 457. Schreb. 621. Willd. 707. Gært. 81. Juſſ. 47. Vent. 2. 155. Tourn. Claſſ. 9. Sect. 1. Gen. 5. Claſs and order, *hexandria trigynia*. Nat. Ord. *Spathaceæ;* Linn. *Junci*, Juſſ. *Joncacei*, Vent.

Gen. Ch. *Cal.* a ſpathe. *Cor.* monopetalous, tubular, very long, ſpringing immediately from the root; border campanulate, deeply divided into ſix lanceolate-egg-ſhaped ſegments. *Stam.* Filaments ſix, awl-ſhaped, ſhorter than the corolla, inſerted into the tube; anthers oblong, four-valved, incumbent. *Piſt.* Germ ſuperior, ſituated at the bottom of the tube of the corolla, contiguous to the root, below the ſurface of the ground; ſtyles three, a little longer than the ſtamens; ſtigmas reflexed, channelled. *Peric.* Capſules three, inflated, coherent in their lower part, ſlightly ſeparated towards the ſummit, opening longitudinally on the inner ſide. *Seeds* numerous, almoſt round, wrinkled.

Eſſ. Ch. Calyx a ſpathe. Corolla ſix-cleft; tube ſpringing immediately from the root. Capſules three, connected, inflated, with many ſeeds.

Sp. 1. C. *autumnale.* Linn. Sp. Pl. 1. Mart. 1. Lam. 1. Willd. 1. Lam. Ill. tab. 267. Eng. Bot. tab. 133. Woodv. Med. Bot. tab. 177. (C. commune; Bauh. Pin. 67. Moris. ſect. 4. tab. 3. fig. 1. Rai. Hiſt. 1172. Syn. 373.) "Leaves flat, lanceolate, erect." *Root* bulbous, nearly as large as that of the tulip, fleſhy, abounding in a milky juice, periſhing after the ripening of the ſeeds, but firſt throwing out a lateral bulbous offſet, which produces the flowers of the enſuing year. *Flowers* generally purpliſh, opening in the latter end of September without ſtem or leaves; tube of the corolla very long; ſegments of the calyx, lanceolate, large; anthers yellow; germ remaining under ground during the winter. *Leaves* appearing in the enſuing ſpring, a foot long, broad, flattiſh, obtuſe, dark green, upright, three or four together, ſheathing. *Capſules* riſing with the leaves, and ripening the ſeeds in May. There is a variety, or rather a monſtroſity of this ſpecies, figured in Engliſh botany, tab. 1432. It is produced by ſome accidental cauſe which prevents the plant from flowering at the proper ſeaſon, in conſequence of which the flowers accompany the leaves in the ſpring; but all their parts are imperfect; there is no pollen in the anthers, the ſegments of the corolla are unnaturally long and narrow, of a greeniſh ſickly hue; and the germ is entirely abortive. Specimens were ſent to Dr. Smith by Mr. Salmon, from a meadow near the Devizes, Wilts. We are in poſſeſſion of ſpecimens gathered in the neighbourhood of York by the Rev. Mr. Wellbeloved.

A native of many parts of Europe, abundant in the weſt and north of England, moſt frequently, but by no means excluſively, in a calcareous ſoil. The whole plant has a ſtrong and nauſeous ſmell. The recent ſucculent bulb has an acrid, cauſtic, bitter taſte, and is poiſonous to man and other animals. A preparation of it is uſed in France, by order of government, to deſtroy wolves. Deprived of its juices by age, or dried in an earlier ſtate, it loſes its active qualities, and may be eaten with impunity. If taken out of the ground before the plants flower, and completely freed from its juices, it affords, like many other bulbs and tubers, a farinaceous matter which is wholeſome and nutritious. Baron Stoerk of Vienna firſt introduced it into uſe as a medicine. He ſliced an ounce of the freſh root, and digeſted it for forty-eight hours in a pound of vinegar, with a gentle heat. He then ſtrained the vinegar, and added to it twice its weight of honey. The oxymel, thus produced, taken twice a day in doſes of a dram, and gradually increaſed to an ounce or more, proved a very powerful diuretic, and in many caſes cured dropſies, which had been eſteemed deſperate. Pills are alſo made of the dried root reduced to powder, which have been found beneficial in removing obſtructions. It is a favourite medicine in Germany and France; but the Engliſh phyſicians have found it a leſs efficacious diuretic than the ſquill, by which it is ſtill more excelled as an expectorant. The London college directs an oxymel colchici; that of Edinburgh, a ſyrup; the latter differs from the former only in uſing ſugar inſtead of honey. The expreſſed juice of the leaves, or an infuſion of them in boiling water, applied as a lotion, has been uſed in France to deſtroy the lice which infeſt horned cattle. In an agricultural point of view, it is certainly a noxious weed to the farmer; not, indeed, on account of its poiſonous qualities, for neither cows, horſes, nor ſheep will touch it; but on account of its broad leaves, which occupy the place of better herbage. The only method of getting rid of it is to dig up the bulbs with a ſpade, and to replace the earth when they have been ſeparated from it. 2. C. *montanum*. Linn. Sp. Pl. 2. Mart. 2. Lam. 2. Willd. 2. Hall. Helv. n. 1256. Allion. Ped. tab. 74. fig. 2. (C. montanum anguſtifolium; Bauh. Pin. 68.) "Leaves linear, ſpreading widely." *Root* ſmaller than that of the preceding ſpecies, with a darker coat. *Leaves* about three inches long, and half an inch broad, coming out with the flower in Auguſt and September, and continuing green all the winter, at firſt broadiſh and egg-ſhaped, afterwards almoſt linear. *Flowers* reddiſh purple, marked with lines; border deeply divided into narrow, almoſt linear ſegments. A native of Spain, Portugal, Italy, Switzerland, and the ſouth of France; cultivated in England in 1629. 3. C. *variegatum*. Linn. Sp. 3. Mart. 3. Lam. 3. Willd. 3. Morii. tab. 3. fig. 4. "Leaves undulated, ſpreading." *Leaves* appearing after the flowers are over, ſmaller than thoſe of C. autumnale, moſt commonly three in number, of a paler and freſher green colour, lying cloſe upon the ground, broad at the bottom, a little pointed at the end. *Flowers* whitiſh, beautifully marked with purpliſh ſpots; border broad, with expanding ſegments. A native of the iſlands in the Archipelago, flowering in October or November.

Propagation and Culture. All the three ſpecies are deſirable ornaments to the flower-garden, particularly as they appear at a ſeaſon when moſt other plants have loſt their beauty. Their bulbs require the ſame treatment as thoſe of the tulip. They ſhould be taken up about the end of May, when the leaves are withered, and may be kept above ground until the beginning of Auguſt. The third ſpecies is rather tender. Many varieties of the common ſort were known in the time of Parkinſon, and are ſtill propagated by the floriſt; thoſe moſt common are the ſingle and double-flowered white, the ſingle and double-flowered purple, the variegated purple, the roſe-coloured, and the ſtripe-leaved.

Colchicum *vernum hiſpanicum*; Bauh. Pin. See Bulbocodium.

COLCHIS, or Colchos, in *Ancient Geography*, now *Mingrelia*, was bounded on the eaſt by Iberia and Caucaſus, on the weſt by the Euxine ſea, on the ſouth by Armenia and part of Pontus, and on the north by mount Caucaſus, dividing it from Sarmatia Aſiatica. The moſt noted cities in this country were Pityus, Dioſcurias, Aea, and Cyta, which ſee reſpectively. The cities of Saracæ, Zudris, Surium, Madia, and Zaliſſa, are alſo mentioned by Pliny, Strabo, and Ptolemy. Colchis was watered by many rivers, as the Corax, the Hippus, the Cyaneus, the Chariſtus, the Phaſis, the Abſarus, the Ciſſa, and the Ophis, all emptying themſelves into the Euxine ſea. The Colchians were, according to Herodotus, originally Egyptians; Seſoſtris having left part of the army, with which he invaded Scythia, in Colchis, to people that country, and guard the paſſes. Apollonius, Diodorus Siculus, Strabo, Euſtathius, and Marcellinus, agree with Herodotus, who mentions many particulars in which the Colchians reſembled the Egyptians. "They had," he ſays, (lib. ii. c. 104, 105.) "the like tendency to woolly hair, and were of the ſame dark complexion. There was a great ſimilitude in their manufactures, particularly in their linen; for they abounded in flax, which they wrought up to a high perfection after the Egyptian method. In ſhort, their whole way of life, and their language, had a great reſemblance." Hence we may perceive, ſays Bryant, (Anal. Anc. Myth. vol. iii. p. 451.) that though they were not, as the ancient hiſtorian ſuppoſes, of the real Mizraim race, yet they came from a collateral branch, and were a colony from Egypt. Accordingly, this learned writer ſuppoſes, that the Colchians were one of the moſt ancient colonies of the Cuthites, which is ſaid to have exiſted many ages before the era of the Argonautæ; ſo that, according to the poet (Apollonius Argon. l. iv. v. 267. v. 276.) many of the conſtellations were not found in the heavens at the time when this colony was founded. One of the principal cities was called Cuta and Cutaia; and the country was called Cuteis and Cutais, from the Cuthite inhabitants. They retained, ſays Bryant, a great reverence for the memory of their anceſtor Chus, and the ridge of mountains, which ran through their country, was from him denominated Caucaſus. The Colchians not only derived their origin from Egypt, but they were, as Bryant maintains, a part of that body, who by the Egyptians were ſtyled the Hellenic and Phœnician ſhepherds. They quitted Egypt, and were ſucceeded by the Iſraelites, called afterwards the Jews. To this purpoſe Diodorus ſays, (lib. ii.), "that the Colchic nation upon the Pontus Euxinus, as well as that of the Jews, who ſettled (in Canaan) between Syria and Arabia, were both founded by people, who went forth in early times from Egypt." As they enriched this country with many uſeful arts, it may well be expected that they ſhould retain to the laſt ſome of their original excellence. We accordingly find, that writers extoll their advances in ſcience, though it muſt have been much impaired, before the Grecians were acquainted with their coaſt.

In proceſs of time many other nations ſettled in Colchis, as the Heniochi, the Ampreutæ, the Lazi, the Ligures, the Marſi, the Iſtri, the Moſchi, and the Manralæ. The Colchians carried on for a long time an extenſive commerce. Strabo (lib. xi.) has given us a good deſcription of their country; and we may preſume that the nature of it muſt have been always much the ſame. He ſays, that the whole region abounded with fruit of every kind, and with every material that was requiſite for navigation. The only product of the country that was at all exceptionable was the honey, which had a bitter taſte. They had plenty of timber, and many rivers for its conveyance downwards. They had alſo abundance of flax and hemp; together with wax and pitch. The linen manufactured by the natives was in high repute. Some of it was curiouſly painted with figures of animals and flowers; and afterwards dyed, like the linen of the Indians. And Herodotus tells us (lib. i. c. 203.), that the whole was ſo deeply tinctured, that no waſhing could efface the colours. They accordingly exported it to various marts, as it was every where greatly ſought after. Strabo ſays, that many people who thought that they perceived a ſimilitude between the natives of Colchis and thoſe of Egypt, particularly in their cuſtoms, made uſe of this circumſtance to prove the reſemblance. He adds, that the high reputation and ſplendour, which they once maintained, may be known by the repeated evidences that writers have tranſmitted concerning them. The enterpriſing diſpoſition or extenſive commerce of the Colchians led them to eſtabliſh many ſettlements; ſo that the coaſt of the Euxine, upon which they lived, was in many places peopled from them. One of their chief colonies ſeems to have been that of the *Amazons*, which ſee. Colchis, beſides its other productions, was enriched with many mines of gold, which gave occaſion to the fable of the golden fleece, and the *Argonautic* expedition, ſo much celebrated by the ancients. See ARGONAUTIC.

The Colchians were governed by their own kings in the earlieſt ages; for Pliny tells us (l. xxxiii. c. 3.) that Seſoſtris, king of Egypt, was overcome, and put to flight, by the king of Colchis. Little, however, that is certain, is known concerning their kings.

Upon the death of Œetes, in whoſe reign the famous expedition of the Argonauts occurred, Colchis, as we learn from Strabo, (l. i. and xvi.) was divided into ſeveral petty kingdoms; but the occaſion of this diviſion is not known. We find no further mention of the affairs of Colchis, or of the princes who reigned there, till the time of Xenophon, who tells us (Anab. l. v.) that the ſon of Œetes, the ſecond of that name, reigned in Colchis, while he was making war in Aſia. Colchis was afterwards ſubdued by Mithridates the Great, but revolted from him while his forces were employed againſt the Romans. As ſoon as the king of Pontus had concluded a peace with Sylla, he marched againſt the Colchians, who offered to ſubmit, upon condition that he would appoint his ſon to reign over them, with the title of king of Colchis. This propoſal ſo provoked Mithridates, that he cauſed his ſon to be arreſted and loaded with chains of gold, ſacrificing him ſoon after to his jealouſy and ambition. Mithridates, finding that the Colchians obſtinately refuſed to ſubmit on any terms, aſſembled his troops in order to reduce them by force; but as he paſſed through the country of the Achæans, that people attacked him with ſuch vigour, and defended the paſſes with ſuch reſolution, that, after having loſt a great part of his army by the ambuſcades of the enemy, and by the exceſſive cold of the country, he was under a neceſſity of returning into Pontus. Colchis, during its ſubjection to Mithridates, was governed by prefects of his appointment, one of whom was Moaphernes, great uncle to Strabo the geographer. The Colchians took part with Mithridates againſt Pompey; and, during that war, were governed by their own king, called Olthæus, who was vanquiſhed, taken priſoner, and led in triumph by Pompey. Pompey conferred the ſovereignty on Ariſtarchus, for his eminent ſervices during the Mithridatic war. Afterwards Pharnaces II., king of Pontus, ſeized on the kingdom of Colchis, while Cæſar was entertained by Cleopatra in Egypt; but was ſoon obliged to abandon his conqueſts, and retire into the country of the Boſporani, where he was killed by Aſander. From this time no mention of the Colchians occurs till the reign of the emperor Trajan, to whom they ſubmitted of their own accord. Perhaps they were governed by their own king; for Strabo makes the river Phaſis the northern boundary of the Roman empire. Under the emperors, Colchis was ſubject to the prætors who governed Bithynia and Pontus; but never made part of any province. Anc. Un. Hiſt. vol. ix. For the preſent ſtate of Colchis or Colchos, ſee MINGRELIA.

COLCOTHAR, in *Natural Hiſtory*, &c. The Latin writers of the middle ages uſe *colcothar* as a name of vitriol in general, which was called by the Greeks *chalcanthum*.

Colcothar is originally an Arabic word, which does not ſignify the common vitriol, but the *chalcitis*. The word has been ſpelt *calchuthar*, and from this the word *chalcitis* differs not very much. The Greeks of the middle ages followed the Arabians in the uſe of the word *colcothar*, but added to it a termination proper to their language, and particularly to the cuſtom of thoſe times, which ſeemed not to expreſs exactly the ſame thing, but a diminutive of it: they wrote it *colcotharion*, or *chalcitarion*. This they alſo called the *orchis*, *orchidion*, the *ladi eladion*, and ſo in a thouſand other inſtances. Avicenna uſes the word *zagi* to expreſs this ſubſtance, but then he is by no means determinate in it, but makes it include the *miſy*, *ſory*, and *melanteria*, as well as the *chalcitis*; but diſtinguiſhing in another place the ſeveral kinds of *zagi*, he tells us, that one was the *chalcand*, which was green; a ſecond the *chalcitis*, which was yellow; a third the *ſory*, which was red. *Alzagiat* is a name alſo uſed by him to expreſs all theſe kinds; and this word the interpreters generally render *atramenta*, inks. This is generally ſuppoſed to expreſs their being all black ſubſtances, which is not the caſe; but it properly ſignifies, that they are all vitriolic foſſils: *atramentum* being a name of vitriol, as a ſubſtance uſed in the making of ink.

There are two kinds of *colcothar*, *natural* and *factitious*.

COLCOTHAR, *Natural*, otherwiſe called *chalcitis*, is a red vitriol, brought from Germany; formed from the common green vitriol, calcined naturally by ſome ſubterraneous fire.

COLCOTHAR, *Artificial*, is a ſubſtance which remains after martial vitriol has been calcined, and diſtilled for a long time by an intenſe fire; and by that means reduced to the redneſs of blood.

Mr. Le Fevre propoſes an eaſy method of making *colcothar of vitriol*: he mixes two parts of filings of iron with one of ſulphur, and a little water. After the acid of the ſulphur has diſſolved the iron, he expoſes the paſte to the air, and it changes into *colcothar*. See Mem. of the A. D. S. an. 1730, H. 52.

To obtain this article the moſt inferior kind of copperas is employed; it is firſt placed in a tolerably regular manner about two inches thick, upon iron plates which cover the firſt half of the bottom of a ſtove or oven which is heated, and nearly evaporates the water of cryſtallization; beyond theſe plates in the ſame oven, which is built with the beſt fire bricks, after having undergone the evaporation upon the iron plates, on which the copperas is thrown, it is then ſubmitted to a red heat; during which, as may be readily ſuppoſed, its loſs is conſiderable, eight cwt. of copperas producing ſcarcely five cwt. of colcothar. In the laſt named proceſs the evaporation is entirely effected, and the ſubſtance completely calcined; from this it is taken to a mill, where it is ground and ſifted into an impalpable powder of a ſtrong red colour.

Colcothar, after calcination, retains ſome of its acid, and imbibes moiſture from the air; but if it is waſhed in water, the remaining acid is diſcharged; it no longer attracts moiſture, and becomes what is called the *ſweet earth* of vitriol. Unwaſhed colcothar is an antiſeptic, tonic, aſtringent, and corroſive, and is therefore applied externally to all putrid, ſanious, and fungous ulcers. See Vitriol.

Colcothar is a dark red-brown oxyd of iron, the reſidue of the diſtillation of nitrous acid, from nitre and vitriol of iron. This is calcined, waſhed, and thoroughly levigated, and in that ſtate is much employed by painters, and in poliſhing glaſs and ſteel. It is called by artiſts crocus, or crocus martis, from its colour.

COLD, in common language, denotes the ſenſation which is felt, or the effect which is produced, by the abſtraction of heat; that is, heat and cold are oppoſite to each other, and the exiſtence or increment of the one is equal to the want or decrement of the other; ſo that the ſame degree of temperature may be called hot or cold, according as it is compared with a colder or a hotter temperature. Thus the climate of Great Britain is a cold climate in compariſon with that of the Weſt India iſlands, and a hot climate in compariſon with that of Siberia. If a man warms one of his hands near a fire, whilſt he cools his other hand by means of ice; and if, afterwards, he plunges both his hands in a baſon of water of the common temperature of the atmoſphere; that water will feel cold to the hand that has been heated, and hot to the other hand.

From this it appears that cold is not any thing real, but merely a privation of heat; ſo that inſtead of ſaying that a body has been cooled to a certain degree, it may with equal truth and propriety be ſaid, that the body has been deprived of heat to that certain degree. Notwithſtanding the ſimplicity of this theory, and the conviction which ſeems to accompany it, philoſophers have often entertained doubts concerning it; and they have endeavoured to inquire into the real ſtate of the matter, by deviſing experiments capable of demonſtrating whether the cauſe of heat was any thing real, and that of cold only a privation or diminution of the former; or, *vice verſâ*, whether the cauſe of cold was any thing real, and that of heat a diminution of it; or, laſtly, whether the production of heat and the production of cold were not owing to two diſtinct principles, or elements. On the ſuppoſition that the cauſe of one of thoſe effects only is real, it is much more natural to ſuppoſe, that the cauſe of heat is the real principle or element; ſince its effects, *viz.* enlargement of the bulk of bodies, the ſeparation of their parts, &c. are ſuch as muſt be produced by the introduction of ſomething real; and the abſtraction of this principle may naturally produce the effects of cold, ſuch as contraction of the bulk of bodies, agglutination, &c.; whereas it would be unnatural to ſuppoſe that a body contracts its bulk, or its parts come into cloſer contact, becauſe ſomething elſe has been introduced amongſt them. With reſpect to the laſt ſuppoſition, *viz.* whether the effects of heat and thoſe of cold be not owing to two diſtinct principles, few arguments, and the equivocal reſult of few experiments, have, at times, been adduced in ſupport of it. But the general and prevailing opinion amongſt philoſophers is, that a ſingle element, called *caloric*, produces heat or the effects of expanding bodies, ſeparating their parts, &c. and that cold is only a relative expreſſion; that is, meaning only the decrement of heat; ſo that real or abſolute cold conſiſts only in the total abſtraction of caloric; and, that ſuch a point, *viz.* the zero of heat may be determined, has been ſhewn by the experiments, the diſcoveries, and the calculations, of ſome late eminent philoſophers, *viz.* Irvine, Black, Crawford, and others. We ſhall preſently give a compendious account of the particulars relating to the determination of this remarkable point; this total privation of heat, below which cold can not increaſe, ſince heat can not decreaſe. But it will be neceſſary, previouſly to it, briefly to mention an experiment which at firſt ſight ſeems to prove that cold is ſomething real, and independent of heat.

Let two concave metallic reflectors, about 10 inches in diameter, or larger, be placed facing each other at about the diſtance of 15 feet; and ſuppoſe the focus of each to be 18 inches diſtant from the ſurface of the ſpeculum. Call the focus of one reflector A, and that of the other B. In order to ſituate the reflectors exactly facing each other, place a lighted candle in the focus of one of them, then move the other, ſo that the reflected image of the candle in the focus of this other reflector appears, by trial (*viz.* by receiving it upon a piece of paper), to fall in the direction of the focus and centre of the firſt reflector. Now, if a piece of red hot iron, or a burning charcoal be held in the focus, A, of one of thoſe reflectors; and the bulb of a thermometer be placed in the focus, B, of the other reflector, the mercury in the thermometer will be raiſed by the radiant heat of the iron which falls upon the firſt ſpeculum in a diverging manner, is reflected from it in parallel lines to the other ſpeculum; and laſtly, is reflected from this in converging lines to its focus, B, where the thermometer is ſituated. And that this is actually the caſe may be eaſily proved; for if the ſurface of either reflector be covered; every thing elſe remaining unaltered, the effect will not take place, *viz.* the mercury in the thermometer will not be heated. If, inſtead of the red hot iron, a piece of ice be placed in the focus, A, the thermometer will be lowered in the focus, B. Cover the ſurface of either reflector, and the mercury will riſe in the thermometer. Uncover the reflector, and the mercury will deſcend, and ſo on. The reſult of this experiment has been ſuppoſed to prove that cold is ſomething real or poſitive; for it proceeds from the ice to the ſpeculum, is reflected from this to the other ſpeculum, and is laſtly reflected from this other ſpeculum to its focus, B, where it cools the thermometer. But the true cauſe of the phenomenon is, that the heat of the thermometer is reflected upon the ice, in the ſame manner as the heat of the red hot iron was reflected upon the thermometer; for in this laſt diſpoſition of the apparatus with the ice and the thermometer, the latter is the hotteſt of the two bodies. If inſtead of the thermometer, a piece of burning charcoal be placed in the focus, B, no perſon will heſitate to ſay, that the heat of the charcoal is reflected upon the ice at A. And there is no reaſon whatever for aſſerting that the ſame thing does not take place, when the thermometer is in the focus B.

We may now proceed to explain the determination of the zero of heat. If a quantity of water, whoſe temperature is 100°, be mixed with an equal weight of mercury, whoſe temperature is 50°, the temperature of the mixture will be found to be 88°; conſequently the water has loſt 12° of heat, and the mercury has gained 38° of heat. But if the original temperature be reverſed, *viz.* the water at 50° be mixed with an equal weight of mercury at 100°, the temperature of the mixture will be 62°; conſequently, the water has gained 12° of heat and the mercury has loſt 38°. Therefore it is evident that the ſame quantity of caloric which raiſes the temperature of water 12°, will raiſe that of an equal weight of mercury 38°; or, by the rule of proportion, the ſame quantity of caloric which raiſes the temperature of water 1°, will raiſe that of the ſame weight of mercury 3.16 degrees.

Hence it may be concluded that when water and mercury are of the ſame temperature, the water actually contains rather more than three times as much caloric as an equal weight of mercury. Or, by the rule of proportion, if the caloric of water be called 1, that of mercury, (always meaning of an equal weight and equal temperature) will be 0.31. And theſe are called the ſpecific calorics of water and of mercury. By the like means the ſpecific calorics of various other bodies have been determined, in relation to that of water, which is always called one, or unity. The ſpecific caloric of ice, which is different from that of water, has been found to be 0.9. This may be ſufficent to give an idea of what is meant by ſpecific caloric in this place; but, for a full account and explanation of the ſubject, ſee the articles CALORIC and HEAT.

It has alſo been found, that when equal weights of water and ice are at the temperature of 32°; the water contains 140° of caloric more than the ice, which 140° of caloric are neceſſary to keep it in a fluid ſtate; nor can the ice be converted into fluid water without communicating to it 140° of heat. Further, ſince the ſpecific calorics of water and of ice, are as 1 to 0.9, it is natural to ſuppoſe that when they are both at the temperature of 32°, their abſolute or entire quantities of calorics are in the ſame proportion; *viz.* as 1 to 0.9, and 140° is their difference, 140 being the number of degrees of latent caloric, which water at the temperature of 32° holds more than ice at the ſame temperature of 32°. Now from theſe data, the zero of heat is determined by the following algebraical reaſoning, according to Dr. Irvine's theorem. Put x for the unknown number of degrees of caloric from 32° down to zero, or to the whole privation of heat; then the whole caloric of ice, in the above mentioned circumſtances, is x; and the whole or abſolute caloric of water is $x+140$. But the abſolute caloric of ice is to that of water as 0.9 to 1; or as 9 to 10; therefore we have this analogy $x : x + 140 :: 9 : 10$, which gives the equation $10x = 9x + 1260$. And by tranſpoſition we have $10x - 9x = 1260$; or, $x = 1260$. Therefore, the zero or total privation of heat ſtands at 1260 degrees below the freezing point, or rather the melting point of congealed water. The ſame zero of heat may be determined by means of other ſubſtances; and it has thus by various means been calculated by other philoſophers: but as their determinations do not agree, ſome fallacy has been generally ſuſpected either in the theory or in the operations. The following are the reſults of the experiments, and the calculations made by divers perſons for the determination of the zero of heat.

Fahrenheit's Scale: degrees below the 0 of that Scale.

Lavoiſier and Laplace, from experiments on a mixture of 9 parts of water, and 16 of quicklime, placed the zero of heat at - - -	$3458\frac{1}{4}$
Their experiments on a mixture of ſulphuric acid, and water in the proportion of 4 to 3, fix the zero of heat at - - - - -	$7292\frac{1}{4}$
Their experiments on a mixture of the ſame fluids in the proportion of 4 to 5, place it at -	$2630\frac{1}{2}$
Their experiments on a mixture of nitrous acid and quicklime, fix the 0 of heat at - -	$23837\frac{3}{5}$
Seguin places the zero of heat at - -	$1894\frac{1}{2}$
Other experiments of the ſame fix it at -	2709
And from other experiments he is led to fix it at	$1662\frac{3}{4}$
Kirwan fixes it at - - -	1350
Crawford places it at - - -	1532
Gadolin's experiments fix it at - -	$1461\frac{3}{5}$

This immenſe diſagreement of reſults ſeems to indicate that ſome one at leaſt of Dr. Irvine's ſuppoſitions muſt be miſtaken. But the preſent Dr. Irvine in his edition of his father's eſſays, obſerves, that his father's method of computing the zero of heat or point of total privation, does not appear to lie under any fallacy; but that the great diſcordance between the determinations of that point, as calculated by different perſons, ariſes from the difficulty of determining with accuracy the proportion of the ſpecific calorics, or capacities of ice and water.

In the preſent ſtate of civil ſociety, the production of cold, as ſubſervient to the advantage, the conveniency, and the luxury of mankind, eſpecially under certain obvious circumſtances, and at certain places, is a matter of conſiderable conſequence. The artificial production of cold is by no means ſo eaſy as the production of heat; ſo that great attention muſt be paid to a variety of circumſtances, in order that the cooling of liquors, of apartments, &c. may be performed in the eaſieſt, and moſt economical manner poſſible. The various known artificial methods of cooling, are ventilation; the uſe of cold caves, wells, grottos, &c. when their temperature is lower than that of the ambient air; evaporation; the uſe of ice where ice is to be had; the ſolution of certain ſalts; and the expanſion of air; but for the particular details and practice of thoſe methods, ſee the articles CONGELATION, VENTILATION, FREEZING, EVAPORATION, and EXPANSION.

COLD, in regard to *its action on the living body*, may be conſidered, according to popular language, and the common feelings of men, from which that language is deduced, as a poſitive agent. In ſtrictneſs, it is merely a privative, or relative term, ſignifying a greater or leſſer abſtraction of heat, or *caloric*: but for practical purpoſes, it is uſeful to refer to the ſenſations, as a ſtandard, and to adopt the vulgar acceptation of the term.

The operation of cold on the animal body may be regarded in *three* points of view: 1ſt, as to its general effects, as well in thoſe degrees in which it is conſiſtent with the health and vigour of the body, as in thoſe in which it becomes deſtructive of the principle of life; 2dly, as to its influence in the production of different diſeaſes; and, 3dly, as to its remedial effects, or its power of alleviating and curing ſome of the moſt fatal diſorders, to which the animal economy is liable. In attending to the detail of facts, under the two firſt heads, we ſhall neceſſarily be led to conſider alſo the means of preventing and removing the pernicious effects of the agency of cold.

I. Of the *general effects* of cold on the living body. A certain quantity of heat is obviouſly indiſpenſible to the exiſtence of life, throughout both the animal and vegetable world. The returns of ſummer and winter alternately multiply and diminiſh to a great extent the number of living beings, eſpecially of thoſe which poſſeſs a comparatively leſs perfect organization; and, in all, a free circulation of the fluids is requiſite for the ſupport of the vital principle. Hence life is incompatible with that degree of cold, which produces a congelation of the fluids. It is a law in the nature of heat, as well in living as in dead matter, that it is communicated from a body poſſeſſing a larger quantity, to any other body which comes in contact with it, poſſeſſing a ſmaller quantity, until an equilibrium is produced, or until the degree of heat is the ſame in both. Were living bodies, therefore, poſſeſſed of no other properties, but thoſe which belong to them in common with inorganic bodies, in an atmoſphere of the temperature of 32° of Fahrenheit's thermometer (the freezing point of water), or a little lower, it is obvious that life muſt ceaſe. The animal body, however, is endowed with a power of generating or evolving heat, to a conſiderable extent, much above the ordinary temperature of the atmoſphere. This power is even increaſed by the neceſſity occaſioned by external cold, and diminiſhes with the increaſe of the atmoſpherical warmth ; ſo that, during a ſtate of health, the temperature of the animal body is pretty uniformly the ſame; notwithſtanding the extenſive variations of the external temperature (within an indefinite limit). Or, in other words, there is in the body a power of regulating or varying the evolution of heat, according to the demand made from without. In the human body, the degree of heat is regularly about 98° of Fahrenheit's ſcale; in birds, it is ſomewhat higher ; and in ſome other animals it is much lower, eſpecially in the amphibia, &c. which have hence been called cold-blooded animals, and which ſuffer great variations of their heat.

In order to aſcertain the truth or falſity of an aſſertion, that ſome animals, eſpecially ſerpents and fiſh, had recovered their vitality after being frozen, Mr. John Hunter inſtituted a number of intereſting experiments on the power of different animals in reſiſting the agency of cold. Carp was gradually deſtroyed, and froze, when ſubmitted to a freezing mixture at 10° Fahrenheit, and did not recover. It was with great difficulty that he ſucceeded in freezing a dormouſe, ſuch were its powers of evolving heat, and the non-conducting quality of its integuments ; and it was not till the hair was wetted that life was deſtroyed, and the animal, when dead, became ſtiff, and could not be recovered. When a toad was ſubmitted to a ſimilar cold mixture, the water froze round the animal, but it did not die. In other caſes the heat was readily overcome.

It appeared from thoſe experiments, that an animal muſt be deprived of life before it can be frozen ; and that the power of reſiſting the cold was in proportion to the perfection of the animal, and the natural heat proper to each ſpecies and to each age. It may, perhaps, alſo depend in ſome degree on other circumſtances, not yet aſcertained ; as in ſome of the experiments on dormice, it was found, that in theſe animals, which are of a conſtitution to retain nearly the ſame heat in all temperatures of the air, it required the greateſt cold that could be produced to overcome this power ; while in the toad and ſnail, whoſe natural heat is not always the ſame, but is altered very materially according to the external heat or cold, this power was exhauſted in a degree of cold not exceeding 10° or 15°, and the ſnail being the moſt imperfect of the two, its powers of generating heat were by much the weakeſt. But in all there was a great exertion or an expence of the animal powers in this reſiſtance, in proportion to the neceſſity ; and the whole animal life was thus, at length, exhauſted. Hence thoſe animals, which cannot ſupport life for any conſiderable time, at the temperature of the freezing point, always endeavour to procure ſuch places of abode in the winter as ſeldom arrive at that point. Thus we find toads burrowing, frogs living under large ſtones, ſnails protected under the ſhelter of ſtones and in holes, fiſh having recourſe to deep water, all which places are generally above the freezing point in our hardeſt froſts ; however, our froſts are ſometimes ſo ſevere as to kill many, whoſe habitations are not very ſecure. When the froſt is more intenſe or of longer ſtanding than common, or in countries where the winters are always ſevere, there is generally ſnow, and the water freezes ; the advantages ariſing from theſe two circumſtances are great ; the ſnow ſerving as a blanket to the earth, and the ice to the water. See Philoſoph. Tranſactions, vols. lxv. and lxviii.

The power of reſiſting the action of cold, or of evolving heat, in greater quantity than the ſurrounding cold media abſtract it, could not of courſe be determined by experiment on the human body ; but many ordinary and accidental circumſtances have demonſtrated its exiſtence to an extent, which could not have been anticipated. It is ſcarcely neceſſary to allude to the common occurrences of the winter ſeaſon, when the heat of the body remains at its natural degree of 98, during an expoſure to an atmoſphere, of 10, 15, or 20 degrees or more below the freezing point, even in this country. In Ruſſia, Mr. Tooke obſerves, that the drivers and their horſes, during extreme cold, feel little or no inconvenience in purſuing their employment, along the roads, though the beards of the former, and the muzzles of the latter, are covered with hoar froſt, and little icicles, from the congelation of their breath ; and they travel all day, in the ſevereſt cold of that northern climate, without receiving any detriment. "Nay, even from twenty to twenty-four degrees" (below the zero or freezing point, we preſume) "of Reaumur, women will ſtand rinſing the linen through holes in the ice, four, five, or ſix hours together, often bare-foot, with their hands dipping in the water all the while, and their draggled petticoats ſtiff with ice." Tooke's View of the Ruſſian Empire, vol. i. Even the extremes of cold in Siberia, in the neighbourhood of Hudſon's bay, &c. are compatible with human life, aided by a cloathing of furs, and other ſlow conductors of heat. We have learnt from accidents, alſo, that cold is ſometimes reſiſted, during a long expoſure, without ſuch aid. An intereſting account is before the public of the caſe of Elizabeth Woodcock, who was involved in a ſnow-drift, on February 2d, 1799, in her way home from market, where it is ſuppoſed ſhe drank too freely of ſpirituous liquor. The ſnow accumulated over her to the height of about ſix feet, a ſort of hollow cone being left from her head to the ſurface, through which breathing was performed. From this ſituation ſhe was removed on the 10th of February, having lain eight days in the ſnow. Her life was preſerved ; but the greater part of her feet were deſtroyed. A hiſtory, ſomewhat reſembling the foregoing, is detailed in the "Journal de Medecine" of Paris, for the year 1767, of a man who reſiſted the action of cold from ſnow, in which he was buried four days, and from which he was removed alive on the fifth day ; and of a crew of 14 men, ſhipwrecked, and immerged in the ſea during 23 hours, eleven reſiſted the action of the cold, and recovered. We ſhall have occaſion to mention theſe caſes more particularly in the ſequel of this article.

Such, indeed, is the power of reſiſtance to external cold in the human body, or rather ſuch the conſtant evolution of heat, that an atmoſphere of the temperature of 98° of Fahrenheit, which, of courſe, does not abſtract any of the heat of the body, is extremely incommoding to the feelings. In a phyſical ſenſe, every temperature of the air, or other ſurrounding medium, below 98°, might be denominated *cold ;* but with regard to the feeling and to the health, a degree much lower, namely, from 60° to 65°, is the moſt grateful and invigorating. The external medium at the temperature of about 62° appears to abſtract the heat of the body, in the ſame proportion in which it is generated, without any extraordinary exertions of the ſyſtem ; and therefore neither contributes to exhauſt its powers, nor to excite uneaſy ſenſations. Thus the conſtitution of man is wiſely adapted to the general or medium temperature of the habitable globe. Hence alſo the general denominations which are given to different degrees of temperature. In a degree of heat from 60° to 64°, every exertion of the body, which is neceſſary to man's ſubſiſtence or gratification, is performed with eaſe and ſafety ; and this degree is called *temperate*. The higher degrees up to 70° are called *warm*, and all above that *hot*. In the inferior range of the ſcale, a few degrees below 60°, as down to 50° or 47°, are denominated *cool;* and all below, *cold.* There is, however, conſiderable difference among men, even in a ſtate of health, in aſſigning names to particular degrees of the thermometric ſcale; as their ſenſations vary, according to the power, which their reſpective conſtitutions poſſeſs, of evolving heat. This depends much upon the original vigour of the ſyſtem, eſpecially of the heart and arterial ſyſtem; it is alſo much influenced, as is every other function of the body, by habit. Mr. Tooke attributed much of the impunity, with which the Ruſſians perform their labours, already mentioned, during extreme cold, to their "being ſeaſoned to it;"—a popular term, which implies the acknowledged effect of habit on thoſe who take their reſidence in climates of widely different temperature.

To perſons who, from vigour of conſtitution, or from habit, readily evolve a conſiderable quantity of heat, eſpecially during moderate corporeal exerciſe, a degree of cold, which, to the weak and unhabituated, is a ſource of painful ſenſations of chillineſs, is agreeable to the feelings, and conducive to health. For the ſenſation of cold is merely relative; it is in proportion to the previous ſenſation of heat, and to the power of evolving it, to ſupply the place of that which the external cold medium abſtracts. Hence the ſame temperature, at different times, excites even oppoſite ſenſations, according to the ſtate of the circulation from exerciſe, or from diſeaſe, or previous expoſure, &c. And thoſe oppoſite ſenſations are even excited at the ſame time in different parts of the body, as is familiarly illuſtrated by the following experiment. If the hands be immerſed in two veſſels of water, the right hand into a veſſel containing water at the temperature of 80°, for inſtance, and the left into a veſſel in which the water is of the temperature of 40°, and after remaining a ſhort time, both be immerſed into a veſſel which contains water at the temperature of 60°; this water, of the intermediate degree of heat, will excite a ſenſation of cold to the hand, which had previouſly been expoſed to the temperature of 80°, and will feel warm to that which had been immerſed in the water of 40°. During the previous immerſion, for a ſhort time, a greater abſtraction and evolution of caloric had been made in the left hand, under a temperature of 40°, and a leſſer in the right, under the higher temperature of 80°; and hence, when the abſtraction is ſuddenly diminiſhed in the left hand, by a higher temperature of 60°, and ſuddenly increaſed in the right, by the lower temperature of 60°, the ſenſation is the ſame as if heat were actually added to the left, and cold applied to the right hand; for the ſenſation is, as we before ſtated, relative.

At the temperature of 62° of Fahrenheit's ſcale, the balance of the evolution and abſtraction of heat is ſteadily maintained, without exertion or injury to the human body; but very low temperatures, by abſtracting the animal heat more ſpeedily than it can with eaſe be evolved, exhauſt the living powers, and ultimately deſtroy the principle of life.

The firſt effect of cold, applied to the human body, is to weaken and diminiſh the action of the blood-veſſels, eſpecially of the ſuperficial branches of the arteries, which become unable to tranſmit the blood in the uſual quantity through the integuments; and more eſpecially in the extreme parts, as the hands and feet, which are at the greateſt diſtance from the heart; and in projecting parts, as in the ears, noſe, ſcrotum, &c. which expoſe a larger ſurface to the cold. Hence the ſkin becomes pale, and, contracting round the miliary glands and roots of the hairs, exhibits a roughneſs, which is compared to the ſkin of an unfeathered gooſe, and is technically termed, *cutis anſerina.* By the ſame contraction of the ſmaller veſſels, and the diminiſhed circulation, the extreme and projecting parts are diminiſhed in ſize; thus rings, which are tight on the fingers, while the body is warm, drop off in cold weather; and even the ſhoes fall from the feet during extreme expoſure. The heart, and the whole arterial ſyſtem, become weak, and the number and ſtrength of their pulſations are diminiſhed, according to the obſervations of Dr. Currie and Dr. Ruſh. Dr. Currie remarks, that the natural pulſe of one of the men, on whom his experiments in the cold bath were made, was about 70 in a minute; but that, in conſequence of agitation of mind, it was never ſlower than 85 before immerſion, and generally more. However this might be, it ſunk invariably to 65 in the water, became firm, regular, and ſmall. After being in the bath ſome time, it could hardly be felt at the wriſt. Phil. Tranſactions, vol. lxxxii. But, from a ſeries of experiments, made by Dr. Stock of Briſtol, a reſult ſomewhat different was obtained. The ſtrength of the arterial action was, in all caſes, diminiſhed by immerſion in cold water, but its frequency was, with ſcarcely any exception, increaſed: in many caſes, from the combination of extreme weakneſs and rapidity, it was ſcarcely poſſible to count the number of pulſations. The circumſtance of the frequency of the pulſe increaſing with its debility, ſeems to be more analogous to the general obſervation with reſpect to arterial action. This fact alſo agrees with the obſervations made by Drs. Spooner and M'Donnell, at Edinburgh. See "Stock Medical Collections on the Effects of Cold," *appendix.* Spooner "Diſſ. Inaug. de Aſcite Abdom." Edin. 1785. From the debility of the arterial ſyſtem, the blood is partially delayed in its courſe through ſome of the cutaneous veſſels, and, not undergoing the change of colour, which a circulation through the lungs produces, it gives a blueiſh or livid colour to the fingers, ears, and other projecting parts. If the cold is intenſe, or the expoſure continued long, the circulation in theſe parts becomes altogether interrupted, and the power of evolving heat being altogether deſtroyed, a partial loſs of the vital principle takes place, or, in other words, mortification enſues, and the parts fall off from the body. The portions thus deſtroyed, are uſually ſaid to be *froſtnipped,* of which an example has already been mentioned, in the caſe of Elizabeth Woodcock, who loſt her feet from this cauſe. But inſtances of this are ſo numerous, that it will be unneceſſary to detail them here.

The influence of cold in debilitating the force of the circulation of blood is alſo evinced in the perſons of the inhabitants of the frigid zone. "As we approach nearer to the north pole," Mr. Tooke has remarked, "both the animal and vegetable productions of nature become more and more ſtunted. The ordinary ſtature of the Samoyedes ſeldom exceeds four or five feet, and their whole exterior correſponds with their dwarfiſh ſize. The ſame bodily ſtructure, and the ſame features of face, are applicable to the Eaſt Siberian tribes. The Kamtſhadales are equally dwarfiſh." View of Ruſſia, vol. 2d. It is remarked by Linnæus, that the hares, partridges, and other animals, which inhabit the northern climes, are conſiderably ſmaller in ſize, than the ſame ſpecies in more ſouthern countries. Amænitates Academicæ, vol. vii.

From the languor and weakneſs of the arterial ſyſtem, produced by the application of cold, other effects on the conſtitution neceſſarily accrue. It is a fact, well eſtabliſhed in phyſiology, that a free circulation of blood, which has undergone the ſalutary change produced by reſpiration, to the brain and nervous ſyſtem, is requiſite for the ſupport of the ſenſibility. If the circulation is ſuſpended for a few moments, as in ſyncope, the ſenſibility of the frame is alſo ſuſpended; and, on the other hand, where there is a more than ordinary ſupply of blood to any part, as in inflammation, the ſenſibility is highly augmented. Hence another immediate effect of the agency of cold on the human body, is a diminution of the ſenſibility of the parts on which it is exerted. This is univerſally felt in the numbneſs of the hands and fingers, which, under the impreſſion of cold, are altogether incapable of accurate diſcrimination of touch; the whole of the ſurface of the ſkin partakes of the imperfect feeling. The tongue is alſo incapable of diſtinguiſhing the peculiar flavour of ſapid bodies, if they be extremely cold; and the ſenſe of ſmell is in a conſiderable degree enfeebled by cold. If the cold be intenſe, or its application long continued, the powers of the whole nervous ſyſtem become weakened; a torpor of the animal functions enſues; the action of the muſcles is feeble, and ſcarcely obedient to the will; an unconquerable languor and indiſpoſition to motion ſucceeds; a gradual exhauſtion of the nervous power ſhews itſelf in drowſineſs, which terminates in ſleep, from which the perſon, unleſs ſpeedily rouſed, frequently awakes no more.

A ſtriking illuſtration of theſe effects of cold is related by captain Cook, in an occurrence which took place during a botanical excurſion of ſir Joſeph Banks and Dr. Solander, among the hills of Terra del Fuego. The party, conſiſting of 11 perſons, were overtaken by darkneſs, and obliged to ſpend the night on the hills, during extreme cold. Dr. Solander, who had more than once croſſed the mountains which divide Sweden from Norway, well knew that extreme cold, eſpecially when joined with fatigue, produces a torpor and ſleepineſs that are almoſt irreſiſtible; he, therefore, conjured the company to keep moving, whatever pains it might coſt them, and whatever relief they might be promiſed by an inclination to reſt; "whoever ſits down," ſaid he, "will ſleep; and whoever ſleeps will wake no more." Thus at once admoniſhed and alarmed, they ſet forward; but while they were ſtill upon the naked rock, and before they had got among the buſhes, the cold became ſuddenly ſo intenſe, as to produce the effects that had been moſt dreaded. Dr. Solander himſelf was the firſt who found the inclination, againſt which he had warned others, irreſiſtible, and inſiſted upon being ſuffered to lie down. Mr. Banks entreated and remonſtrated in vain; down he lay upon the ground, though it was covered with ſnow; and it was with great difficulty that his friend kept him from ſleeping. Richmond alſo, one of the black ſervants, began to linger, having ſuffered from the cold in the ſame manner as the doctor. Mr. Banks, therefore, ſent five of the company forward, to get a fire ready at the firſt convenient place they could find, and himſelf, with four others, remained with the doctor and Richmond, whom, partly by perſuaſion and entreaty, and partly by force, they brought on; but when they had got through the greater part of the birch and ſwamp, they both declared they could go no farther. Mr. Banks had recourſe again to entreaty and expoſtulation, but they produced no effect. When Richmond was told, that if he did not go on he would in a ſhort time be frozen to death, he anſwered, that he deſired nothing but to lie down and die. The doctor did not ſo explicitly renounce his life; he ſaid he was willing to go on, but that he muſt firſt take ſome ſleep, though he had before told the company that to ſleep was to periſh. Mr. Banks and the reſt found it impoſſible to carry them, and there being no remedy, they were both ſuffered to ſit down, being partly ſupported by the buſhes, and in a few minutes they fell into a profound ſleep. Soon after ſome of the people who had been ſent forward, returned with the welcome news, that a fire was kindled about a quarter of a mile farther on the way. Mr. Banks then endeavoured to wake Dr. Solander, and happily ſucceeded; but though he had not ſlept five minutes, he had almoſt loſt the uſe of his limbs, and the muſcles were ſo ſhrunk, that his ſhoes fell from his feet; he conſented to go forward, with ſuch aſſiſtance as could be given him; but no attempts to relieve poor Richmond were ſucceſsful. He, together with another black, left with him, died. Several others began to loſe their ſenſibility, having been expoſed to the cold and the ſnow near an hour and a half, but the fire recovered them. See captain Cook's firſt Voyage.

In addition to this intereſting narrative, many examples of death from extreme cold, occurring in a ſimilar way, are recorded. Bomare obſerves that travellers among the Glaciers of Switzerland, are ſometimes ſurprized and killed by the cold, eſpecially thoſe who travel on horſeback; and that the approaching danger manifeſts itſelf by a ſtrong diſpoſition to ſleep; ſo that if the perſon does not immediately reſiſt it, and put himſelf into a briſk movement, death is inevitable. Dictionaire d' Hiſt. Naturelle, *Art.* Froid. Sauſſure alſo has remarked that among theſe mountains, even in the fineſt weather of ſummer, ſudden ſtorms of the moſt intenſe cold wind, with ſnow that obſcures the air, are not uncommon, and are frequently fatal to the traveller; for he periſhes with cold, if he ſtops; and if he goes on at hazard, he falls in all probability over a precipice. Voyage dans les Alpes, tom. ii.

The French peaſants, who inhabit the feet of the bleak mountains, which ſeparate France from Spain, annually ſuffer fatal accidents, in their journeys acroſs the perpetual ſnows, which cover them. In February 1765, five men who were returning from the Spaniſh forges, to bring their families the fruits of their labour, were caught in one of thoſe ſtorms deſcribed by Sauſſure. One of them, named Boutillât, ſeized by the cold, immediately felt extreme laſſitude, his limbs were unable to ſupport him, and he fell down, overcome with ſleep, and was ſoon overwhelmed with the ſnow. The cold continued, and he lay four days, inſenſible, in the ſnow, which, to uſe the words of Mr. Hunter, probably "ſerved as a blanket," to ſhelter him from the more intenſe cold of the atmoſphere. He awoke on the 5th morning, with a ſenſation of burning thirſt in his throat, and he inſtinctively bit of the ſnow, in which he was enveloped. A ſimilar hollow cone, through which he had breathed, was found in this inſtance, as in that of Elizabeth Woodcock before deſcribed; and he was, like her, unable to aſſiſt himſelf to throw off his cold covering. But ſome men, ſent in ſearch of him by the magiſtrates of the village, fortunately diſcovered him. The cuticle of a conſiderable part of his body was detached, as if by bliſters; but he was not ſenſible of pain; in ſeveral places gangrene had occurred. When he was taken home, the limbs were ignorantly wrapped in warm linen, ſome of which was dipped in aromatic liquors. The feet were deſtroyed by the mortification, and came off; and in twelve or fourteen days after the accident he died. M. Pilkes, who details the hiſtory of the caſe, remarks, that, if cold applications had been made, inſtead of the warm linen, and aromatic liquors, his life might probably have been preſerved. See Journal de Medecine, Paris, 1767, tom. xxvii.

The effect of extreme and continued cold is not only to deſtroy animal life, but alſo to preſerve animal ſubſtances from decompoſition by the proceſs of putrefaction. Hence in regions of unvarying cold, the bodies of thoſe who periſh are preſerved entire under the ſnow. Bomare affirms, that there are ſtill found in South America, a conſiderable number of the firſt conquerors of the new world, who, at the commencement of the ſixteenth century, preferred to a long and circuitous route, the ſhort but dangerous paſſage of the mountains of Peru, in order to examine more ſpeedily the rich mines, which had been deſcribed to them. "The warmth of their avarice, and their ardour in ſearch of gold, could not defend them from the influence of cold, from which they periſhed, and by which they are ſtill preſerved, with all that they carried with them, and in the various attitudes, in which they were frozen and ſurpriſed by death, conſtituting a ſort of natural mummies." Dict. d' Hiſt. Nat. And Bartholin obſerves, that the Daniſh ſailors had informed him, that bodies had been preſerved in Spitzbergen during 30 years. Gazette de Salut.

When cold is combined with *moiſture*, even at a much higher temperature, its effects are extremely deleterious, and even fatal, independent of the train of diſeaſes, which it excites, and which we ſhall deſcribe hereafter. For water not only conducts the heat away more rapidly, but, by evaporating, it abſtracts an additional quantity from the body, eſpecially when it is expoſed to wind: in this caſe, a new ſheet of cold water is, as it were, perpetually applied to the ſurface of the body, which induces an extreme chill, both by the number of particles in contact with the ſkin, and their greater facility of receiving heat. It appears, however, that the deleterious effects of cold combined with moiſture, are ſomewhat different from thoſe which are the conſequence of a dry cold; and that cold *ſalt* water is leſs prejudicial to the body, than cold *freſh* water; as the following facts and experiments, related by Dr. Currie, will evince.

On the 13th of December, 1790, an American ſhip was caſt away on a ſand bank, that lies in the opening of the river Merſey, into the Iriſh channel. The crew got on a part of the wreck, where they paſſed the night; and a ſignal which they made being diſcovered next day from Hillberry iſland, a boat went off, though at a great riſk, and took up the ſurvivors. The unfortunate men had remained twenty-three hours on the wreck; and of fourteen, the original number, eleven were ſtill alive, all of whom in the end recovered. Of the three that periſhed, one was the maſter of the veſſel; another was a paſſenger, who had been a maſter, but had loſt or ſold his ſhip in America; the third was the cook, who was a weakly man; he died only a few hours before the boat reached the wreck. The two maſters had been long dead. This fact excited much curioſity, and their death was attributed to intoxication from a free uſe of cherries from a keg, which had contained cherry-brandy. But in fact nothing was preſerved, neither food nor drink, and the whole crew were upon an equality, except that ſome were deeper in the water than others; and the two maſters had the advantage in this reſpect, for they ſat on the only part of the wreck that was out of the ſea; they were, however, frequently overwhelmed by the ſurge, and at other times expoſed to heavy ſhowers of ſleet and ſnow, and to a high and piercing wind. The temperature of the air, as nearly as can be gueſſed, was from 30° to 33° of Fahr. and that of the ſea, from trials in ſimilar circumſtances, from 38° to 40°. The mate was generally up to the middle in the water. The crew were worſe ſituated, being ſome of them up to the ſhoulders. They were not at any time able to change their poſition, but kept their legs in pretty conſtant motion to counteract the cold, their arms being employed in holding the wreck. It is remarkable that a poor negro, who eſcaped almoſt unhurt, was perhaps deepeſt in the ſea of any.

The maſter of the ſhip, Capt. Scott, a native of North Carolina, and about 40 years of age, died firſt. As they were in the dark, Mr. Amyat, the mate, could not ſee his countenance; but he was firſt alarmed by hearing him talk incoherently, like one in the delirium of fever. By degrees his voice dwindled into a mutter, and his hearing ſeemed to fail. At length he raiſed himſelf up in a ſort of convulſive motion, in which he continued a few ſeconds, and then fell back dead on the deck. This happened about eight o'clock in the evening, four hours after the ſhip went aground. Soon after this, Capt. Daviſon, who was about 28, began to talk incoherently, in the ſame manner as the other; he ſtruggled longer, but died in the ſame way about eleven at night. The cook died in the forenoon of the ſucceeding day; he was a low-ſpirited man, and deſponded from the beginning. All the reſt held out, though ſorely pinched with cold and hunger, till they were taken up about three in the afternoon. Mr. Amyat ſaid that his hands and feet were ſwelled and numb, though not abſolutely ſenſeleſs; he felt a tightneſs at the pit of his ſtomach, and his mouth and lips were parched; but what diſtreſſed him moſt were cramps in the muſcles of his ſides and hips, which were drawn into knots. Though immerſed in the ſea, they were all of them very thirſty; and though expoſed to ſuch ſevere cold, not one of them was drowzy, nor did ſleep precede death in thoſe who periſhed.

Reflecting on the curious facts mentioned in this melancholy narrative, Dr. Currie was led to inſtitute a ſeries of comparative experiments on the effects of immerſion in cold freſh water and ſalt water baths on the human body. The reſults tended to elucidate in ſome meaſure the facts in queſtion; as well as to aſcertain ſome important practical deductions, which may be of uſe to perſons ſuffering under ſimilar accidents; and others, which relate to the general uſe of the cold-bath. Dr. Currie imagined that the death of the two maſters was to be imputed to their poſition on the wreck. Being expoſed to heavy ſhowers of ſleet and ſnow, they might ſuffer from being wet with freſh, rather than ſalt water; the chilling effects of evaporation might operate againſt them, promoted as they muſt have been by the high wind; or they might receive injury from their frequent immerſions in the ſea, producing an *alteration* in the media ſurrounding. The experiments of Dr. Currie ſeem very ſtrongly to corroborate theſe ſuppoſitions.

The immediate effect of plunging into a cold *ſalt water* bath, was a reduction of the temperature of the body, from its natural ſtandard 98° to about 87°; but while the perſon remained in the water, the conſtitution was called on for a greater evolution of heat, and his temperature aroſe gradually to 94° or 95° in the courſe of twelve or fifteen minutes. On emerging, and being expoſed to a north eaſt wind, the temperature again rapidly ſunk, even while attendants were rubbing him with towels, to 87° or 88°. But a warm bath ſoon reſtored the natural heat. After immerſion in a *freſh water* bath, the heat of the body ſunk gradually, and not ſo low; but after being 30 minutes in it, even the hot bath with difficulty reſtored the heat. In two minutes after the perſon, who had been in the freſh water bath, was put into a warm bath at 90°, he fell into a violent ſhiver, and his heat fell two degrees. The bath was then heated to 95° and 96°, but ſtill he felt cold. It was heated to 99°: he continued in it five minutes, and his heat was ſtill one degree lower, than when he quitted the cold bath. The heat was gradually raiſed to 106°, when the ſenſe of coldneſs of which he had complained at the pit of the ſtomach, gradually went off. After immerſion in the cold ſalt water bath, the perſon, who was the ſubject of the experiment, had been uſually kept in the warm bath till his natural heat was nearly recovered; but now after being half an hour in the heat of 106°, his own heat was ſtill 93°. He now became ſick and very languid, a cold ſweat covering his face, his pulſe very quick and feeble. He was removed into bed, but paſſed a feveriſh night, and next day had wandering pains over his body, with great debility, reſembling the beginning ſtage of a fever. By cordials and reſt, this went off. See the experiments related in the Philoſ. Tranſactions, vol. lxxxii. for 1792, and the Appendix to Dr. Currie's Medical Reports on the effects of water, &c. vol. i.

The facts juſt ſtated clearly point out the greater danger of being wet with *freſh* than with *ſalt* water: the ſuperior ſafety of the latter, probably, conſiſts in the ſtimulus of the ſaline impregnation upon the ſkin, which may counteract the debilitating effects of the cold. The practical inferences which Dr. Currie deduced from theſe facts are extremely important. He obſerves,

"1. It is, I think, already well known among ſeamen, that where there is only the choice of being wet with ſalt or freſh water, it is always ſafeſt to prefer the firſt. In the heavy ſhowers of rain, hail, or ſnow, by which gales of wind are generally accompanied, the men that muſt be expoſed to them, ought, like Lieutenant Bligh and his crew, to wring their clothes out of ſalt water.

"2. In all caſes where men are reduced to ſuch diſtreſs by ſhipwreck, or otherwiſe, that they have it only in their power to chuſe between keeping the limbs conſtantly immerged in the ſea, or expoſing them to the air while it rains or ſnows, or of being expoſed to it, where the ſea is at times waſhing over them, it is ſafeſt to prefer a conſtant immerſion; becauſe, in the northern regions, where the cold becomes dangerous to life, the ſea is almoſt always warmer than the air, as the experiments of Sir Charles Douglas ſhow; and becauſe there is not only a danger from the increaſed cold produced by evaporation, but alſo from the loſs of heat by the rapid changes of the ſurrounding medium, as the foregoing experiments point out.

"3. Whether, in high and cold winds without rain or ſnow, and where a ſituation may be choſen beyond the reach of the waves, it is ſafer to continue in the air, or to ſeek refuge in the ſea, muſt depend upon ſeveral circumſtances, and cannot perhaps be certainly determined. The motives for chuſing the ſea will be ſtronger in proportion as the wind is high and cold, and in proportion as the ſhore is cold."

Some deductions alſo were obtained from the experiments, which relate to the common uſe of the cold-bath, and which, as they do not exactly accord with the vulgar opinion on this ſubject, and may contribute to correct ſome practical errors in the uſe of the bath, we ſhall tranſcribe.

"The air and the water being equally cold, and both 45° or under, I found the loſs of heat in paſſing from the one to the other, to be regulated in the following way.

"1. If, inſtead of being expoſed naked to the wind, previous to immerſion in the water, the body was kept warm by a flannel covering, the mercury fell much leſs on the firſt plunge.

"2. If, after plunging in the water, the perſon continued in it only a minute or two, a ſubſequent fall of the mercury did not always take place on his emerging into the air. On the contrary, there was ſometimes a riſe on ſuch occaſions in the mercury, eſpecially if the atmoſphere was at reſt.

"3. In one inſtance, after continuing in the water fifteen minutes, on riſing into the air in a perfect calm, though during a froſt, there was little or no ſeeming diminution of the heat; while expoſure under ſimilar circumſtances, with a north-eaſt wind blowing ſharply, though the air was many degrees warmer, produced a rapid diminution. The effects of the wind in diminiſhing the human heat are indeed ſtriking, and are not, in my opinion, explained by the common ſuppoſition."

Hence we ſee an obvious neceſſity, that invalids ſhould not allow themſelves to become chilled, before going into the cold-bath, that they ſhould leave it ſpeedily, and not ſuffer any expoſure to a cool wind on emerging; ſince by ſuch means they not only counteract the beneficial effects of bathing, but even incur conſiderable danger. See BATH and BATHING.

Hitherto we have attended to the effects of extreme cold, with or without the joint operation of moiſture, on the human body, in a ſtate of previous natural temperature. The action of cold in more moderate degrees on the body, heated to a preternatural extent, by exerciſe, or other cauſes, affords a ſubject of not leſs important conſideration: The more important indeed, as the popular notions on this topic are moſtly founded in error, and lead to daily practical conſequences of very pernicious tendency. So many inſtances of the noxious effects of expoſure to cold, or of drinking cold liquids, when the body was hot, are recorded, and are believed frequently to occur, that a conviction of the fact is univerſal; and this conviction is corroborated by the popular hypotheſis, that the ſuppreſſion of perſpiration is the ſource of innumerable evils, and that ſudden viciſſitudes are invariably noxious. On the other hand, however, a number of facts, ſtanding on equally authentic record, tend to contradict this general doctrine, by ſhowing us that rapid and great tranſitions, as from vapour-baths to rolling in the ſnow, &c. are conſtantly made, in ſome countries, with impunity, and even with advantage to the health. It remained for the genius of Dr. Currie, (a name to which the higheſt honours of medical ſcience are due,) to reconcile theſe contradictions, upon philoſophical principles, and to give us rational views of practical utility on this ſubject. However inconſiſtent with the vulgar notion, the general truth appears to be, "that, from whatever cauſe the heat of the body is increaſed, in proportion to this increaſe (provided no local diſeaſe has occurred, and the body is not already in a ſtate in which it is rapidly parting with its heat,) is the ſafety with which cold may be applied." Medical Reports, p. 104 and 123. 2nd. edit. The numerous apparent exceptions, upon which the popular opinion is founded, will be found not to invalidate this principle, if the circumſtances are minutely examined. For it will then be aſcertained, that the injuries which perſons have ſuffered from the application of cold under the circumſtances in queſtion, did not ariſe from its agency on them *when hot*, but *when cooling*, *after having been heated*; when a profuſe general perſpiration was rapidly carrying off the heat, or when fatigue had exhauſted the vigour of the ſyſtem, and the power of evolving heat; and that, on the contrary, where the ſenſation of heat was great and ſteady, the heat itſelf ſteadily retained, or kept up by exertion, and the living power not debilitated by fatigue, the application of cold was ſafe and ſalutary. A brief detail of ſome facts will evince the juſtice of this concluſion.

Firſt, then, we ſhall find that all the fatal effects of cold, either when internally or externally applied, have occurred in thoſe ſituations, where the ſyſtem, after having been much heated and enfeebled by ſevere exertions, was loſing its preternatural heat from profuſe perſpiration, and, in general, alſo from the ceſſation of the exertions by which this heat was originally produced.

Dr. Currie relates one inſtance of death from drinking cold water under theſe circumſtances, which occurred in his own experience. It was the caſe of a young man, who had been engaged a long time in a moſt ſevere match at fives. After it was over he ſat down on the ground, panting for breath, and covered with profuſe perſpiration. In this ſtate he called to a ſervant to bring him a pitcher of cold water juſt drawn from a pump in ſight. He held it in his hand for ſome minutes, but put it to his head as ſoon as he had recovered his breath, and drank a large quantity at once. He laid his hand on his ſtomach, and bent forwards; his countenance became pale, his breath laborious, and in a few minutes he expired.

We are told by Dr. Ruſh, that few ſummers elapſe, in which there are not inſtances of many perſons among the labouring part of the community, being thus affected in Philadelphia; and he has deſcribed the ſeries of ſymptoms more minutely. In a few minutes, he ſays, after the patient has ſwallowed the water, he is affected by a dimneſs of ſight, he ſtaggers in attempting to walk, and, unleſs ſupported, falls to the ground; he breathes with difficulty; a rattling is heard in the throat; his noſtrils and cheeks expand and contract in every act of reſpiration; his face appears ſuffuſed with blood, and of a livid colour; his extremities become cold, and his pulſe imperceptible: unleſs relief is ſpeedily obtained, the diſorder terminates in death in four or five minutes. Medical Inquiries and Obſervations, vol. i. More frequently patients are ſeized with acute ſpaſms in the breaſt and ſtomach, which are ſo painful as to produce ſyncope, and even aſphyxia.

Many caſes are related by authors, and Dr. Currie has given a detail of ſeveral, from the collection of Shenck, in which the leading circumſtances are nearly the ſame with thoſe of the example above quoted; and many facts have been incidentally recorded by hiſtorians, which alſo agree with it in the eſſential points. In Quintus Curtius, (lib. vii. cap. 5.) an account is given of the march of the army of Alexander the Great in purſuit of Beſſus, through the country of the Sogdiani, which is repreſented as deſtitute of water, ſterile, and covered with ſcorching ſands. The intolerable heat, fatigue, and thirſt of the ſoldiers in their march through this burning deſert, are deſcribed with all the florid eloquence of the hiſtorian. At length, fainting under their toils, they reached the banks of the river Oxus, where, by indulging in large draughts of the ſtream, Alexander loſt a greater number of his troops than in any of his battles. "Sed qui intemperantius hauſerant, intercluſo ſpiritu extincti ſunt; multoque major horum numerus fuit, quam ullo amiſerat prælio." A ſimilar ſtory is related by Appian (De Bellis Civil. lib. v.); and a diſaſter of the ſame kind is recorded to have occurred to the Chriſtian army in the holy wars, (Gulielm. Tyrius, lib. iii. cap. 16.). See Currie's Reports, p. 99. et ſeq. The almoſt fatal effects which enſued to Alexander himſelf, when, after a long and haraſſing march, covered with duſt and ſweat, he plunged into the Cydnus, in the ſight of his army, are to be accounted for in the ſame way. (Quint. Curt. lib. iii. cap. 5.) The heat preternaturally accumulated by exerciſe is held with little tenacity; it is diſſipated by the profuſe perſpirations; and is ſpeedily loſt, when, to theſe perſpirations is added a ſtate of reſt after fatigue. The vital power is then unable to effect any re-action, and a ſlight application of cold exhauſts the heat and the vitality of the ſyſtem.

But, *ſecondly*, experience has demonſtrated that, on the contrary, where the heat is ſteadily retained, as in the early ſtages of exerciſe, before perſpiration has diſſipated it, or fatigue has debilitated the living power; or where it is continued by ſubſequent exertion; cold drink, or the cold bath, are highly ſafe and ſalutary. Hence the Roman youth, in the heat of their exerciſe in the Campus Martius, frequently plunged into the Tiber, not only with impunity, but deriving from it a high enjoyment: and hence the ſafety of the practice of the Ruſſians, of remaining ſome time in a hot bath of from 106½° to 116° of Fahr., then rolling naked in the ſnow, and returning to the warm bath as before. In the celebrated experiments of Dr. Fordyce, ſir Charles Blagden, &c. theſe gentlemen paſſed from a room, heated to upwards of 200°, naked, to the cold air, yet no one received the leaſt injury. The heat of the body and the action of the arterial ſyſtem were here increaſed; but had they continued expoſed naked to the cold air, till the heat ſunk as low as its natural ſtandard, and the heart and arteries ſubſided into their uſual ſtate of action, their ſituation would have been very hazardous.

From the preceding ſtatements then, it is evident, that the application of cold to the body, when heated, is always ſafe, while the heat is kept up by exertion, and while there is ſtill a ſufficient power remaining in the conſtitution of generating heat. Perhaps the ſteadineſs of the ſenſation of warmth, or at leaſt the abſence of chillineſs, is the beſt teſt of this ſafety. Hence the danger of a popular practice, of waiting till a degree of coolneſs has taken place, before quitting a hot room, or before going into a cold bath, is ſufficiently obvious; and the frequent bad conſequences of leaving hot rooms are moſt frequently the effect of this imprudent practice. We doubt whether any perſon ever received an injury from cold, after leaving a heated aſſembly, if he left it while he continued warm, and either by exerciſe in the air, or by a warm covering, kept up that warmth in ſome degree till he reached his home. And with reſpect to the cold bath, every judicious phyſician now recommends all who are delicate and infirm, to uſe ſuch a degree of exerciſe before immerſion, as may produce ſome increaſed action of the veſſels, with ſome increaſe of heat, and thus ſecure a degree of re-action under the ſhock. Thoſe who, being heated and beginning to perſpire, wait on the edge of the bath until they are perfectly cooled, and then plunge into the water, often feel a ſudden chillineſs and ſhivering, which are alarming and dangerous. In ſuch caſes the injury is generally imputed to going into the water too warm, whereas in truth it ariſes from going in too cold. See Currie's Reports, p. 109. Buchan on Sea-Bathing.

Some controverſy has been maintained among phyſicians as to the mode of action of cold on the living body, and ſome apparent inconſiſtency is to be found in the language of writers, when treating on this ſubject. Thus Dr. Cullen mentions the *ſtimulant* operation of cold, as well as the *tonic*, and the contrary, or *ſedative* operation of the ſame agent. This has ariſen from not diſtinguiſhing between the direct and indirect effects of cold. The direct effect of the application of cold, or, ſtrictly ſpeaking, of the abſtraction of heat, is ſimply the abſtraction of a great and general ſtimulus, *viz. heat*; and this is of neceſſity a *ſedative* operation. Hence, by its continuance, all the actions of the ſyſtem, and the functions of life, are enfeebled and ultimately deſtroyed. This, the two late ſyſtematic writers, Brown and Darwin, contend, is the only operation of cold. When again Dr. Cullen ſpeaks of the *ſtimulant* power, he means the *indirect* action of cold, or the conſequences which reſult from the ſubſequent operation of the ordinary temperature of the air, after the cold is withdrawn. Theſe conſequences are attributed by Drs. Brown and Darwin, not to the cold, but to the returning ſtimulus of heat. The diſpute, therefore, is obviouſly little more than verbal. The direct action of cold is *ſedative;* the indirect operation is *ſtimulant*, or *tonic*; whatever theory we adopt on the ſubject.

The mode in which the latter effect is produced, was, indeed, not explained until Dr. Brown's ſyſtem was promulgated. This acute, but prejudiced theoriſt, demonſtrated this general fact in the animal economy; that whenever any accuſtomed ſtimulus is greatly reduced, or withdrawn, the living ſyſtem becomes more acutely ſuſceptible of ſtimulation; ſo that a leſſer portion of ſtimulus, ſubſequently applied, will excite an equal action; and the uſual proportion will excite an extraordinary degree of action, or, to uſe the language of Brown, the *excitability* is accumulated during the abſtraction of ſtimuli. In Dr. Darwin's phraſeology the excitability is called *ſenſorial power*. Thus, Dr. Brown obſerves, "If cold ſometimes appears to ſtimulate, it produces that effect not as actual cold, but either by diminiſhing exceſſive heat, and reducing it to its proper ſtimulating temperature, or by accumulating the excitability diminiſhed by exceſſive ſtimulus." Elements of Medicine, vol. i. ſect. 87. And Dr. Darwin remarks, that, "After any part of the vaſcular ſyſtem of the body has been long expoſed to cold, the ſenſorial power is ſo much accumulated in it, that on coming into a warm room the pain of hot-ach is produced, and inflammation and conſequent mortification, owing to the greater exertion of thoſe veſſels, when again expoſed to a moderate degree of warmth." Zoonomia, vol. ii. cl. iii. 2. 1. 17, &c. Hence, the glow on the ſkin, produced by the increaſed action of the cutaneous veſſels, on emerging from a cold bath; and hence the face becomes of a red colour in a cold day in turning from the wind. This re-action, however, or increaſed excitability of the ſyſtem, is in proportion to the relative vigour of the conſtitution and the degree and period of the action of the cold. In a delicate habit, the vital power is ſo ſpeedily enfeebled by cold, that it becomes almoſt incapable of ſubſequent excitement; and languor, debility, paleneſs, chillineſs, and ſhivering enſue after immerſion in the cold bath; this ſtate is ſucceeded by a dry and burning heat of the ſkin, which terminates in a free perſpiration, conſtituting, in fact, the ſimpleſt form of a febrile paroxyſm.

But although it be admitted, that the action of cold, as merely conſiſting in the abſtraction of the ſtimulus of heat, is directly *ſedative*, and only indirectly *ſtimulant*; yet we muſt contend that cold alſo exerts a different agency on the living body, which is directly ſtimulant; namely, an agency on the faculty of ſenſation. This ſenſorial power was altogether overlooked by Dr. Brown; but it is not eaſy to explain why Dr. Darwin, who underſtood the laws of ſenſation ſo well, ſhould have diſregarded the influence of cold upon it altogether. The ſtimulating action of cold, as Dr Currie has obſerved, though ſhort in duration, is powerful in degree. In the torpor of convulſion, when weaker ſtimuli are unperceived, the affuſion of cold water on the naked body will often excite the dormant ſenſibility, and introduce a new action throughout the nervous ſyſtem. In the apoplectic ſtate, brought on by the fumes of charcoal, this remedy is of all others the moſt efficacious. In a caſe of aſphyxia from this cauſe, which was lately detailed to a medical ſociety, by an eminent phyſician, it was remarked, that the ſprinkling of cold water over the cheſt and face produced an effect of ſtimulation, and excited motions which were only equalled by powerful ſhocks paſſed from a Galvanic battery. When dogs are ſuffocated in the vapour of the *grotto del cani*, it is well known that they are recovered by plunging them in the adjoining lake. The ſtimulating influence of cold water in ſyncope, or fainting, is a matter of vulgar obſervation. It is impoſſible, therefore, to deny this influence of cold, unleſs, indeed, it ſhould be ſaid that it is not the cold that ſtimulates, but the ſenſation which the cold produces; a point which it would be a waſte of time to diſpute.

Beſides the difference in the intenſity of the cold, in the period of its application, in its being accompanied with moiſture, or with a current of air and evaporation, and other external circumſtances already deſcribed, as modifying its operation on the living body; there are many internal circumſtances which render the body more liable to be injured by cold, or, on the contrary, enable it to reſiſt the deleterious effects of this agent. Whatever induces debility, eſpecially of the circulating ſyſtem, tends to enfeeble the calorific power, and, therefore, to diminiſh the means of reſiſtance to the action of cold. Hence, long faſting, great fatigue, a previous debauch, exceſs in venery, long watching, evacuations, ſevere ſtudy, with its concomitant, a ſedentary life, all contributing to debilitate the body, render it particularly liable to ſuffer from expoſure to cold. Hence alſo, during ſleep, (in which the heat is commonly 1½° lower than the ſtandard of health when awake, according to Mr. Hunter), in a ſtate of reſt after violent exertion, and during convaleſcence from diſeaſe, when the arterial action is languid and feeble, even ſlight cold is capable of producing injury, unleſs the internal heat is retained by means of warm cloathing. Injury is likewiſe more frequently ſuſtained, when one part of the body is expoſed, while the reſt are kept more warmly covered than uſual; or where there is a peculiar ſenſibility of the conſtitution, or of any particular organ of the body.

On the contrary, circumſtances of an oppoſite nature enable the body to reſiſt the morbid effects of cold. Such are vigour of conſtitution, eſpecially of the heart and arteries; exerciſe, by which the action of the latter, and conſequently the evolution of caloric, is increaſed; and the uſe of cordials, by which the ſame action is promoted. The operation of active paſſions, or of vigorous attention to certain other objects, weaken the ſenſation of cold, and its phyſical action on the body. Thus the aſtronomer, intent on the object of his ſublime ſcience, it is ſaid, neither feels, nor is injured by, the damps or chillneſs of the night. And in certain ſtates of excitement of the brain and nerves, as in ſome ſpecies of madneſs, cold is reſiſted in an extraordinary degree. Dr. Currie ſays, "I have ſeen a young woman, once of the greateſt delicacy of frame, ſtruck with madneſs, lie all night on a cold floor, with hardly the covering that decency requires, when the water was frozen on the table by her, and the milk that ſhe was to feed on was a maſs of ice." The influence of habit is alſo great, in enabling the body to reſiſt the effects of cold; and the uſe of the cold bath is hence a powerful preſervative from its injuries. Cullen. Diſ. Inaug. de Frigore. 1780.

The means to be adopted for the relief of thoſe who have ſuffered from the action of cold, will be readily underſtood from a conſideration of the principles, which have already been ſtated. Where a ſtate of torpor, or a ſuſpenſion of the animal functions, has been the conſequence of expoſure to cold, the principal object is to reſtore heat to the body, and to excite the reſpiration and circulation; in as much as it has already been ſhewn, that the torpor of the nervous ſyſtem depends upon the imperfect performance of theſe functions. The patient then may be brought into a warm but well-ventilated room, and gently rubbed with warm flannels. His feet and legs may be immerſed in tepid or warm water. The action of the diaphragm and the heart, are moſt readily excited by warmth and other ſtimuli, applied to the pit of the ſtomach. Dr. Currie invariably found in his experiments, that a bladder filled with warm water applied to this part, was the moſt effectual mode of communicating an equable heat to the body, and removing the ſhiverings, the ſenſe of chillneſs, and languors, produced by extreme cold in the bath. And Dr. Kellie remarked, that the good effects of friction with ammonia on the epigaſtric region were very ſtriking, in exciting the action of reſpiration, and the motion of the heart. (See Edinburgh Med. and Surg. Journal, N° iv. p. 313.) He obſerved, too, that the progreſs of the reſtoration of the temperature of the body, appeared to keep pace with, and to be regulated more by, the excitement of theſe functions, than determined by the caloric communicated from without. The application of ammonia, or other ſtimulants, to the noſtrils, is alſo uſeful; and as ſoon as the patient has ſo far recovered as to be able to ſwallow, ſome warm and gently ſtimulating drink ſhould be given, in ſmall quantities, from time to time.

From the accumulation of excitability, during expoſure to cold, and the conſequent tendency to violent inflammatory action, on the reſtoration of heat, it has been recommended to begin the attempt to recover perſons under thoſe circumſtances, by the application of cold of a leſs ſevere degree, as by friction with ſnow. But the writer juſt quoted has ſuggeſted the propriety of diſcriminating between a general torpor, and the local affection in a froſt-bitten limb. In the latter caſe, where, notwithſtanding the injury done to a part, the general powers of the ſyſtem remain excitable, heat muſt be very ſlowly and gradually communicated, or inflammation, gangrene, and loſs of the part enſue. But in the former occurrence there does not appear to be the ſame danger of violent reaction, or of deſtroying, by premature ſtimulation, the accumulated ſenſibility, where the ſenſorial functions have been altogether ſuſpended.

When diſorder has been produced by drinking large quantities of cold water during profuſe perſpiration, after violent exerciſe, two remedies have been found uſeful; namely, a bladder filled with water heated to 110° or 115° of Fahrenheit, and the tincture of opium; the latter of which is recommended by Dr. Ruſh, and the combination of the two by Dr. Currie. "I know but one certain remedy for this diſeaſe," ſays Dr. Ruſh, "and that is *liquid laudanum*. The doſes of it, as in other caſes of ſpaſm, ſhould be proportioned to the violence of the diſeaſe. From a tea-ſpoonful to near a table-ſpoonful has been given in ſome inſtances before relief has been obtained. Where the powers of life appear to be ſuddenly ſuſpended, the ſame remedies ſhould be uſed which have been ſo ſucceſsfully employed in recovering perſons ſuppoſed to be dead from drowning." Med. Inq. & Obſ. vol. i. p. 152.

II. *Of the Effects of Cold in producing different Diſeaſes.*— It is well known, that the application of cold, in very moderate degrees, whether the body were previouſly of its natural temperature, or had been heated above that point, though incapable of producing the fatal conſequences before enumerated, is nevertheleſs productive of numerous diſeaſes. We have already remarked, that, in a perſon of a delicate conſtitution, immerſion in cold water ſo far ſinks the calorific powers, as to leave a great chillneſs, ſhivering, and languor on emerſion, which, by a law of the animal economy not ſatisfactorily underſtood, is ſucceeded by a dry burning heat of the ſkin, quick pulſe, and thirſt, conſtituting a febrile paroxyſm, of the ſimpleſt form. Now, expoſure to cold, eſpecially *after* having been heated, produces, in many perſons, a ſimilar febrile ſtate. If it ſubſides in the ſpace of 24 or 48 hours, it is denominated an *ephemera*, or fever of a day. Moſt commonly it remains longer, and is accompanied with ſymptoms of catarrh, with a diminution of the diſcharge from the ſkin. This diſorder is ſo common a conſequence of ſuch expoſure, that it is denominated vulgarly *a cold*. See CATARRH. According to the prediſpoſition of the conſtitution, however, or the particular expoſure or ſuſceptibility of parts, a local inflammatory affection of one part or other, generally accompanies the febrile ſtate. Hence we ſee the different forms of catarrh; inflammations of the eyes, throat, lungs, bowels, &c.; rheumatiſm, eryſipelas, and other inflammatory diſeaſes.

Since the experiments of Sanctorius attracted the public attention to the diſcharge of perſpirable fluids from the ſkin, a great importance has been attached to the regularity of this diſcharge, and all the morbid effects of cold are ſtill attributed by the vulgar to the interruption or ſuppreſſion of it. This notion is apparently countenanced by the dry ſtate of the ſkin during the febrile ſtate which enſues; and by the termination of the fever, when a free perſpiration again breaks forth. But it is more probable that thoſe complaints ariſe from the irregularity of the circulation, and the congeſtion of blood in ſome parts, and diminution of it in others; the diminution of the diſtenſion and action of the veſſels of any part being generally followed by an increaſe of both (by the law of excitability), which, in thoſe caſes, amounts to inflammation. Hence the parts moſt frequently diſordered by cold, are thoſe which are moſt expoſed to its action, as the limbs, lungs, and throat; and rheumatiſm, catarrh, and inflammation of the throat, are the moſt common diſeaſes: and thoſe internal parts, which are moſt affected by the diminiſhed circulation of the ſurface, as the bowels, alſo ſuffer conſiderably; whence dyſentery and diarrhœa are frequent conſequences of expoſure to cold.

In all the attempts which have been made to paſs the winter in extremely cold climates, the *ſcurvy* appears to have been the moſt fatal diſeaſe. It becomes therefore a ſubject of important inquiry, whether this dreadful malady is cauſed by the *cold*, or by the diet and other circumſtances, and what means are the moſt effectual in preventing its occurrence. Dr. Aikin has collected together ſeveral accounts of ſuch attempts in the firſt volume of the Memoirs of the Lit. and Philoſ. Society of Mancheſter, p. 89, et ſeq. from which ſome important inferences relative to theſe inquiries may be deduced. It is remarkable, that thoſe who were compelled by accident, and without a ſupply of proviſions, to paſs the cold ſeaſon in thoſe inclement regions, were nearly all preſerved; while thoſe who were left by deſign, and with plenty of ſtores, all periſhed in the ſcurvy.

Capt Monck, a Dane, in 1619, wintered in Hudſon's bay, lat. 63° 20′, with the crews of two ſhips, well provided with neceſſaries; the crews amounted to ſixty-four perſons, all of whom, except the captain and two men, periſhed. In 1633, two trials were made by the Dutch of eſtabliſhing wintering-places at their northern fiſheries; the one at Spitzbergen, the other on the coaſt of Greenland, in latitudes about 77° or 78°. Seven ſailors were left at each place, amply furniſhed with every article of cloathing, proviſion, and utenſils, which were thought neceſſary or uſeful in ſuch a ſituation. The journals of both companies are preſerved, but they were all found dead on the return of the veſſels in the ſpring.

On the other hand, Capt. James, an Engliſhman, wintered on an iſland in Hudſon's bay, with a crew of twenty-two, of whom only two died. They were all afflicted with the ſcurvy, but, weak and ſick as they were, compelled to labour hard out of doors, during the greateſt inclemency of the ſeaſon, in building a pinnace. Two other inſtances, one of eight Engliſhmen, the other of four Ruſſians, left by accident, and deſtitute of proviſion, in Spitzbergen, are recorded,

corded; the whole of the former returned home the enſuing ſpring; the latter all ſurvived ſix years on the iſland, when one died, and the three others were reſcued.

The *three* principal circumſtances which diſtinguiſh the fatal attempts from thoſe which ſucceeded, are, that, in the former inſtances, the men fed on *ſalt proviſions*, drank *ſpirituous liquors*, and lived in *indolence;* whereas the men who ſurvived the winters, and were but ſlightly affected by, or altogether eſcaped, the ſcurvy, fed upon *freſh* animal food, or at leaſt preſerved *without ſalt*; they drank *water* only, and uſed much *exerciſe*. On the value of freſh meat and exerciſe, as preventives of diſeaſe, it is unneceſſary to comment. With reſpect to the uſe of ſpirituous liquors, the preceding facts are extremely important and ſatisfactory. Theſe pernicious liquors, indeed, are now generally underſtood to be prejudicial during ſevere and continued cold, although they afford ſome ſupport againſt the temporary effects of cold and moiſture. The brief elevation which they produce, is a very fallacious token of their good effects, as it is always ſucceeded by the greater depreſſion, and therefore tends rather to exhauſt, than to invigorate, the principle of vitality.

The popular opinion in regard to the influence of cold on the health, is, in this country, founded altogether in error. During a mild winter, complaints of the unwholeſomeneſs of the ſeaſon are heard perpetually, and the ſalubrity of froſt is generally extolled. Now the fact is entirely the reverſe, as the experience of every phyſician will evince. Dr. Fothergill ſays, "it has been frequently obſerved, and, as far as the bills of mortality may be depended on, is demonſtrable, that an exceſs of wet with moderate warmth, is not ſo injurious to our conſtitutions as a ſevere cold ſeaſon." Obſervations on Weather and Diſeaſes, Nov. 1751. And again, Dec. 1757, he remarks, "that no weather is in common ſo little productive of acute and fatal diſeaſes, as the warm and the moiſt, nor any ſo dangerous, in theſe reſpects, as the oppoſite:" this fact is alſo confirmed by Dr. Willan. Reports on Diſeaſes in London, p. 211. Dr. Heberden has ſhewn, that, of the two ſucceſſive winters of 1794-5, and 1795-6, the former was the coldeſt, the latter the warmeſt, of which any regular account has been kept in this country, and the comparative mortality was not leſs remarkable than the temperature. "For in five weeks, between the 31ſt of December, 1794, and the 3d of February, 1795, the whole number of burials amounted to 2823; and in an equal period of five weeks, between the 30th of December, 1795, and the 2d of February, 1796, it was 1471; ſo that the exceſs of the mortality in January, 1795, (the cold ſeaſon) above that of January, 1796, (the mild ſeaſon) was not leſs than 1352 perſons; a number ſufficient ſurely to awaken the attention of the moſt prejudiced admirer of a froſty winter." Philoſ. Tranſac. for 1796. The moſt remarkable effect of a cold winter is apparent in the diſeaſes of old people; a mild winter, is, indeed, a year's reſpite from death to many of the aged. "It is curious to obſerve," ſays Dr. Heberden, "among thoſe who are ſaid, in the bills, to die above 60 years of age, how regular the tide of mortality follows the influence of this prevailing cauſe; ſo that a perſon, uſed to ſuch inquiries, may form no contemptible judgment of the ſeverity of any of our winter months, merely by attending to this circumſtance. Thus their number in January, 1796, was not much above one fifth of that in 1795." All the chronic diſeaſes of this country ſeem to be hurried on to a premature termination by a cold winter. In ſhort, if there be any whoſe lungs are tender, any whoſe conſtitution has been impaired by age, intemperance, or diſeaſe, he will be liable to have all his complaints increaſed, and all his infirmities aggravated by ſuch a ſeaſon.

III. *Of the Effects of Cold as a Remedy in certain Diſeaſes.*—Although the action of cold on the living body, whether by directly reducing the powers of the vaſcular, and nervous ſyſtems, by occaſioning great irregularities of the circulation, or by accumulating the excitability, is a prolific ſource of diſeaſes; it is fitted, at the ſame time, by theſe powerful qualities, to counteract many of the morbid actions of the conſtitution, and to arreſt ſome of its moſt fatal diſorders. Hence, from the time of Hippocrates downwards, it has been claſſed among the moſt active remedies which the art of medicine is poſſeſſed of, more eſpecially in the febrile and inflammatory complaints. The writings of that extraordinary man, as well as thoſe of Galen, Celſus, and moſt of the celebrated phyſicians whoſe works have come down to us, contain many ſuggeſtions, both as to the internal and external application of cold; and a hoſt of modern writers have commented on its uſe. In our own country it was propoſed as an almoſt univerſal remedy by Smith; and Dr. Hancock wrote a treatiſe on the ſubject in the early part of the 18th century, under the title of "Febrifugum Magnum," which excited ſome controverſy. But in Spain and Italy the uſe of cold water obtained, about the ſame period, a greater and more general reputation, than in any of the other countries of Europe. This treatment was celebrated under the title of "Diæta Aquea." See Dr. Cyrillus's Account of it. Philoſ. Tranſac. vol. xxxvi.

But although the uſe of cold, as a remedy, is ſupported by the ſanction of antiquity, and by a ſeries of ſucceeding authorities, it has been recommended, eſpecially in febrile diſorders, in a vague indiſcriminate and empirical manner. It was reſerved for a medical philoſopher of the preſent age, to determine the circumſtances which render its employment in fevers ſafe and ſalutary, and to point out the nature of its operation on clear and rational principles. We allude to Dr. Currie of Liverpool, whoſe name we have already frequently mentioned. From the ſtatement of the facts and principles before laid down, the reader will eaſily comprehend the practical rules and cautions which muſt be obſerved in the application of cold to febrile diſeaſes.

We have already ſeen, from many facts and experiments, that wherever the heat of the body is increaſed above its natural degree, and is retained ſteadily, the action of cold is ſafe, pleaſant, and ſalutary. Now in *continued* fevers, the heat is retained in general with a tenacity much greater than when it is the conſequence of temporary exertion, or of expoſure to heat from without. There is, in the febrile ſtate, an inflammatory conſtriction of the cutaneous veſſels, which tends at once to keep up the febrile action, and to prevent the flow of perſpiration, the great refrigerating proceſs of the conſtitution. Its ſafety, therefore, in the hot ſtages of *continued* fever, is decided and complete. But it is, moreover, extremely ſalutary and remedial in various ways. In the firſt place, the ſenſation of heat is one of the greateſt ſources of irritation in fever, and therefore tends to augment and to continue the febrile action, and to prevent the refreſhment of ſleep. The operation of cold, by relieving that ſenſation, contributes materially to leſſen the febrile actions, and to ſooth the patient to repoſe, at a time when all opiates are unable to effect that purpoſe, but rather aggravate the reſtleſſneſs. Secondly, it has been proved by the experiments of Dr. Alexander and Dr. Currie, that a conſiderable elevation of the heat of the body, above the ſtandard of health, is incompatible with the proceſs of perſpiration. Thus at the temperature of 104° or 105° of Fahr. the veſſels of the ſkin remain obſtinately conſtricted, the ſkin continues dry, and pungently hot to the touch of the byſtander; and it is only when it is reduced to 99° or 100°, that the orifices of the veſſels relax, and a free perſpiration diminiſhes the heat, and moderates the febrile condition. Hence the obvious abſurdity of attempting to force ſweats, by covering the patient with a load of bedclothes, a practice ſtill unfortunately prevalent among the vulgar and the ignorant, but which all intelligent practitioners have long ago abandoned. In fact, the only means of exciting perſpiration, under ſuch high temperatures, is to *cool* the body to that lower degree at which the veſſels can relax and pour out their fluids. In fevers, therefore, as in health, *when there is no ſenſe of chillineſs preſent, when the heat of the ſurface is ſteadily above what is natural, and when there is no general or profuſe perſpiration*, the free uſe of cold drink, and the affuſion of cold water over the ſkin, are the moſt ſalutary remedies which can be adopted, as ample experience has now unequivocally decided. The conſequences of the waſhing of the body with cold water, or of the uſe of the ſhower-bath, in *typhus* fever, under the circumſtances juſt quoted, are almoſt invariably the following, as we have witneſſed in the London Houſe of Recovery. As ſoon as the patient is returned to bed, a gentle, ſometimes a profuſe, perſpiration breaks out, and a calm and quiet ſleep enſues; the actual heat of the ſurface and the diſtreſſing ſenſation of heat, are greatly diminiſhed, the pulſe becomes much leſs frequent, the tongue cleaner and moiſt, the pains of the head and limbs are alleviated, and the whole febrile condition is relieved, and its courſe rendered milder, and conſiderably abridged. This relief is the more effectual and permanent, in proportion as the remedy is more early reſorted to. When it is employed on or before the third day of the fever, in the form of affuſion, by means of a bucket of water, or the ſhower bath, it ſometimes produces a complete ſolution of the diſeaſe; but after that period, its effect is merely to relieve the ſymptoms, and, eſpecially if repeated when the heat returns, to bring the diſeaſe to a ſpeedy happy termination. In the former caſe, the great operation is attributed to *the ſhock* produced by the ſtrong ſenſation of cold; which, like other violent operations, ſuch as an emetic, a briſk purgative, &c. adminiſtered in the beginning, diſſevers the catenation of ſymptoms, which, by delay, become indiſſoluble by medicine.

Experience has now confirmed the great benefit ariſing from the application of cold water to the ſurface of the body, according to the practical precept before quoted, in typhus fever, whether originating from contagion, or other cauſes; in the ſynochus, or ſub-inflammatory fever of ſummer, in this climate; and alſo in the exanthemata, as in the eruptive fever of ſmall-pox, in which the fever and ſubſequent eruption are rendered extremely mild; and, above all, in the ſcarlet fever, in which the heat of the body riſes higher than in any other febrile diſeaſe of this country. Several remarkable inſtances of the rapid alleviation of this ſevere diſeaſe are related, which occurred in the family of Dr. Gregory, at Edinburgh, and among Dr. Currie's own children. Reports, vol. ii. In the plague, ſeveral accidents have occurred, which render it probable that cold water would be of the higheſt benefit in that terrible diſeaſe. M. Deſgenettes, phyſician to the French army in Egypt, relates that a miner, attacked by the plague, during the expedition into Syria, eſcaped naked, during a violent delirium, from the fort of Cathieth, and wandered nearly three weeks in the deſert. Two buboes, which he had upon him at that time, ſuppurated and healed of themſelves. This man perfectly recovered. An artilleryman alſo, who had two buboes and an anthrax, made his eſcape from the lazaretto of Boulak, on the day of his being admitted, and in a violent delirium precipitated himſelf into the Nile. He was taken up about half an hour afterwards, below Embabeth, by the people of that village; and he afterwards perfectly recovered. Hiſtoire Medicale de l'Armee d'Orient, p. 249. Theſe extraordinary cures correſpond perfectly with a number of ſtriking facts of the ſame kind, all pointing out the powerful inſtinct by which, in the delirium of the plague, as in other burning fevers, the patient is impelled to ſeek the moſt eaſy and obvious modes of relief. "How fruitleſs and how perverted," Dr. Currie remarks on theſe facts, "are the efforts by which learning and ſcience have attempted to combat this fatal diſeaſe! The beſt remedies for the plague were probably miſſed by the phyſicians both of France and England: they were not to be traced in the prevailing ſyſtems of medicine, or in the pharmacy of our ſhops; but it is probable they might have been found, in the refreſhment of the breeze, in the dews of the night, and in the waters of the Nile." The application of cold water to the ſkin, in the yellow fever of the Weſt Indies, has been attended with great benefit. For the evidence on this ſubject the reader may conſult Dr. Currie's ſecond volume of Reports. Dr. Jackſon's Treatiſe on the Fevers of Jamaica. Dr. Chiſholm's Eſſay on the malignant peſtilential Fever of the Weſt Indies. Dr. Stock's Medical Collections on the Effects of Cold, &c. &c.

In *intermittent* fever the preternatural heat is retained more feebly than in continued fever; and, therefore, the uſe of cold muſt be reſorted to with more caution. In the cold fit, when there is not only a ſenſation of great cold, but an actual diminution of the heat, as ſhewn by the thermometer, its application would be extremely deleterious; but experience has ſhewn, that *when the hot ſtage is fully formed*, the affuſion of cold water ſpeedily brings on the ſweating ſtage, and ſhortens the paroxyſm. Dr. Currie has related a caſe of tertian intermittent, of three months ſtanding, which had reſiſted every medicine, but of which only one paroxyſm occurred after the cold affuſion had been uſed, the bark being taken in the interval. Indeed he almoſt always found the cold affuſion produce an immediate ſolution of the fit; but, in general, if no remedy were uſed in the intermiſſion, the fever returned at its uſual period. In ſome inſtances, however, the ſucceeding paroxyſm was prevented by uſing the cold affuſion about an hour previous to its expected return; and the diſeaſe ultimately removed by continuing this practice through four or five of the following periods. But the uſe of the cold affuſion in the abſence of this fever, requires a conſtitution in a great meaſure unbroken, to render it ſafe.

In recommending the application of cold water to the ſkin as a remedy in fevers, an expreſs exception is made againſt it, during the feveriſh chill, or after the perſpiration has begun to flow profuſely, and more eſpecially after it has continued to flow profuſely, for ſome time. An exception is alſo made againſt its being employed in the latter end of fever, when the ſtrength is much exhauſted, and the heat is ſometimes as low or lower than the temperature of health. We ſpeak at preſent of fevers unaccompanied by any viſceral inflammation. The only caution, then, which is requiſite is, *that the heat of the body be ſteadily above the natural degree, and that there be no chillineſs on the one hand, nor profuſe perſpiration on the other*. Theſe obſervations apply equally to the uſe of cold drink, as to the external application of cold water.

If the aſperſion of cold water on the ſurface of the body be uſed during the cold ſtage of the paroxyſm of fever, the reſpiration is nearly ſuſpended; the pulſe becomes fluttering, feeble, and of an incalculable frequency; the ſurface and the extremities become doubly cold and ſhrivelled, and the patient ſeems to ſtruggle with the pangs of inſtant diſſolution. Conſequences, not leſs alarming, enſue, if the cold is applied during profuſe perſpiration, when the heat is rapidly ſinking; and the application is ſometimes equally hazardous, when the heat, meaſured by the thermometer, is leſs than, or only equal to, the natural heat, though the patient ſhould feel no degree of chillineſs. This is eſpecially the caſe towards the laſt ſtages of fever, when the powers of life are too weak to ſuſtain ſo powerful a ſhock. When theſe alarming ſymptoms have been produced by accident or inadvertence on the part of the attendants, frictions on the ſurface, and particularly on the extremities, ſhould be employed; a bladder filled with warm water, of the heat of 110° or 120°, ſhould be applied to the pit of the ſtomach; and cordials cautiouſly adminiſtered in ſmall quantities.

With reſpect to the modes in which external cold may be applied to the body, it may be obſerved, that circumſtances will determine the eligibility of each. In the commencement of fever, where the object is to cut ſhort the diſeaſe, by the ſhock of the ſenſation of cold, as well as by the ſudden abſtraction of the ſtimulus of heat, the *cold affuſion* is to be preferred. This is performed by throwing a bucket full of water over the naked body of the patient; the ſhower-bath is alſo a convenient mode of affuſion. But where the ſimple cooling of the body is the object of the practice, the ſkin may be waſhed with cold water alone, or with a mixture of vinegar, or common ſalt, by means of a ſponge. This mode ſeems preferable in all caſes in which great re-action of the ſyſtem would be detrimental; as it may be regulated according to the heat, and the ſtate of the ſenſations of the patient, ſo as to avoid, in a conſiderable degree, the fluſh of heat which enſues, after a momentary cold. The affuſion of *tepid* water, *i. e.* of the heat of 87° to 97° of Fahrenheit, may be advantageouſly uſed with the ſame view. "The tepid affuſion," Dr. Currie remarks, "is little, if at all, ſtimulating; and does not, like the cold affuſion, rouſe the ſyſtem to thoſe actions by which heat is evolved, and the effects of external cold are reſiſted. Where the object is to diminiſh heat, that may be obtained with great certainty by the repeated uſe of the tepid affuſion, ſuffering the ſurface of the body to be expoſed in the interval to the external air; and if the beams of the ſun are excluded, and a ſtream of wind blows over it, the heat may be thus reduced where cold water cannot be procured; even in the warmeſt regions of the earth; on the plains of Bengal, or the ſands of Arabia. I have accordingly employed the tepid affuſion very generally in thoſe feveriſh affections, where the morbid actions are weakly catenated, depending rather on the ſtimulus of preternatural heat, than on contagion, miaſmata, the morbid contents of the ſtomach and bowels, or local inflammatory affection. Of this kind are a great part of the feveriſh affections of children, in which the tepid affuſion is a valuable remedy. It very generally produces a conſiderable diminution of heat, a diminiſhed frequency of the pulſe and reſpiration, and a tendency to repoſe and ſleep. I have uſed it alſo in feveriſh diſorders of various kinds where the lungs are oppreſſed, and the reſpiration laborious, and where, of courſe, the oppreſſion might be dangerouſly augmented by the ſudden ſtimulus of the cold affuſion. It is alſo applicable to every caſe of fever in which the cold affuſion is recommended, and thoſe may receive much benefit from it, whoſe fears or whoſe feebleneſs deter them from that energetic remedy." Vol. i. p. 69.

It remains to be determined by experience, to what extent the application of cold water to the ſurface of the body may be advantageouſly employed, where there is active inflammation in any of the more important organs, as in the lungs, liver, &c. Dr. Currie has collected abundant evidence, from his correſpondents, of the ſafety of cold affuſion in typhus fever, when accompanied with a cough, and other catarrhal ſymptoms. We have uſed the ſhower-bath, under ſuch circumſtances, in ſeveral caſes; as well as in fever, combined with inflammation of the tonſils, and with dyſenteric affection of the bowels, not only with impunity, but with relief, as well to the febrile as to the inflammatory ſymptoms.

In all caſes of active inflammation, to which topical remedies can be applied, the application of cold is, next to the detraction of blood, the moſt powerful remedy. In theſe inſtances, as the object is ſimply the diminution of heat, the application of cold muſt not be ſudden and temporary, but conſiderable in degree, and permanent in duration, ſo as to prevent any local re-action. Hence the ſucceſs with which ice and ſnow, and the clay cap, are applied to the head and other parts, for the purpoſe of preventing or reducing inflammation. The ſaturnine and other lotions, which are employed in inflammation of the eyes, &c. ſeem to owe their powers principally to their cold temperature; and many of the popular remedies in ſuch complaints are uſeful on this principle only.

In rheumatiſm, and even gout, the application of cold has, in all ages, been freely recommended by many practitioners. Hippocrates and Celſus employed it largely; and in modern times its benefits have not been overlooked. Dr. Heberden informs us, that "the great Dr. Harvey, upon the firſt approach of gouty pains in his foot, would inſtantly put them off by plunging his leg into a pail of cold water." This practice is now recommended by Dr. Kinglake, as invariably ſafe, and ſpeedily curative; and we doubt not, that, in a majority of caſes, where the conſtitution remains unbroken, and the gouty inflammation is active, ſuch will be the event. We have yet to learn, however, under what circumſtances the danger of repulſion, which is perhaps not altogether imaginary, occurs. In the more local attacks of acute rheumatiſm, or what is commonly called rheumatic gout, we have ſeen the application of cold water to the inflamed joints very beneficial.

In the commencement of the painful inflammation produced by fire, whether by burning or ſcalding, the free uſe of cold is rapidly beneficial, in relieving the pain, and removing the inflammatory ſymptoms. A ſlight burn or ſcald, if the part be plunged into cold water, and detained there, or on the frequent repetition of the immerſion, is frequently cured in a ſhort ſpace of time. The following ſtriking fact is related in the New York Medical Repoſitory, vol. i. p. 538. "Two brothers, apprentices to a hatter, were employed in taking hats from a boiler, and rinſing them out in a very large tub of cold water. Some diſpute ariſing, one of them lifted the other in his arms, and ſeated him directly in the boiler; but being inſtantly ſtruck with terror at what he had done; without looſing his hold, he again lifted him from the boiler, and ſeated him in the tub of cold water. The youth, who had been thus hurried through theſe extremes of temperature, had on a pair of wide trowſers, and received no other injury, than a narrow bliſter, which was formed directly under the waiſtband, and encircled his body."

There is another important claſs of diſeaſes, in which, as well as in febrile and inflammatory complaints, the application of cold is one of the moſt active remedies that we poſſeſs; namely, *ſpaſmodic*, or *convulſive* diſeaſes. In theſe, however, the object is not, as in the former, the ſedative operation of abſtracting heat, and thus diminiſhing vaſcular action; it is the *ſtimulant* effect of cold, the ſtrong impreſſion on the ſenſations, by which the morbid catenations are diſſevered, of which we avail ourſelves in treating ſpaſmodic diſeaſes. It is, therefore, only the affuſion of cold water, or the ſudden immerſion in the cold bath, which is ſerviceable in theſe maladies; and the chief benefit derived from the application of cold in theſe caſes, "depends on its being uſed in the *paroxyſm of convulſion*; its efficacy conſiſts in reſolving or abating the paroxyſm; and when this effect is produced, the return of the paroxyſm is greatly retarded, if not entirely prevented." Currie, Reports p. 133. In ſpaſmodic diſeaſes, which do not ariſe to general convulſion, the cold bath is of little efficacy.

The cold bath and cold affuſion have been employed for the cure of convulſive diſorders from very early times; there was a great difference of opinion, however, among the ancients as to their good effects. Hippocrates recommends the uſe of them, and Galen ſupports the ſame doctrine; while Paul Œgineta and others aſſert the inſufficiency, and even danger, of theſe expedients. The continental writers of the laſt two centuries have detailed numerous inſtances of their good effects. In that terrible diſeaſe, the tetanus, the cold affuſion appears to be the moſt effectual remedy, which has hitherto been adopted. Hippocrates recommends that a quantity of cold water ſhould be poured over the patient in the convulſions of tetanus, with a view of exciting a febrile re-action; as he had obſerved (Aphoriſm. 57. ſect. 4.) that a fever, ſupervening on a ſpaſm or tetanus, removes the diſeaſe. He adds a caution to this advice, that the practice muſt not be uſed, except in ſummer; nor unleſs the patient be young, and of a full habit of body, and the diſeaſe do not originate from a wound. Aph. 21. ſect. 5. In the Weſt Indies, where this diſeaſe is of frequent occurrence, the affuſion of cold water is ſaid by Dr. Moſeley, to have been found by far the moſt efficacious remedy, during the laſt fifty years. (Treatiſe on Tropical diſeaſes. p. 491.) Dr. Currie has related ſeveral caſes in which it was ſucceſsful, even though the diſeaſe was the conſequence of a wound; in which caſe, it appears that the father of phyſic relinquiſhed the convulſions to nature, as incurable. Dr. Wright, who firſt employed the cold affuſion in fever, uſed it alſo with ſucceſs in tetanus. And the writer of this article has witneſſed one caſe, which, although originating from a wound in the heel, made by an axe, was ſucceſsfully treated by the cold affuſion, combined with free doſes of opium.

"In the *hyſteric* paroxyſm," Dr. Currie affirms, "the cold bath, or indeed the plentiful affuſion of cold water, is an infallible remedy. Thoſe who ſuppoſe that the terror it occaſions ought, in this caſe, to prevent our having recourſe to it, are, in my opinion, miſtaken. Though the hyſteric paroxyſm be the offſpring of paſſion, it is never occaſioned, I will venture to aſſert, by the paſſion of fear. A ſenſe of danger will always, I believe, prevent it; or indeed a powerful dread of any kind. I have known a tub of cold water kept in readineſs, with the certainty of being plunged into it on the recurrence of the paroxyſm, cure this diſeaſe, without the remedy being ever actually tried. I know the hyſteric paroxyſm often takes place when *danger is over*, but that is another caſe."

In the ſpaſmodic affection of the bowels, which conſtitutes *colic*, the application of cold, eſpecially to the lower extremities, has been frequently efficacious in diſſolving the ſpaſms, and procuring evacuations. A caſe of obſtinate conſtipation, which continued in ſpite of all the medicines, that were deviſed for its relief, and in which there was alſo extreme pain, and conſiderable fever, was at length completely removed by daſhing cold water on the extremities, up as high as the pubes, and plunging the feet in warm water. See Edin. Med. Eſſays, vol. v. p. 890. Similar caſes are alſo recorded in the Medical Tranſactions of the London College, vol. iii.

By the ſame expedient ſpaſmodic ſtrictures of the neck of the bladder, have been frequently removed. It is a very common practice to place children, when afflicted with a temporary ſuppreſſion of urine, with their naked feet on a cold ſtone, or marble hearth; and in general this plan at once removes the obſtruction, and cauſes the urine to flow. The caſe of an adult (a gentleman of Briſtol) is related by Dr. Currie; he was inſtantly relieved of an obſtinate ſtricture of the neck of the bladder, of thirty hours duration, during all which time not a drop of water had paſſed, by placing his feet on a marble ſlab, and daſhing cold water over the legs and thighs; the effect was inſtantaneous. The urine burſt from him in a full ſtream, and the ſtricture was permanently removed. The common remedies, particularly opium and bleeding, and each of them very largely, had previouſly been tried in vain. Reports, p. 138.

The effect of the ſtimulus of the ſudden ſenſation of cold, in the ſtate of ſuſpended animation, occaſioned by the fumes of charcoal, has been already mentioned. In the experiments made for the gratification of travellers, who viſit the *grotto del cani*, the dogs that are rendered apparently lifeleſs from the carbonic gas, are ſpeedily recovered on being plunged into the adjoining lake. Several experiments on other animals, in which the ſame phenomena were obſerved from the application of ice and cold water, after ſuffocation by carbonic acid gas, are related by Dr. Stock. See his Med. Collections before quoted, p. 120. et ſeq. The good effects of the ſame ſtimulus are univerſally known, in common caſes of fainting, or ſyncope, from which the patient is ſpeedily rouſed by ſprinkling cold water on the face. The ſtimulating effects of this application, were, indeed, in one caſe of aſphyxia, to which we before alluded, not leſs obvious than thoſe occaſioned by the Galvanic fluid.

We ſhall content ourſelves with merely mentioning other inſtances of diſeaſe, in which the application of cold is of conſiderable value as a remedy. Such are the active hæmorrhagies; phrenſy or inflammation of the brain; the early ſtage of the acute hydrocephalus, and of the torpor from drunkenneſs; and the paroxyſms of acute mania. In all theſe maladies the cold ſhould be applied ſteadily, near the parts affected, the object being to diminiſh the action of the veſſels in thoſe parts by abſtracting the ſtimulus of heat. There are other diſeaſes alſo, in which the ſudden and temporary application of cold, in the form of the cold-bath, is efficacious, by gradually ſtrengthening the conſtitution; ſuch are ſcrofula; the rickets of children; and ſome cutaneous diſorders. The ſame expedient is alſo beneficial as a preventive of ſeveral diſeaſes, eſpecially thoſe which ariſe from expoſure to cold and moiſture, ſuch as catarrh, rheumatiſm, inflammatory ſore throat, &c. by inuring the ſyſtem to the action of cold, and thus fortifying it againſt its deleterious effects.

COLD, the popular term for catarrh, which is the moſt frequent diſeaſe occaſioned by the action of cold. See CATARRH.

COLD is alſo a diſeaſe to which horſes are ſubject; this is uſually occaſioned by want of regular exerciſe, by overheating them in riding, and ſuffering them to cool too faſt, or neglect of rubbing them down when they come in hot after journeys. The ſigns of a cold are a cough, heavineſs, watery eyes, kernels about the ears and under the jaws, gleets of the noſe, and rattles, in breathing, &c. Bleedings, hot maſhes of bran and water, and moderate exerciſe will, in moſt caſes, be an effectual remedy. To theſe may be added balls conſiſting of warm opening ingredients; Dr. Bracken preſcribes the following; take anniſeed, carraway ſeed, and greater cardamoms, finely powdered, of each one ounce, two ounces of flower of brimſtone, one ounce and a half of turmeric in fine powder, two drams of ſaffron, two ounces of Spaniſh juice diſſolved in water, half an ounce of oil of anniſeed, one ounce and a half of liquorice powder, and a ſufficient quantity of wheat flour; let theſe ingredients be well beat in a mortar and made into a ſtiff paſte; and given in ſmall quantities about the ſize of a pullet's egg. See Cough.

Cold *Fit*, in *Medicine*, the firſt ſtage of a paroxyſm of fever, in which there is not only a ſenſation of cold, but a pale and contracted ſkin, and generally a diminution of the actual heat, as meaſured by the thermometer. The cold ſtage is moſt ſevere and obvious in intermittent fevers, in which it is accompanied with great ſhivering, and even ſhaking of the whole body, and clattering of the teeth: it is denominated by the vulgar, the *ague*, in contradiſtinction to the ſucceeding hot and ſweating ſtages, which are called the *fever*. See Fever and Ague.

Cold-*Bath*. See Bath, and Bathing.

Cold, *Artificial*. See Feeezing, or Thermometer.

Cold *Diamargariton*. See Diamargariton.

Cold *Diatragacanth*. See Diatragacanth.

Cold *Diſtillations*. See Distillation.

Cold *Fuſion*. See Fusion.

Cold-*charge*, in *Farriery*, a medicine conſiſting of vinegar, bole, and whites of eggs, mixed to the conſiſtence of a poultice, and ſpread over the injured part for the cure of ſtrains, &c.

Cold-*finch*, in *Ornithology*, the name of a ſmall bird occaſionally obſerved in England, and better known by the appellation of pied-fly-catcher. It is the *muſcicapa atricapilla* of Linnæus. See Atricapilla.

Cold-*Aſton*, in *Geography*, a vicarage in Glouceſterſhire in the hundred of Puckle-Church; the ſituation of its church ſteeple was determined in the "Government Trigonometrical Survey," in 1797, by obſervations from Lanſdown ſtation, diſtant 13,563 feet, and from Farley Down ſtation, diſtant 24,120 feet, and bearing 33° 43′ 21″ S.E. from the parallel to the meridian of Black-Down; whence was deduced its latitude 51° 26′ 54″.8 N. and its longitude 2° 20′ 44″.4, or $9^m\ 24^s.9$ W. of Greenwich.

Cold, *Cape*, a cape at the north end of Charles iſland, on the coaſt of Eaſt Greenland. N. lat. 79° 6′. E. long. 10° 57′.

Cold *Spring Cove*, is ſituated near Burlington, New Jerſey, America, and is remarkable for its ſand and clay, uſed in the manufacture of glaſs; from whence the glaſs-works at Hamilton, 10 miles weſt of Albany, are ſupplied with theſe articles.

COLDDITZ, a town of Germany, in the circle of Upper Saxony, and circle of Leipſick; 21 miles S.E. of Leipſick, and 36 W. of Dreſden.

COLDENIA, in *Botany*, (ſo named by Linnæus, in honour of C. Colden, a North American botaniſt, who ſent ſeveral new plants to Europe, which are deſcribed in the Upſal acts for 1743.) Linn. Gen. 173. Schreb. 233. Willd. 268. Gært. 424. Juſſ. 130. Claſs and order, *tetrandria tetragynia*. Nat. Ord. *Aſperifoliæ*, Linn. *Borragineæ*, Juſſ.

Gen. Ch. *Cal.* Perianth, four-leaved (four-cleft, Gært.); leaves lanceolate, erect, rough with hairs. *Cor.* monopetalous, funnel-ſhaped, the length of the calyx; mouth not cloſed; border four cleft, ſpreading, obtuſe. *Stam.* Filaments four, inſerted into the tube; anthers roundiſh. *Piſt.* Germs four, ſuperior, egg-ſhaped, connate in pairs, each ending in a filiform permanent ſtyle; ſtigmas ſimple. (Style one; ſtigma bifid; Gært.) *Peric.* none. *Fruit* egg-ſhaped, compreſſed, ſcabrous, acuminate, terminated by four beaks; Linn. (Fruit four-capſular, ſcabrous, four-beaked; capſules approximating, one-ſeeded; Juſſ. *Seeds* two, two-celled, mucronate at their ſummit, echinate with ſhort hairs, flattened on the ſide where they join, two-lobed on the outſide, forming together four regular lobes, ending in a point compoſed of four upright ſtyles cloſe to each other; Lam. Nuts four, ſmall, encloſed in a rind, united into a rounded, tetragonal, mucronate fruit; rind fungous, very thick on the back of the nuts, becoming gradually thinner, and almoſt membranous on the ſides; ſhells bony, hard, convex, and rounded on one ſide, compreſſed into an acute angle on the other, one-celled; Gært.)

Eſſ. Ch. Calyx four-leaved. Corolla funnel-ſhaped. Styles four. Seeds two, two-celled.

Sp. C. *procumbens*. Linn. Sp. Pl. Mart. Lam. Willd. Gært. tab. 68. (Teucrii facie biſnagarica tetracoccos roſtrata; Pluk. Alm. tab. 64. fig. 6. Moriſ. Hiſt. 3. 423. n. 22.) *Root* annual. *Stems* trailing on the ground, a foot long, cylindrical, branched, rough with white hairs. *Leaves* alternate, egg-ſhaped, rounded at their ſummit, nearly ſeſſile, deeply crenated, plaited at the ſerratures, unequal at the baſe, cloathed with white hairs except in the plaits. *Flowers* pale blue, ſmall, axillary, ſeſſile. A native of the Eaſt Indies. It is propagated by ſeeds, ſown in a hot-bed in the ſpring. When the plants are fit to remove, they ſhould be put into ſeparate pots, plunged into a hot-bed of tanners' bark, and kept in the ſhade till they have taken freſh root; after which they ſhould have freſh air, according to the warmth of the weather, and be ſparingly watered two or three times a week. They muſt remain in the hot-bed, where they will flower in June, and ripen their ſeeds in September.

COLD-Harbour, in *Geography*, a houſe on the north bank of the Thames, oppoſite to the town of Earith in Kent, the ſituation of which was determined in the "Government Trigonometrical Survey," about the year 1798, by obſervations from Rainham ſteeple, diſtant 11,090 feet, and bearing 3° 1′ 31″ N.E. from the parallel to the meridian of Greenwich; and from the ſtation on Purfleet Cliff, diſtant 10,971 feet, and bearing 81° 1′ 59″ S.E. from the ſame parallel; whence is deduced its latitude 51° 29′ 16″.5 N. and longitude 0° 11′ 19″.3 E. of Greenwich.

COLDING, or Kolding, a town of Denmark, in the dioceſe of Ripen, ſituated between mountains, on the river Thueths, which runs into the Little Belt about a league below. It is an ancient town, and was formerly the reſidence of many Daniſh kings, who adorned it with ſeveral edifices. The harbour is now filled up, and its commerce almoſt annihilated; 24 miles N.E. of Ripen. N. lat. 55° 30′. E. long. 9° 23′.

COLDINGHAM, a town and pariſh in the county of Berwick, Scotland. The town is ſituated about a mile from the ſea, in a recluſe vale, watered by two rivulets, which flow on either ſide of it. The monaſtery at Coldingham is ſaid to have been burnt previous to the conſecration of St. Cuthbert, or about 685, and was rebuilt, according to lord Hailes, by king Edgar in 1098, who aſſiſted at its dedication, after which it became one of the moſt important in this eaſtern portion of the kingdom. The diſſolution of the monaſtery, or ſome other cauſe, appears to have injured and diminiſhed the town conſiderably, but it has recently exhibited indications of renovation, and the inhabitants rapidly increaſe. The pariſh is fertile with the exception of about 600 acres, which are totally incapable of cultivation, and the peats found in the diſtrict are not ſufficiently ſolid for fuel; but the hills are not generally ſo ſteep as to prevent the uſe of the plough, though St. Abb's head is in the vicinity, and the coaſt, compoſed of crags, is conſidered dangerous to the mariner. The banks of the river Eye, which flows through the pariſh, are fringed with wood, and Coldingham loch, a mile weſt of St. Abb's head, is a beautiful ſheet of water of conſiderable depth, and about a mile in circumference. There are ſeveral hamlets within the pariſh, inhabited principally by farmers and weavers, and the ruins of a church are ſtill viſible on St. Abb's head. Faſt-caſtle in this neighbourhood, is entirely ſurrounded by the ſea, and muſt have been almoſt impregnable before the invention of cannon. Population in 1791, 2391.

COLDITZ, a town of Germany, in the circle of Upper Saxony, and margraviate of Meiſſen, ſituated on the Mulda; 10 miles S.E. of Leipſick.

COLDSHIRE *Iron*, ſuch as is brittle when it is cold; ſee IRON.

COLDSTREAM, in *Geography*, a town ſituated on the north ſide of the river Tweed, in the county of Berwick, Scotland, ſeems to have owed its origin to an abbey of Ciſtertain monks which ſtood within the pariſh of the ſame name. General Monk has contributed to immortalize the place, from having raiſed a regiment here, which he named the Coldſtream, previous to his victorious exertions in favour of Charles II. Since that period a portion of the royal guards have borne the title, which has never yet been ſullied, or diſhonoured; probably this is the moſt important epoch in the annals of Coldſtream. There are ſeveral tumuli in the pariſh, that are ſuppoſed to contain the remains of Chieftains ſlain in remote border wars. The roads from London to Berwick, and from the latter to Kelſo, and Dunſe to England, paſs through Coldſtream, which is admirably ſituated for manufactures, as coals are reaſonable in price, wool plentiful and excellent, and the banks of the Tweed produce great crops of corn, and feed numerous herds of cattle; yet, with all theſe advantages, and a neat bridge facilitating communication between the two kingdoms, no conſiderable trade is carried on.

The pariſh borders on the Tweed for ſeven or eight miles in length, and is about four in breadth; the ſoil on the above river is light, but inclines to clay at ſome diſtance from it, and a ſingular ſlip of barren land, termed the *Muir-Land*, divides the pariſh from eaſt to weſt. Shell and rock marle, free-ſtone, and coals, are found in abundance, and yet the latter is much neglected. Several plantations have lately been ſet to ſupply the deficiency of native trees. The principal ſeats in the pariſh are Hirſel, the reſidence of the earl of Home, who has erected two ſuperb obeliſks to the memory of his ſon, lord Dunglaſs, ſlain in the American war, and Kersfield, the manſion of Mr. Moriſon. Population of the diſtrict in 1793, 2193.

COLD-WATER, a lake of North America. N. lat. 54° 56′. W. long. 111°.

COLE, WILLIAM, in *Biography*, the moſt famous botaniſt of his time, was born at Adderbury in Oxfordſhire, in 1626, and after the uſual elementary learning he went to Merton College, Oxford, where he completed his education. He ſettled at Putney, a village near London, and publiſhed a work intitled “The Art of Simpling, or an Introduction to the Knowledge of gathering Plants,” &c. and another intitled “Adam in Eden, or Nature's Paradiſe, containing a Hiſtory of Plants,” &c. Upon the reſtoration of Charles II., he was appointed ſecretary to Dr. Duppa, biſhop of Wincheſter, but died in the year 1662, at the early age of 36.

COLE, WILLIAM, a learned and ingenious phyſician, who diſtinguiſhed himſelf by various publications on phyſiology, and on the practice of medicine; received his education at Oxford, where he took his degree of doctor in the year 1666. He ſoon after ſettled at Briſtol, and having acquired celebrity there, he removed to London. He had the merit of being an early convert to the opinion of the excellence of the Peruvian bark, which he preſcribed liberally and with ſucceſs in hyſterical affections, as well as in intermittents. His works abound too much with theory. Fever he ſuppoſed to be occaſioned by a depravation of the nervous fluid. His works are, “De Secretione Animali, cogitata,” Oxon. 1677, 8vo. The ſecretions receive their qualities from the ſtructure of the glands, by which they are ſeparated from the blood. “An Eſſay concerning the late frequency of Apoplexies,” Oxford 1689. His new hypotheſis as to the cauſe of fever, firſt publiſhed in 1694, was ſeveral times reprinted, “Conſilium ætiologicum de caſu quodam Epileptico.” He recommends the miſletoe, by which he pretends to have cured the complaint. The patient, who deſcribes his caſe, ſays he was much relieved. He wrote alſo on inſenſible perſpiration, and was author of ſeveral diſſertations which were publiſhed in the “Philoſophical Tranſactions” of that time. Haller Bib. Med. Eloy. Dict. Hiſt.

COLE, in *Agriculture*, the name of a plant of the cabbage kind, which is cultivated both on account of its ſeed, and for feeding cattle and ſheep. The ſeed, by preſſure in mills contrived for the purpoſe, affords a valuable oil, and the refuſe, or cake, is uſed as a manure.

It has ſometimes the name of *rape*. Martyn, in his edition of Miller's Dictionary, ſeems to conſider cole (*braſſica napus*) as the wild plant; and rape (*napus ſativa*) as a garden or cultivated variety; but obſerves, that “the ſpecific diſtinctions are very inſufficient,”

A late writer on huſbandry remarks, that “as to the difference between cole and rape, it is hardly poſſible to diſtinguiſh them in the ſeed, but when in plants you may eaſily tell one from the other. Cole is generally intended to be eaten by ſheep, and rape to ſtand for ſeed to be manufactured into oil, which is uſed in large quantities by clothiers, and other tradeſmen, and likewiſe in phyſic. Cole is alſo often ſown for the purpoſe of ſtanding for ſeed, from which oil is made. Cole grows to a greater height when in leaf than rape; and the ſtalks are ſo ſoft and pulpy, that ſheep can eat them very near the bottom. Rape is of a hardier nature, fitter to ſtand the winter; the ſtalks are rigid, grow buſhy, and branch much; and when ſpring approaches they ſpread and yield more ſeed than cole. Theſe two ſeeds are in general, he thinks he may ſay always, intermixed; it would, therefore, be well worth while for a grower to collect with care, out of a crop, the different ſeeds, and to ſort them properly, for cole is the beſt for feeding ſheep, and rape for the purpoſe of making oil.”

It is a plant which has been found to thrive in the beſt and moſt perfect manner in deep, rich, dry, friable, and kindly ſoils; but which, with plenty of manure, and deep ploughing, may be grown in moſt others. And it has been ſtated by Mr. Young, in his calendar of huſbandry, that upon fen, and peat ſoils and bogs, as well as black peaty low grounds, it thrives aſtoniſhingly, but more eſpecially when the land has been pared and burnt, which is the beſt ſort of preparation for it. But the author of the “New Farmer's Calendar,” thinks that it is a plant which is not perhaps worth attention on any but rich and deep ſoils; for inſtance, thoſe luxuriant ſlips that are found by the ſea ſide, fens, or newly broken up grounds, where vaſt crops of it may be raiſed; hence it is, he ſuppoſes, we have heard ſuch different accounts of its produce and uſe.

It has been ſuggeſted by the author of “Practical Agriculture,” that when grown on lands that have been long in tillage, the friable, loamy kinds are found to anſwer the beſt; but that it may be grown with perfect ſucceſs on the fenny, marſhy, and other coarſe waſte lands, that have been long in the ſtate of graſs, after being broken up and reduced into a proper ſtate of preparation. As a firſt crop, on ſuch deſcriptions of lands, it is often the beſt that can be employed. When ſown on old tillage lands, the method of preparation is pretty much the ſame as that which has been given for the common turnips; the land being ploughed over four or five times, according to the condition it may be in, a fine ſtate of pulverization or tilth being requiſite for the perfect growth of the crop. In this view, the firſt ploughing is moſtly given in the autumn, in order that the ſoil may lie expoſed to the influence of the atmoſphere, till the early part of the ſpring, when it ſhould again be turned over twice, at proper diſtances of time from each other; and towards the beginning and middle of June, one or two additional ploughings ſhould be performed upon it, in order that it may be in a fine mellow condition for the reception of the ſeed. But if the ſeed be intended to be put in upon lands that are newly broken up from the ſtate of ſward, they muſt, ſays he, be rendered perfectly clean, and in a ſufficiently fine ſtate of mould for the reception of the ſeed, either by frequent ploughing in the common way, and afterwards harrowing the ſurface well by light ſhort-tined harrows, or by having recourſe to the practice of paring and burning. The laſt is by much the moſt effectual, cheap, and advantageous method, where the ſurface contains a large quantity of coarſe graſſy matter, as it can ſcarcely be reduced by any other means, without much time and trouble. This is the ſort of preparation that is generally employed when the crop is intended to ſtand for ſeed. Further, that where it is ſown on the firſt ſort of preparation, it is the beſt practice for it to ſucceed wheat or barley crops. When the former, barley and oats, with graſs ſeeds, may be put in after it, but if the latter, it may be ſucceeded to the greateſt advantage by wheat, as it is found to be not only an excellent preparation for that ſort of grain, but to afford it of the fineſt quality; and by its being taken off early, there is ſufficient time allowed for getting the land in order for the wheat crop. That where the tillage land is not in a good ſtate of fertility, manure of the ſame kind, and in the ſame proportion as for turnips, ſhould be applied, and turned in with the laſt ploughing for the ſeed.

It is ſtated in the "Eſſex Report on Agriculture," that cole ſeed is uſually prepared for by as full and complete a fallow as turnips, and no leſs quantity of manure. This, however, chiefly reſpects arable land long cultivated; but newly broken up ground, eſpecially, is found generally moſt congenial to this ſeed, and vaſtly the moſt productive. The writer ſaw a ſtriking inſtance of this. "A fine field, as to quality of ſoil, was ſown broad-caſt with cole ſeed. The greater part of it had been arable time immemorial, the remainder recently broken up. The produce of the former was only between three and four quarters an acre, the latter upwards of five."

It is found in the raiſing of this ſort of crop, ſuch ſeed as has been perfectly ripened, is quite freſh, and has a fine black colour, is to be preferred, as vegetating in the moſt perfect and expeditious manner.

The quantity or proportion of ſeed that is made uſe of is, in general, from a quarter to half a peck, according to the manner of ſowing that may be practiſed. Where the crop is intended to be conſumed as a green food for cattle, a larger proportion of ſeed may, however, be neceſſary than where the obtaining of ſeed is the chief object of the cultivator. Two quarts an acre have been mentioned by Mr. Young, but ſome, he ſays, ſow three, and he has heard of a gallon being ſown.

In the Eſſex Survey it is ſuggeſted, that "from three to four pints per acre ſhould be ſown if intended to ſtand for ſeed; but if deſigned merely for autumn, winter, or ſpring feed, more may be requiſite, and even five or ſix pints may not be too much."

The methods of ſowing are different in different caſes; but the moſt common practice is that of broad-caſting, or diſperſing it in as regular a manner as poſſible over the ſurface of the ground by the hand, covering it by means of a buſh, or other light harrow. Inſtead of this it is, however, ſometimes ploughed in, when cultivated on the more light and open kinds of ſoils, a large proportion of ſeed being allowed, and the furrows made narrow, with but little depth. In caſes of this ſort, this has been ſuggeſted by Mr. Kent as preferable to the former mode.

But the drill method has alſo been practiſed, the ſeed being depoſited, to the depth of one inch, in rows; on every other land twelve inches aſunder. The ſuperiority of this mode, over that of the broad-caſt, appears, according to Mr. Amos, to be conſiderable, as the land is capable of being kept clean with leſs difficulty and expence than in the other modes.

The author of the "Experienced Farmer," ſays, that "rape ought to be drilled in the ſame manner as peas and turnips, with the manure in the drills; and, like peas and turnips, ſhould be cleaned in the ſpring by the plough. If this is properly done, it will, he thinks, make the land equal to the beſt fallow in the kingdom. The falling of the leaves, and the ſmothering of the crop, will keep it in quite a mellow ſtate; and if the ſtraw and roots are immediately cleaned off, the ground ſcarified, and a ſufficient quantity of ſeed ſown, there will be a crop of rape, to be eaten by ſheep, between the time of reaping the rape and of ſowing wheat. This, inſtead of impoveriſhing, would improve the land in a very high degree, and intermix the manure in the beſt manner poſſible." Rape has two years rent to pay, and cannot turn out a very profitable crop, without ſome management of this ſort, but, by the method here recommended, you get a crop and a half in two years."

It has been ſuggeſted by Mr. Marſhall, as a deſirable method, to ſow the ſeed in beds, for the purpoſe of being afterwards tranſplanted into the field, and ſet out in the manner of cabbage plants. Half a rood of land, in this way, would, he ſays, be ſufficient to furniſh plants for five or ſix acres. In this manner, as well as by pulling the plants from the places where they may ſtand too cloſe in the fields, the vacancies that frequently occur in this ſort of crop, may be filled up, the work being performed by dibbles. And this Mr. Young conſiders as the Flemiſh culture.

The ſeed ſhould, he thinks, be ſown thick, the plants being ſet out on an oat ſtubble, after one ploughing.

It is, he conceives, ſo great and ſtriking an improvement of our culture of the ſame plant, that it merits the utmoſt attention; for ſaving a whole year is an object of the firſt conſequence. The tranſplanting is not performed till October, and laſts all November, if no froſt; and at ſuch a ſeaſon there is no danger of the plants not ſucceed. Earlier would, however, ſurely be better, to enable them to be ſtronger rooted to withſtand the froſts, which often deſtroy them; but the object of the Flemings is not to give their attention to this buſineſs, till every thing that concerns wheat ſowing is over. The plants are large, and two feet long; a man makes the holes with a large dibble, like the potatoe one uſed on the Eſſex ſide of London, and men and women fix the plants at 18 inches by 10 inches, ſome at a foot ſquare, for which they are paid 9 *liv. per manco* of land. The culture is ſo common all the way to Valenciennes, that there are pieces of two, three, and four acres of ſeed-bed, he ſays, often met with. The crop is reckoned very uncertain; ſometimes it pays nothing; but in a good year, up to 300 *liv.* the arpent (100 perches, of 24 feet), or 8 *l.* 15 *s.* the Engliſh acre. They make the crop in July, and by manuring the land, get good wheat.

In Eſſex "rape-ſeed," Mr. Vancouver obſerves, "is tranſplanted at twelve inches ſquare upon potatoe land, at a guinea per acre; generally ſtands for a crop, and is always found to anſwer extremely well. This practice is ſtrongly recommended where wheat ſtraw is in much demand, as the ſtraw of the rape-ſeed affords an excellent ſubſtitute for littering the ſtraw-yards, the ſheds, and the ſtall-fed cattle."

Another mode is likewiſe ſuggeſted by Mr. Marſhall, which is "the tranſplanting the whole crops, by beginning at one ſide of the field, and proceeding gradually from one land to another, till the whole is finiſhed, which would, it is believed, be highly advantageous; as in this way the land would be provided with the beſt plants, and ſuch as are of equal ſize; and by their being placed at regular diſtances, the crops would ripen in a more equal manner, while at the ſame time free admiſſion would be given to the hoe, and the intervals be kept clean by narrow horſe-hoes for the purpoſe. The work is commenced about the beginning of September or October, according to circumſtances, in which the plough is made uſe of, the plants being placed by women in a leaning poſition in every ſecond furrow, about a foot apart, and the roots covered by the next furrow, after which another is added, and more plants placed in as before, proceeding in the ſame manner till the whole is finiſhed. The plants, of courſe, ſtand about the diſtance of eighteen or twenty inches by twelve. Where land that has been pared or burned, is managed in this way, it is adviſed that the firſt, or ſeed-ploughing, ſhould be in a croſs direction; and that for tranſplanting lengthways, in order to render the land dry in the winter ſeaſon.

It may be obſerved, however, that theſe latter methods of managing theſe crops appear better adapted for ſuch as are deſigned for ſeed, than for thoſe intended as green food for live-ſtock; as, by the perfect culture, that may be thus given them, and the uſe of manure, the inconveniencies attending the feeding of rape crops, may, perhaps, in a great meaſure, be obviated.

And it is ſuggeſted, that when cultivated for uſe as a green food, the ſeed ſhould probably be ſown more early than where the crop is to ſtand for ſeed, or be employed in both ways, but ſufficiently early to get a ſtrong leaf without running to ſtem the firſt autumn. The middle of June and the laſt week in July may, it is ſuppoſed, be the moſt proper periods. Mr. Young remarks, that, when for ſheep-feed, the crop is ſown all through theſe months, but, for ſeed, the firſt week in Auguſt will do.

Where, however, the plant is cultivated merely for the ſeed, it is moſtly ſown on ſuch lands as have been newly broken up, either by paring and burning, or ſome other ſimilar means, about July or Auguſt. But when it is to be made uſe of as a winter and ſpring food for animals, the land is prepared as above, and the ſeed ſown about the ſame time as that of the turnip.

In reſpect to the after culture of crops of this ſort, it ſhould always be well attended to, in order that large ſtems may be produced. It is adviſed by ſome that the crop ſhould be kept perfectly clean by means of hand and horſe-hoeing, a practice which is not, however, by any means general among the cultivators of this kind of produce. It is, indeed, ſuppoſed by ſome farmers, who are in the habit of cultivating this plant, that it would anſwer well, and pay for the labour and trouble of having the young plants tranſplanted from a ſeed-bed, as above; a very ſmall bed, or portion of ground, being ſufficient to ſupply the neceſſary quantity of plants. By adopting this method, and ſetting them out upon ridges, as practiſed in ſome places for turnips, having a proper allowance of manure and ſuitable hoeing, the general complaint againſt the cultivation of this plant for ſeed might, it is thought, be obviated, as it is probably the weedy and ſlovenly ſtate in which the crop is ſuffered to remain that renders it more exhauſting than many other ſimilar crops. In whatever way the cultivation may be attempted, it is evident that the land cannot be too mellow or too much pulverized, for the growth of the cole-ſeed plant; as it not only requires a rich ſoil, but alſo that it be in excellent tilth.

In the caſes of broad-caſt ſowing, where the culture of the crops is afterwards attended to, it is ſuggeſted as the practice of ſome farmers, after the plants have attained two or three inches in height, put out ſix leaves, and begun to ſpread and ſhew themſelves perfectly above ground, to hoe them over by means of a hand-hoe, ſomewhat ſmaller than that employed for turnip crops, ſetting the plants out to the diſtances of from ſix to eight or nine inches from each other, according to their vigour or ſtrength, and the fertility of the ſoil. This is the only hoeing that is in general given; but in many caſes, as where the land is poor and diſpoſed to throw up weeds, much advantage may be derived from a repetition of the operation, not only in cleaning the ground, but promoting the growth of the plants, by ſtirring the mould round them. This ſhould be done about a month or five weeks after the firſt hoeing. The expence of performing the work once is moſtly from about ſix to ſeven or eight ſhillings the acre. But that in the row method of cultivation, whether by drilling the ſeed, or tranſplanting the young plants, the buſineſs of hoeing may be performed in a more perfect and cheap manner, on account of the great diſtances of the plants admitting the earth in the intervals to be ſtirred by the plough or horſe-hoe, while hand-labour becomes only neceſſary between them in the rows. In this way a garden cleanneſs may be preſerved in ſuch field crops at no great expence.

It is ſtated, in the "Report of Eſſex," that in the rich diſtrict of Rochford hundred, they have immenſe crops of cole, and they are admirable farmers in the management of it. Some crops of Mr. Wright's, at the Hall, are exceedingly fine ploughed for ſeven times, manured with twenty loads an acre of dung, and all hoed out (though not for ſeed) to a foot aſunder: this incomparable management, which ſtretches away ſo far beyond the common practice of the kingdom, produces, the writer ſays, *ſtalk*, which is the great value of cole; and on this fine land that ſtalk is as brittle as glaſs, the ſure proof of a feeding property. Theſe crops are mown with a ſtrong ſcythe made on purpoſe, and carted to the farm-yard to feed bullocks, which it fattens better than any other food produced by the farm; ſome alſo ſcatter them on dry paſtures for fattening ſheep. In Lincolnſhire, he remarks, they know the value of cole, but none is hoed. And Mr. Prentice, of Prittlewell, is largely in this huſbandry, and his crops very fine. He is very careful in the hoeing, as he conceives that great virtue is in the ſtalks; he gets ſtalks as large as his wriſt, and theſe are more forcing to a bullock than turnips: this is the object that makes hoeing ſo profitable. They are mown and carried to bullocks in yards. He finds oats are as good after cole as after turnips; but a clear fallow will give more than either. He has fed part of a field on the land and mown part, the oats were a little better after feeding. Mr. Vaſſall, of Eaſtwood, is alſo ſo well convinced of the great value of the ſtalk, that he does not mow but ſpeeds up to get more, and every atom is eaten by ſheep. And ſeveral other cultivators in the ſame diſtrict find great advantage from hoeing and keeping the crops clean.

By ſome it is thought, that where theſe ſorts of crops are conſumed in their green ſtate on the ſoil, they may be equally beneficial to the landlord and his tenant; but it is ſuggeſted in the "Agricultural Survey of the county of Middleſex, that, ſuffering them to perfect their ſeed, would be putting a conſiderable ſum of money into the pocket of the tenant at the certain expence of the landlord."

And it is obſerved by Mr. Donaldſon, that where this kind of crop is cultivated for ſeed, great care ſhould be taken that it be not allowed to remain too long uncut; as, in that caſe, it is very apt to ſhed its ſeeds. As ſoon as the pods begin to aſſume a browniſh colour, it ſhould be reaped, and laid carefully in the ground, where it ought to remain, without moving, till it be ready for thraſhing. This is aſcertained by the ſtraw or ſtalks becoming white, and the ſeed, when rubbed out, appearing black. It ſhould always be thraſhed out on the field on which it grows, as it is almoſt impoſſible to remove it any diſtance, without ſhaking out a great part of the ſeed. The operation is uſually performed on large cloths, about twenty yards ſquare; and, in order to do it expeditiouſly, a great number of hands are commonly employed.

Mr. Young has remarked, that crops of rape or cole-ſeed are extremely different, uncertain, and liable to numerous accidents. "They muſt," ſays he, "be conducted with great ſpirit, or the loſs will probably not be ſmall. The principal point is to make good uſe of fine weather; for, as they muſt be thraſhed as faſt as reaped, or at leaſt without being houſed or ſtacked like other crops, they require a greater number of hands in proportion to the land, than any other part of huſbandry. The reaping is very delicate work; for, if the men are not careful, they will ſhed much of the ſeed. Moving it to the thraſhing-floor is another work that requires attention; the beſt way is to make little waggons, on four wheels, with poles, and cloths ſtrained over them: the diameter of the wheels about two feet; the cloth-body five feet wide, ſix long, and two deep, and drawn by one horſe; the whole expence not more than 30 or 40*s*." He has, in large farms, ſeen ſeveral of theſe at work at a time in one field. The rape is lifted from the ground gently, and dropped at once into theſe machines without any loſs; they carry it to the thraſhers, who keep hard at work, being ſupplied from the waggons as faſt as they come, by one ſet of men, and their ſtraw moved off the floor by another ſet; and many hands of all ſorts being employed, a great breadth of land is finiſhed in a day. Some uſe ſledges prepared in the ſame way. All is, he ſays, ſtopped by rain, and the crop much damaged; it is therefore of very great conſequence to throw in as many people as poſſible, men, women, and boys, to make the greateſt uſe of fine weather.

The author of the "Rural Economy of Yorkſhire" has obſerved, that a public rape thraſhing, conducted as it is in the vale diſtrict of this county, is one of the moſt ſtriking ſcenes which occur in the field of rural practice. "Contending armies," ſays he, "can ſcarcely exhibit to the diſtant eye, greater tumult; nor can the parade boaſt of better diſcipline, than may ſometimes be obſerved in a well-conducted rape-thraſhing.

"If the quantity to be thraſhed be large, as 20 or 30 acres, the whole country, for many miles round, are collected. The days of thraſhing are conſidered as *public days*; the lord of the harveſt keeping *open field*, for all who chooſe to enter; ample proviſion of meat and drink being made for this purpoſe. A wake or a fair is not a ſcene of greater jollity.

"It is not common, however, for unbidden gueſts to go to theſe rural meetings, without aſſiſting, or at leaſt offering their ſervices to aſſiſt, in forwarding the buſineſs of the day. But to make ſure of hands for the more laborious departments, men and women are previouſly retained with wages, over and above the ſpoils of the feaſt.

"Alſo previous to the day of thraſhing, a "rape-cloth," "carrying cloths," and other neceſſaries, are to be provided. The cloths are in the hands of a few men who let them out at ſo much a day, or ſo much an acre. A rape-cloth of the largeſt ſize meaſures twenty yards ſquare, weighing more than half a ton weight. Heſſen is the uſual material of which it is made. The hire of ſuch a cloth is 15*s*. a day.

"Alſo, before the thraſhing, the rape and the ſtubble are to be cleared away from the place, or places, (if the piece be large) where the thraſhing-floor is to be made, the clods being taken off, and the hollows filled up where the cloth is intended to be laid.

"The buſineſs of the day is thus conducted: the men are divided into carriers, thraſhers, and floor-men. Women fill the carrying-cloths, and boys hold them while filling. Theſe cloths are made of canvaſs, about ſix feet ſquare, with poles fixed on two oppoſite ſides, in the manner of a rolling map; openings being left in the middle between the poles and the canvaſs, for two men to run their arms through, one on either ſide the poles, reſting by them on the men's ſhoulders; the cloth filled with rape hanging between them. In theſe cloths the whole of the crop is carried to the thraſhing-floor.

"The floor-men are divided into layers-on, turners, takers-off, rake-men, riddlers, &c. &c. &c.

"The rape to be thraſhed is ſpread thin upon the cloth, in a circle as large as the cloth will contain.

"The thraſhers move continually in this ring; marching with a ſlow ſtep, in pairs and in two diviſions; the individuals of each diviſion following one another, as cloſely as the nature of their employment will allow them.

"The firſt diviſion are preceded by the layers-on, and followed by the turners, and cloſe upon the rear of the ſecond diviſion follow the takers off, who, with wooden tined forks, ſhake and throw off the ſtraw, which is piled in heaps by others, with longer implements.

"Finally, the rake-men run off the ſeed with the ends of their rakes thruſt before them, forcing the ſeed into receſſes formed within the ring, or upon the corners of the cloth; where groups of fillers, riddlers, &c. &c. are employed in ſeparating the ſeed from the principal parts of the pods and ſhort ſtraws which are beat off in thraſhing; while others are equally buſy in putting the unwinnowed ſeed into bags, and carrying it to the *pie* of the waggon.

"Toward the cloſe of the day, when the ſtraw has riſen in mountain piles of almoſt ſilver brightneſs; when the field of employment appears on its largeſt ſcale; when every department is in full work; and when every individual is animated, and not yet ſatiated with the entertainments of the day, the rape-thraſhing affords the contemplative mind a pleaſing ſight, and would afford the pencil a pictureſque ſubject.

"The two diviſions of thraſhers, moving in cloſe phalanx, with flails nimbly brandiſhing, ſometimes in open view, ſometimes partially hid among the piles of ſtraw; the cloth-men, buſy and attentive to their various employments; the team drawing off the loaded ſeed; the carriers, from every hand, preſſing to the thraſhing-floor, with their ſeemingly cumbrous loads, and the diſtant groups of fillers, ſcattered on every ſide of the foreground; could not, he thinks, fail of affording matter intereſting to the painter; eſpecially in a country where a ſuitable offscape is ſeldom wanting.

"It were almoſt a pity, ſays he, that a ſcene, at once ſo picturesque and ſo truly ruſtic, ſhould ſink into oblivion, as in all probability it will, in a ſhort courſe of years. A more frugal management is growing into eſteem, and it is highly probable that, in a few years, public rape-thraſhing will be diſcontinued, and in a few years more be forgotten."

The ſeed of this ſort of crop is, likewiſe, ſometimes cleaned in the field, and put into ſacks for the market. But where large quantities of ſeed are brought quickly together, as they are liable to heat and become mouldy, it may be a better method to ſpread them out thinly over a barn, granary, or other floor, and turn them as often as neceſſary. It is ſtated, that the method of binding crops of this kind in ſmall ſheaves, and ſtacking them in the field, is now much adopted. The barn ought, however, to be preferred.

In reſpect to the expences of the different operations, ſuch as reaping, turning, thraſhing, dreſſing, and depoſiting the ſeed in bags, they may, in general, be eſtimated at from 30*s.* to 40 or 50*s.* the acre.

The produce is various, according to the difference of culture which the crop has undergone, and the manner in which it has been managed in procuring the ſeed.

It is further ſtated by the author of "Modern Agriculture," that cole, on which ſheep have been folded, is in many places allowed to ſtand afterwards to perfect its ſeed:—A practice which cannot however be recommended, except in caſes where it has been ſlightly eaten off. This is particularly the caſe, he ſays, in Northamptonſhire, as is evident from the following paſſage in the report of the preſent ſtate of agriculture in that diſtrict. "Cole, or rape, is cultivated as a ſpring food for ſheep. The ſheep are folded in the ſame manner, as on rye and turnips, and continue till about the end of February. If the winter be favourable, and not very wet, the cole is ſometimes allowed to ſtand for ſeed, when thirty buſhels, on an average, are produced on the acre. In Eſſex on a medium of the county, Mr. Vancouver ſtates the produce to be twenty-nine buſhels the acre. But in the pariſh of Bradwell, it is ſet by Mr. Dudley at thirty-four. And at Spaines Hall, in the largeſt crops, and beſt ſeaſons, it riſes to five, and even ſix quarters the acre. Others under theſe laſt circumſtances have found the produce forty or fifty buſhels or more per acre. And Mr. Marſhall conſiders it on the whole, as one of the moſt profitable crops in farming. On cold unproductive old paſture lands, there have, ſays he, been inſtances in which the produce of the rape crop has been equal to the purchaſe value of the land. The ſeed is uſually diſpoſed of by the laſt of ten quarters, for the purpoſe of having oil expreſſed from it, by mills conſtructed for the purpoſe. But it is an article which varies very much in price, as from 18 to 35*l.* the laſt. As there are ten quarters, or eighty buſhels, in a laſt, the price of this ſeed may be ſaid to vary from 4*s.* 6*d.* to 8*s.* 9*d.* the buſhel, according to the prices above mentioned; and from 6*l.* 15*s.* to 13*l.* 2*s.* 6*d.* by the acre; average, 9*l.* 18*s.* 9*d.* Cole, when it thrives, and the ſeeds are well preſerved, is, Mr. Donaldſon thinks, one of the moſt profitable crops known in this country. It is, however, at the ſame time extremely precarious; being, like turnips, very liable to be deſtroyed by ſwarms of flies and inſects. And from what has been obſerved above, it is obvious, that uncommon care and attention are neceſſary in harveſting this ſort of crop. If it be not cut down at the proper time, or if a long continued fall of rain ſhould happen immediately afterwards, the crop is in great danger of being entirely loſt.

The great application of this crop is, however, as a green food in the feeding of cattle and ſheep. And it has been obſerved, that where it is to be conſumed in this way, the crop will, in general, be ſufficiently advanced for the purpoſe, if there ſhould be a neceſſity for it, towards the latter end of November; but, except where the ſeed is to be afterward taken, it is probably a much better practice to reſerve it as feed in the ſpring months. When cut or fed down in the autumn, the plants moſtly advance ſo in the ſpring as to form a ſecond crop in April. But in this method of feeding off the crop, care ſhould be taken that the plants are not pulled up and deſtroyed by the animals being confined too long upon them at a time.

In its uſe for ſheep it is ſcarcely ſurpaſſed by any other vegetable, in ſo far as reſpects its nutritious properties, and thoſe of being agreeable to the taſte of the animals; but in quantity of produce, it is inferior to both turnips and cabbages. In this uſe, the crops are fed off occaſionally, from the beginning of November to the middle of April; being found of great value in the firſt period, in fattening dry ewes, and all ſorts of old ſheep, and in the latter, for ſupporting ewes and lambs. The ſheep are folded upon them in the ſame manner as practiſed for turnips, in which way they are found to pay from 50 to 60*s.* the acre, that quantity being ſufficient for the ſupport of ten ſheep, for ten or twelve weeks, or longer, according to circumſtances. And it has been found by experience to be ſuperior to turnips in fattening, and in ſome caſes, even to be apt to deſtroy them by its fattening quality. In the ſurvey of Lincolnſhire, it is likewiſe ſtated, that the crop which is grown on freſh land has the ſtem as brittle as glaſs, and is ſuperior to every other kind of food in fattening theſe animals; while in that produced on old tillage, the ſtem is tough and wiry, and has but little proof in it.

In Eſſex this crop is alſo ſometimes ſown for feeding off with ſheep, and alſo for ploughing in for manuring the land. And other farmers are largely in the ſyſtem of ſowing cole crops to be fed off the ſame year, for wheat, feeding them off in September for that purpoſe, by weaned calves, and fattening ſheep and lambs, &c. One intention beyond the mere value of the food is that of treading and conſolidating the land, as a preventative to the ravages of the wire worms.

As a winter and ſpring food for ſheep, it is therefore almoſt indiſpenſible. It is evident, however, Mr. Donaldſon thinks, that the cultivators of cole, in order to turn the crop to the greateſt poſſible advantage, ſhould always keep in view the double purpoſe to which it may be applied. By feeding it off ſlightly with ſheep in the early part of winter, the following crop is not materially injured; ſo that, while a conſiderable ſupply of winter food is procured, the return of cole ſeed by the acre, may not be greatly, if at all diminiſhed: and this, therefore, of all others, ſeems the moſt profitable mode of management.

But though for ſheep this is a very fattening ſort of food, highly productive of milk, and much reliſhed by them; it muſt be given to cattle with proper caution, as it is apt to hove and burſt them in the ſame manner as clover. When it ſucceeds, the produce of green feed in the ſpring is conſiderable; but where afterwards ſhut up for ſeed, the quantity cannot however be expected ſo large as where it is reſerved entirely for that purpoſe. As a winter and ſpring food, it is worth from about forty ſhillings, to three or four pounds per acre, for two or three months in the ſpring ſeaſon; for which time, an acre may carry from ſeven or eight, to ten large ſheep, according to circumſtances. The haulm of this plant is frequently burned; and in ſome places the aſhes, which are equal to pot-aſh, are ſold; by which practice, if no manure be ſubſtituted, the ſoil muſt be greatly deteriorated. It is ſuggeſted by Mr. Marſhall, that the value of the ſtraw to cattle in winter is very conſiderable. The *ſlover* (pulls and points broken off in threſhing) is as acceptable as hay, and the tops are eaten with an avidity nearly equal to cut ſtraw, better than wheat ſtraw. When well got the ſmaller butts will be eaten up clean. The offal makes excellent litter for the farm yards, and is uſeful for the bottoms of mows, ſtacks, &c. It is a cuſtom, in Lincolnſhire, ſometimes to lay their lands down with cole, under which the ſeeds are found to grow well. But this ſort of crop, as has been already obſerved, is moſt ſuited to freſh broken up, or burned lands, or as a ſucceſſor to early peaſe, or ſuch other green crops as are mowed for ſoiling cattle. The culture of theſe crops for ſeed has been much objected to by ſome, on account of the great degree of exhauſtion of the land that it is ſuppoſed to produce, but where it is grown on a ſuitable ſoil, and preparation, with proper attention in the after culture; and the ſtraw and offal inſtead of being burnt, as in the common practice, are converted to the purpoſes of feeding and littering cattle; it may, in many inſtances, be the moſt proper and advantageous crop that can be employed by the farmer. This is a kind of plant which is ſometimes alſo known and cultivated under the name of rape. See RAPE.

COLE-*Seed*, in *Agriculture*. a name by which the above ſort of crop is ſometimes cultivated, eſpecially when the ſeed is the principal object. See RAPE.

COLE-*Fiſh*, more properly COAL-*Fiſh*, in *Ichthyology*, the name by which the gadus carbonarius is known in England. In Cornwall it paſſes under the name of the *Rawlin Pollack*. See GADUS *Carbonarius*.

COLE-*Mouſe*, in *Ornithology*, a ſpecies of *Parus*. See ATER.

COLE-*Pearch*, in *Ichthyology*, a name given to a ſmall fiſh, much eſteemed about Dantzick and other places, for its delicate flavour. It is very like the common river pearch, but it does not grow ſo large, and has a greater variety of colours, and its head is proportionably larger. Phil. Tranſ. N° 83.

COLE-*Seed*, in *Botany*. See BRASSICA *Napus*.

COLEBROOK, in *Geography*, a townſhip of America, in the northern part of New Hampſhire and Grafton county, ſeated on the eaſt bank of Connecticut river, oppoſite to the Great Monadnock, in Canaan, and ſtate of Vermont; joining Cockburne on the ſouthward and Stuartſtown on the northward; 126 miles W. by N. from Portſmouth.—Alſo, a rough, hilly townſhip on the north line of Connecticut, in Litchfield county; 30 miles N.W. of Hartford city. It was ſettled in 1756. It has two iron-works, and ſeveral mills, on Still river, and N.W. water of Farmington river.

COLEBROOKE-*Dale*. See COALBROOK-DALE.

COLEFORD, a ſmall town of Glouceſterſhire, England; though poſſeſſing the privilege of a weekly market on Tueſdays, it is only a chapelry to Newland, a village in its vicinity. The original charter for this market was granted by king James I. In the time of the civil wars between king Charles and his parliament, this market-houſe, with ſome other buildings, ſuffered from a ſkirmiſh that took place in this town, when Sir Richard Lawdy, the major-general of South Wales, and ſeveral officers were killed. A new market-houſe was built in 1679, towards the expence of which Charles II. contributed 40*l.*; queen Anne gave towards rebuilding the chapel, which had ſuffered at the ſame time, 300*l.* The houſes of this town are ranged moſtly in one wide ſtreet. Coleford is 124 miles N. W. from London. This town is ſituated at the edge of the Foreſt of Dean, within a few miles of the navigable river Wye, and near to the tract of the once propoſed Dean Foreſt Rail-way, See CANAL. Rudder's Hiſtory of Glouceſterſhire, 2 vols. folio. Rudge's ditto, 2 vols. 8vo.

COLENDA, in *Ancient Geography*, a town of Spain, which was taken, according to Appian, by Titus Didius after a ſeven months ſiege. It is the preſent *Cavarruvias*.

COLENET, or COLNETT *Cape*, a cape on the N.E. coaſt of New Caledonia. N. lat. 20° 30′, E. long. 162° 56′.

COLENETO, in *Geography*, a river of Naples, which runs into the gulf of Tarento, four miles E. of *Roſſano*.

COLENICUI, in *Ornithology*, the name given by Buffon to the *Louſiane* quail, *tetrao Mexicanus*, called alſo Colcuicuiltu. Hern.

COLENTUM, in *Ancient Geography*, a town of the iſland of Scardona, on the coaſt of Liburnia, forming part of Illyria.

COLEOPTERA, in *Entomology*, an order of the Linnæan ſyſtem, comprehending ſuch inſects as have four wings, the upper pair of which are cruſtaceous and divided by a ſtraight ſuture. The word is derived from κολεὸς, a *ſheath*, and πτερὸν, a *wing*. See ENTOMOLOGY.

COLERAIN, in *Geography*, a townſhip of America, in the ſtate of Pennſylvania, and county of Lancaſter.—Alſo, a town on the north bank of St. Mary's river, in Camden county, Georgia. By a treaty concluded at this place in 1796, between the United States and the Creek nation of Indians, the line between the white people and the Indians was eſtabliſhed to run from the Currahee mountain to the head or ſource of the main ſouth branch of the Oconee river, called by the white people, Appalatohee, and by the Indians, Tulapocha, and down the middle of the ſame. Liberty was alſo given by the Indians to the preſident of the United States to eſtabliſh a trading or military poſt on the ſouth ſide of Alatamaha, about a mile from Beard's Bluff, or any where from thence down the river, on the lands of the Indians; and the Indians agreed to annex to the ſaid poſt a tract of land five miles ſquare; and in return for this and other tokens of friendſhip on the part of the Indians, the United States ſtipulated to give them goods to the value of 6000 dollars, and to furniſh them with two blackſmiths, with tools.

COLERAINE, a townſhip of America in the ſtate of Maſſachuſetts and county of Hampſhire, containing 229 houſes, and 1417 inhabitants.

COLERAINE, a market, poſt, and borough town of the county of Londonderry, Ireland, ſituated on the river Bann, about three miles above its mouth. It was anciently a great place of note, being the chief town of a county erected by ſir John Perrot, during his government of Ireland; and on the ſettlement of the preſent county of Londonderry, it gave name to a barony, and had a conſiderable tract of land attached to it under the government of its corporation, called the *Liberty of Coleraine*. It is one of the Iriſh boroughs deemed of ſufficient importance to ſend a repreſentative to the parliament of the United Kingdom. It is of a tolerable ſize, and contains nearly 4000 inhabitants. The port is indifferent, occaſioned by the extreme rapidity of the river, which repels the tide and makes the coming up to the town difficult; yet it has no inconſiderable trade in imports, and it exports ſome butter and hides, beſides large quantities of ſalted ſalmon. In 1801, the average annual duties of this port exceeded 6000*l.*, and they have ſince increaſed. There has lately been a conſiderable importation of old drapery, but this will be prevented in future, having been diſcovered to be of a fraudulent nature. Many plans for the improvement of the port and town, by making a canal to the ſea, by opening the navigation of the Bann, and removing the ridge of rocks above the town, have been ſuggeſted, but none of them have been carried into effect. The fine ſalmon fiſheries above and below the town have engaged the notice of travellers. Mr. Young gives the following account of it. "The ſalmon ſpawn in all the rivers that run into the Bann about the beginning of Auguſt, and as ſoon as they have done, ſwim to the ſea, where they ſtay till January, when they begin to return to the freſh water, and continue doing it till Auguſt, in which voyage they are taken; the nets are ſet the middle of January, but by act of parliament no nets or weirs can be kept down after the 12th of Auguſt. All the fiſheries on the river Bann let at 6000*l.* a-year. From the ſea to the rock above Coleraine, where the weirs are built, belongs to the London companies; the greateſt part of the reſt to the marquis of Donegal. The eel fiſheries let at 1000*l.* a-year, and the ſalmon fiſheries at Coleraine at 1000*l.* The eels make periodical voyages as the ſalmon, but inſtead of ſpawning in the freſh water, they go to the ſea to ſpawn, and the young fry return againſt the ſtream; to enable them to do which with greater eaſe at the leap, ſtraw ropes are hung in the water for them; when they return to the ſea they are taken: many of them weigh 9 or 10 lbs. The young ſalmon are called *grawls,* and grow at a rate which, I ſhould ſuppoſe, ſcarcely any fiſh, commonly known, equals; for within the year ſome of them will come to 16 and 18 lbs. but in general 10 or 12 lbs.; ſuch as eſcape the firſt year's fiſhery are *ſalmon,* and at two years old will generally weigh from 20 to 25 lbs. This year's fiſhery (1776), has proved the greateſt that ever was known, and they had the largeſt hawl, taking 1452 ſalmon at one drag of one net. I had the pleaſure of ſeeing 370 drawn in at once. They have this year taken 400 tons of fiſh; 200 ſold freſh at 1½*d.* a pound, and 200 ſalted at 18*l.* and 20*l.* per ton, which are ſent to London, Spain, and Italy. The fiſhery employs 80 men, and the expences in general are calculated to equal the rent." Mr. Sampſon obſerves, that the fiſh moſt eſteemed are thoſe which weigh from 16 to 20 lbs.; and that the grawls are reckoned one penny a pound inferior to ſalmon. He alſo mentions that the price of ſalmon has riſen to 4*d.* and 5*d.* per lb. principally in conſequence of a communication with the Liverpool market by means of faſt ſailing ſmacks. The linen manufacture is carried on extenſively; and Coleraine gives name to a particular kind of linen made and ſold in this town and the neighbouring ones, which is ⅞ths wide. Coleraine is 114 Iriſh miles (145 Eng.) N. from Dublin, W. long. from Greenwich 6° 30′, N. lat. 55° 8′. Beaufort, Young, Sampſon, &c.

COLESHILL, a town in Warwickſhire, England, was a royal demeſne, held by Edward the Confeſſor, and William the Conqueror, in whoſe reign, or that of his ſucceſſor, it paſſed to the Clintons, from whom it went to ſir John de Mountfort, in conſequence of his marriage with Joan, daughter of ſir John Clinton, in the year 1353. The manor remained in the family of Mountfort till the reign of Henry VII., when ſir Simon Mountfort, deceived by the pretenſions of Perkin Warbeck, with a belief that he really was the ſon of Edward IV., unfortunately ſent the impoſtor 30 *l.* by his youngeſt ſon, Henry; he was ſoon afterwards apprehended, on a charge of aiding Warbeck, tried at Guildhall, London, in 1494, and ſubſequently hanged and quartered at Tyburn. The manor of Coleſhill was immediately granted to Simon Digby, deputy conſtable of the caſtle, who had brought ſir Simon Mountfort to the bar; from him the manor deſcended to the preſent poſſeſſor, the lord Digby. The town is ſituated on a hill of conſiderable height, in the neighbourhood of rich meadows, watered by the Cole, and is adorned by the vicinity of beautiful hanging woods, to which its handſome church and lofty ſpire form a moſt pictureſque addition; the view from the churchyard is equally attractive; but the town includes nothing worthy of notice, except a place neatly built. The church contains many ancient and intereſting monuments, particularly two arches, under which are the effigies of two knights, cruſaders, one of which is aſcertained by Dugdale to have been John de Clinton, who died in 1291. The tomb of Simon Digby, erected by himſelf, previous to his deceaſe in 1519, ſupports the effigies of him and his wife, Alice. This lady left a ſingular bequeſt, of a ſilver penny to every child under nine years of age (whoſe parents were houſekeepers within the pariſh), who ſhould kneel at the altar, every day, after the ſacring of the high maſs, and there ſay five paternoſters, an ave, and a creed, for the ſouls of herſelf, her huſband, and all Chriſtian ſouls. The inhabitants, aware of the ſalutary conſequences to early youth, ariſing from this bequeſt, purchaſed the lands charged with the payment, after they had devolved to the crown by the diſſolution of chantries, part of the rent of which is now diſtributed to thoſe children who attend at church every morning at 10 o'clock, and there ſay the Lord's prayer, and part maintains a ſchool. There are, beſides, handſome tombs to the memory of ſeveral other of the family of Digby, whoſe deſerted ſeat, named Coleſhill-hall, of antique architecture, ſtands in a fine park near the town. About a mile below Coleſhill, is Blithe-hall, ſo termed from its ſite on the river Blithe, once the reſidence of the great and excellent antiquary, ſir William Dugdale, where there are many valuable portraits, but none more ſo than that of ſir William by Boſſeler, painted in 1665.

COLET, John, in *Biography,* well known as the founder of St. Paul's ſchool, London, and one of the revivers of ancient literature in England, was the eldeſt ſon of ſir Henry Colet, knight, an opulent tradeſman, who was twice lord mayor of London. He was born in the pariſh of St. Antholin's in the city, in the year 1466, and although it does not appear at what ſchool he received his elementary inſtruction, or at what college at Oxford he was entered, yet it is certain he ſpent ſeveral years at that univerſity, where he took his degrees in arts in 1490. Afterwards he travelled for improvement in France and Italy, where he reſided about four years. During this period, he diligently cultivated the acquaintance of thoſe perſons, whether foreigners or his own countrymen, who were moſt eminent for literary attainments, and embraced every opportunity of ſtudying the Greek language, which, at this time, was but imperfectly taught in our univerſities; and in which he had made, at home, but a ſlender proficiency. While abroad Mr. Colet employed his time in reading the beſt ancient fathers, and in the ſtudy of eccleſiaſtical hiſtory. Notwithſtanding his abſence, he was preſented at different times to valuable preferments in the church of England, though he had not even taken orders. On his return to his own country in 1497, he received firſt deacon's and afterwards prieſt's orders; and then retired to Oxford, that he might purſue his theological ſtudies without interruption. There he read lectures gratis on St. Paul's epiſtles, and contracted an acquaintance with the learned Eraſmus, which grew into an intimacy and friendſhip of the cloſeſt kind. In his lectures he exhibited much learning; and in his expoſition of the ſcriptures he not only expoſed the corrupt notions of the ſchoolmen, but ſhewed a fearleſs integrity in avowing his own ſentiments. This open and manly conduct procured him a high degree of celebrity, which was followed by new preferments in the church. He was ſucceſſively preſented to a prebend in the church of Sarum; to another in St. Paul's; and, through the favour of the king, was made dean of that church. He introduced the practice of preaching and expounding the ſcriptures, and eſtabliſhed a lecture in St. Paul's church, which is ſuppoſed to have made way for the reformation. The freedom of his diſcourſes, the reform which he introduced into the cathedral church; the contemptible light in which he held out the conduct of the monaſtic orders, and his open enmity to the ſuperſtitions and corruptions of the church, afforded his enemies an opportunity of accuſing him of hereſy. He was, however, protected by the archbiſhop Warham, and favoured by Henry VIII.; and by their means enabled to triumph over his opponents, and to perſevere in his various undertakings.

About the year 1508, he formed his plan for the foundation of St. Paul's ſchool, which he completed in the ſpace of four years, and endowed with eſtates to a conſiderable amount. Here the Greek language was firſt publicly taught; and in this excellent inſtitution have been educated many of the moſt diſtinguiſhed characters that have adorned our country. The celebrated William Lilly was the firſt high maſter in dean Colet's ſchool; and the Mercers' company were appointed truſtees for the management of this important national concern. This foundation conſtitutes an æra in the hiſtory of Engliſh literature, and merits the grateful regards of every friend to ſound learning. A few years after he had completed the eſtabliſhment of the ſchool, the dean built a handſome houſe near the palace of Richmond, Surrey, where he meant to retire in old age, that he might receive and enjoy the ſociety of his friends. He died, however, before he could realize his intentions, in September, 1519, in the fifty-third year of his age, and was buried on the ſouth ſide of the choir of St. Paul's; over his grave is a ſtone, with the inſcription of "John Colet" only: his meritorious deeds ſpeak more to his praiſe than the proudeſt monuments of braſs or of ſtone. The perſon of dean Colet was tall, handſome, and manly. His manners were conciliating, but his temper was very iraſcible; and to obtain a command over himſelf, he practiſed much abſtemiouſneſs, and frequent faſtings, beſides making uſe of all the motives that religion and philoſophy could ſuggeſt. His attachment to literature was ardent; and his public ſpirit can never be forgotten ſo long as learning is valued. Though a papiſt, he was an enemy to the groſs ſuperſtitions of the church of Rome. He diſapproved of auricular confeſſion, the celibacy of prieſts, and thoſe other tenets that have been generally condemned by men of ſound judgment in every age and country.

By one of his biographers, it is obſerved, that "no higher teſtimony need be given of the merit of dean Colet, than his great intimacy with Eraſmus. There was a ſimilitude of manners, of ſtudies, and of ſentiments in religion, betwixt theſe illuſtrious men, who ventured to take off the veil from ignorance and ſuperſtition, and expoſe them to the eyes of the world; and to prepare men's minds for the reformation of religion, and the reſtoration of learning. Eraſmus, who did him the honour to call him maſter, has given us a hint of his religious ſentiments, in his colloquy entitled "Peregrinatio Religionis ergo," in which Colet is the perſon meant, under the name of Gratianus Pullus."

Colet was not diſtinguiſhed as an author, but we have his "Rudimenta Grammatices:" "The conſtruction of the eight parts of ſpeech;" and ſome religious tracts. He left alſo a convocation ſermon in Latin, of which there is a tranſlation in the firſt volume of the Phœnix, and Epiſtolæ ad Eraſmum, and other treatiſes which ſtill exiſt in manuſcript. Biog. Brit. Granger.

COLETON, in *Geography*, a hamlet of King's Ware, in Devonſhire, near to the Froward point at the entrance of the navigable river Dart, (ſee Canal) where there is a naval flag-ſtaff, whoſe ſituation was determined in the Government Trigonometrical Survey in 1795, by an obſervation from Butterton ſtation, diſtant 87,314 feet, and bearing 75° 0′ 28″ N.W. from the parallel to the meridian of Butterton; and from Furland ſtation diſtant 8593 feet; whence is deduced its latitude 50° 21′ 2.″3 N. and its longitude 3° 31′ 11″.2, or 14^{m} $4^{s}.7$ W. of Greenwich.

COLEWORT, in *Botany*. See Brassica *Oleracea*.

Colewort, in *Agriculture*, a plant of the cabbage kind, which was formerly much more cultivated in the field than at preſent, cabbage plants being ſubſtituted in its room. It might, however, be a very uſeful plant for feeding milch cows or other cattle, in the ſpring, when there is a ſcarcity of green food, as it is ſo hardy that the froſt does not deſtroy, or in the leaſt injure its growth.

The moſt advantageous method of cultivating this plant in the field, is that of ſowing the ſeeds about the beginning of July, chooſing a moiſt ſeaſon, by which the plants may be brought up in about ten or fourteen days. The quantity of ſeed which is neceſſary for an acre of land is generally about nine pounds. When the plants have got five or ſix leaves, they ſhould be hoed in the ſame manner as turnips, cutting down all the weeds from among them; and alſo thinning out the plants where they are too thick; but they ſhould be kept thicker than turnips becauſe they are in more danger of being deſtroyed by the fly. This work ſhould be performed in dry weather, that the weeds may be killed. About ſix weeks after this, the plants ſhould have a ſecond hoeing; which, if carefully performed in dry weather, will entirely deſtroy the weeds, and make the ground clean, ſo that they will require no farther culture. In the ſpring they may either be drawn up, and carried out to feed the cattle, or the beaſts may be turned into the field to feed upon them as they ſtand; but the former method ſhould be preferred, becauſe there will then be little waſte; whereas, when the cattle are turned in among the plants, they tread down and deſtroy more than they eat: eſpecially when they are not fenced off by hurdles. By ſowing the ſeeds in rich beds of ground, and afterwards removing the plants into the field, in the way that cabbage plants are managed, the produce of this vegetable might perhaps be rendered more abundant. See Brassica and Cabbage.

In the practice of J. C. Curwen, eſq. theſe plants have been found highly beneficial as a green food for milch cows; they have alſo been found to anſwer well for ſheep in ſome diſtricts.

COLGIAT, a gantlet, which the Turks carry in war. The colgiat covers the arm down to the elbow, and in defending the hand it at the ſame time enables them to parry off the blows directed againſt the head.

COLI, Giovanni, in *Biography*, an excellent freſco painter, who was born at Lucca in 1634. He purſued his ſtudies in company with Filippo Gherardi under Pietro di Cortona, and a friendſhip of ſo powerful and laſting a nature took place between the two young artiſts, that it could only be diſſolved by the hand of death, which carried off Coli in 1681. Until this period they had ever painted together, each heightening his enjoyments and ſoftening his labour, by ſharing them with the other. They were ſome years at Venice, where they acquired much of the ſtyle of that ſchool and painted the ceiling of the library of St. Giorgio Maggiore. Amongſt the greateſt of their joint works at Rome, are thoſe of the grand gallery in the palace Colonna, and of the church of the Lucchefi. Their principal work at Lucca is the Tribuna of the church of St. Martino in freſco, and three altar-pieces in oil, in the church of St. Matteo. Orlandi. Lanzi. Storia Pitt.

Coli *Sonalis, ſeu Coyolcozque*, of Ray, is the leſſer Mexican quail. See Tetrao *coyolcos*.

Coli *valvula*, in *Anatomy*, is a valve formed in the point of communication between the large and ſmall inteſtines. See Intestine.

Coliacum *promontorium*, in *Ancient Geography*, a promontory of India, N. of Taprobana, ſeparating two ſmall gulfs: the ſame which is called by Ptolemy *Cory*, and by others, *Calligiacum*, *Colis* and *Colias*.

COLIAS, a promontory of Attica, on the coaſt of the Saronic gulf, S.E. of the port of Phalerus. In this place were a temple and ſtatue of Venus, whence Venus was denominated Colias. Here were alſo ſtatues of goddeſſes called "Genetyllides," becauſe they preſided over childbirth. Suidas reports, that in this place there was a manufacture of veſſels painted with vermillion.

COLIART, in *Ichthyology*, the French name of the *Raja batis* of Linnæus, which ſee.

COLIBERTS, *Coliberti*, in *Law*, were tenants in ſoccage, and particularly ſuch villeins as were manumitted, or made freemen. Domeſday.

But they had not an abſolute freedom; for though they were better than ſervants, yet they had ſuperior lords, to whom they paid certain duties, and in that reſpect might be called ſervants, though they were of middle condition between freemen and ſervants. Du-Cange.

COLIBRI, in *Ornithology*, the general name under which Buffon deſcribes the family of humming birds (Trochili of Linnæus) which have the beak curved. See Trochilus.

COLICA, *Colic*, in *Medicine*, a pain in the abdomen, particularly about the region of the umbilicus, or navel, attended with conſtipation.

This term was probably originally intended to deſignate a pain of the large inteſtine, or *colon*, only. Celſus obſerves, "Intra ipſa inteſtina conſiſtunt duo morbi, quorum unus in tenuiore, alter in pleniore eſt. A pleriſque video nunc illum priorem ἐιλεὸν, hunc κωλικὸν nominari." (Lib. iv. cap. 13.) In the writings of Hippocrates, the word *colic* is not to be found; it was probably firſt employed by Celſus. (See Tronchin de Colica pictonum, cap. i.) At preſent, it is uſed as a general term, and is applied to a variety of painful affections of the abdomen, which differ conſiderably in their ſeat and cauſes; but which agree in their general character of a deep-ſeated pain in the belly, occupying more eſpecially the umbilical region, frequently accompanied with nauſea, or even vomiting, and generally with a conſtipation of the bowels. See Cullen. Noſol. Method. Gen. 59. Under circumſtances of great aggravation, when the periſtaltic motion of the inteſtines becomes inverted, ſo that ſtercoraceous matter is thrown up by vomiting, the denomination of *ileus*, or *iliac paſſion*, has been applied to this diſeaſe by modern authors.

The pain, in colic, is ſeldom fixed and pungent in any one part of the belly; but is generally a painful diſtention ſpreading in ſome meaſure over the whole of the abdomen, and particularly with a ſenſe of twiſting or wringing round the navel. At the ſame time the navel and teguments of the belly are frequently drawn inwards, and often the muſcles of the belly are ſpaſmodically contracted, and this in ſeparate portions, giving the appearance of a bag full of round balls. The bowels are coſtive, and the ſtomach is ſqueamiſh, ſo as frequently to reject the food and drink, which are ſwallowed; and in theſe vomitings, not only the contents of the ſtomach are thrown up, but alſo the contents of the duodenum, and therefore frequently a quantity of bile. The colic is unaccompanied by fever in the beginning; but if it be not relieved, an inflammation is liable to enſue in the part of the inteſtine eſpecially affected, which aggravates all the ſymptoms of the diſeaſe. When this takes place, the pain of the abdomen, which in the beginning was moveable, and relieved by external preſſure, is greatly aggravated by the ſame cauſe, and becomes fixed; and the patient is unable to ſtand erect; but leans forward, to diminiſh the tenſion of the muſcles and integuments of the belly. The pulſe, which was little altered at the commencement, becomes frequent, ſmall and wiry. The breathing becomes difficult, and the patient is cut off with the ſymptoms of inteſtinal inflammation. See Enteritis. To this inflammation the vomiting of fæcal matter, which conſtitutes the ileus, has generally been attributed. Dr. Cullen, however affirms, that, as there are inflammations of the inteſtines without ſtercoraceous vomiting, ſo he has ſeen inſtances of ſtercoraceous vomiting without inflammation; there is therefore no ground for diſtinguiſhing ileus from colic, but as a higher degree of the ſame affection. Firſt Lines of Pract. §. 1438.

The ſymptoms of colic, and the diſſections of bodies dead of this diſeaſe, ſhew very clearly, that it depends upon a ſpaſmodic conſtriction of a part of the inteſtines; and that this therefore is to be conſidered as the proximate cauſe of the diſeaſe. In ſome of the diſſections of perſons dead of colic, an introſuſception, or inverſion of one portion of the inteſtine within another, has been obſerved to have taken place.

The colic has been deſcribed by many writers as being of different ſpecies. Sauvages enumerates twenty, excluſive of ſeveral ſpecies of ileus, rachialgia, &c. which are alſo varieties of the ſame affection. (Noſol. Method. Claſſ. vii. Ord. iv.) Theſe diſtinctions, however, in a practical view, are of little utility; ſince in all the different modifications of the diſeaſe, the proximate cauſe appears to be the ſame, that is, a ſpaſmodic conſtriction of a part of the inteſtines; and conſequently, in all the inſtances, the principal indication of cure is the ſame; namely, to remove that conſtriction. Even where the diſeaſe depends upon a mechanical obſtruction of the inteſtine, as from accumulated forces, calculous concretions, or a thickening and narrowing of the bowel itſelf, it is not produced by the exiſtence of theſe obſtructions, unleſs ſpaſmodic conſtrictions of the inteſtines are brought on.

The exciting *cauſes*, which are as various as the modes of irritation which can act upon the bowels, have been aſſumed as the ſources of diſtinction of the ſpecies of colic. Hence the following varieties have been pointed out by noſologiſts; namely *colica flatulenta*, ariſing from wind in the bowels, and known by the great diſcharge of it with the ſtools, or glyſters, by the rumbling noiſe or borborygmi, and by the frequent change of the ſeat of the pain;—C. *pituitoſa*, from a ſuppoſed collection of mucus in the canal;—C. *ſtercorea*, from hardened fæces lodged in the bowels, occurring generally after long conſtipation, and in perſons of habitually ſlow bowels; this commonly conſtitutes the variety of colic which occurs in women in the latter ſtages of pregnancy, or C. *gravidarum*. Other ſpecies have been noted under the titles of C. *verminoſa*, ariſing from the irritation of worms in the inteſtine, which ſtimulates it to partial ſpaſmodic conſtrictions, eſpecially the round-worm or lumbricus;—C. *bilioſa*, excited by an unuſual ſecretion of acrid bile, frequently accompanied with a lax belly, and bilious ſtools;—C. *calculoſa*, in which the ſpaſmodic actions are excited by the ſtimulus of concretions lodged in the bowels, eſpecially in the colon; and under which head alſo may be included the colic occaſioned by hard ſubſtances taken in by the mouth, as the ſtones of plums, cherries, or other ſuch fruit;—C. *accidentalis*, which is of temporary duration, being produced by indigeſtible aliment, or by too great a quantity of proper food, or by other matters, which by their mechanical, chemical, or ſome other peculiar quality, irritate the inteſtines as they paſs through it, and which terminate when thoſe matters are diſcharged. The colica *à frigore* ariſes from the action of external cold, eſpecially when applied to the feet, between the integuments of which and the bowels there is a great ſympathy. The C. *hyſterica* may perhaps be properly included under the C. flatulenta. The C. *meconialis*, and C. *lactentium*, conſtitute the gripings of infants and children, the former ariſing from the retention of the meconium, within the firſt ſix weeks after birth; the latter, after that period, from the prevalence of acidity in the ſtomach and primæ viæ. (Sauvage's Loc. Cit.) Of the C. *pictonum*, ariſing from the poiſon of lead, we ſhall ſpeak more particularly afterwards.

The chief point, both in directing our prognoſis, and our choice of remedies, in colic, is the preſence or abſence of inflammation. The continuance of that irritation, which in the beginning excites a ſpaſmodic action in the muſcular coat of the inteſtines, produces at length an inflammation in the ſame part. Before we proceed to apply our remedies, then, the principal diagnoſis which we muſt determine, is whether the pain is occaſioned by ſimple ſpaſm, or by a ſupervening inflammation. The favourable ſymptoms, which imply the ſpaſmodic ſtate, are a ſoft pulſe, of natural, or of little increaſed frequency; the pain intermitting occaſionally, or moving from one part to another, and being relieved, or at leaſt not increaſed, by external preſſure; and the occurrence of fæculent evacuations. The unfavourable ſymptoms, on the contrary, as leading to a ſuſpicion of inflammation, are a conſiderable duration and unremitting ſeverity of the pain, obſtinate conſtipation, with tenſion of the abdomen, and an aggravation of the pain by preſſure; a very frequent, ſmall, and hard pulſe: the ſkin being hot and dry, or partially moiſt with clammy ſweats; frequent retching, with a dry, brown tongue, hiccup, and delirium.

The principal indications of cure, in colic, are, 1ſt, to prevent or remove inflammation; 2d, to relieve the ſpaſmodic conſtriction and pain of the bowels; and 3d, to excite their regular action, and procure free and fæculent ſtools. The means by which theſe indications muſt be fulfilled, though obvious in general, will be neceſſarily varied by circumſtances, eſpecially by a conſideration of the nature of the exciting cauſe, and of the progreſs and variety of particular ſymptoms.

1. Where inflammatory action has already taken place, as indicated by the ſymptoms before enumerated, eſpecially by the ſeverity of pain, by its increaſe on preſſure, and by the very frequent, hard pulſe, recourſe ſhould be immediately had to the lancet, and a free bleeding from the arm, from a large orifice, ſhould be effected. In perſons of full and ſtrong habits, this operation may require to be repeated, if the pain ſhould not remit, and the pulſe ſhould remain hard and frequent, and if the blood drawn ſhould exhibit, not only the buffy coat, but a conſiderable contraction of the coagulum. In more delicate habits the ſame purpoſe may be accompliſhed by the application of ſeveral leeches to the abdomen, aided by the warm bath, or warm fomentations, or by the application of a bliſter. In ſtrong habits, indeed, if the pain has been of conſiderable duration, inflammation is always much to be apprehended, and a moderate veneſection may be beneficially employed in anticipating its actual attack. In perſons of a weak and lax conſtitution, however, conſiderable caution is requiſite in the uſe of this powerful expedient, unleſs there is a ſtrong ſuſpicion of the abſolute exiſtence of inflammation.

2. The moſt effectual antiſpaſmodic means that can be reſorted to, are the application of heat, whether in a dry or humid form; and the uſe of opium, either by the mouth or the anus. The application of a dry heat is frequently employed with relief. Thus bladders filled with warm water, or bags of ſubſtances which long retain their heat, or living animals, have been uſed for this purpoſe. But the application of heat in combination with moiſture is perhaps generally more efficacious; and moſt of all, when it is applied to nearly the whole of the ſurface of the body, as by immerſion in the warm bath. The frequent inconvenience, however, or impracticability of this, renders it neceſſary to adopt, as a ſubſtitute, the local fomentation of the belly with cloths wrung out of hot water. The fomentation has one advantage, that it may be longer continued; but to procure all the benefits of immerſion it ſhould be applied at the ſame time to the lower extremities. Upon the ſame principle, a filthy expedient, frequently adopted by the older practitioners, was beneficial; namely the application of the omentum, or the warm ſkin, of a newly killed animal.

Practitioners are not altogether agreed as to the propriety of adminiſtering opiates in colic; many have extolled them as highly uſeful, while others have conſidered them as ambiguous, if not dangerous, medicines. As the tendency of opium is to produce coſtiveneſs, by diminiſhing the irritability, and therefore ſuſpending the periſtaltic motion of the bowels; it is ſuppoſed that while it relieves the pain, it muſt render the cauſe of the diſeaſe more obſtinate, and more eſpecially as upon the ſame grounds, it alſo has a tendency to impede the operation of purgatives. But it muſt be obſerved that the great cauſe of the conſtipation in colic, as well as of the pain, is the ſpaſmodic conſtriction of the bowels; and, therefore, it is obvious, that the moſt effectual way of aiding the operation of a purgative, is to remove this conſtriction, and thus to ſuffer the contents of the bowels to paſs freely along. And ſo far, we believe, from finding the action of purgative medicines impeded by the effects of an opiate, in colic, the practitioner has generally the ſatisfaction of ſeeing, that, after an opiate has been taken, a milder purgative will produce the deſired evacuations, which a more active one had previouſly failed to produce. It is, therefore, to be recommended that an opiate be generally given a ſhort time preceding the adminiſtration of a purgative; or, as the operation of a purgative on the inteſtines is neceſſarily ſlower than that of an opiate, which acts immediately upon the nervous ſyſtem, through the medium of the ſtomach, the opiate and purgative may be advantageouſly combined. Perhaps the only caſes, in which the operation of an opiate can be conſidered as hazardous, are thoſe which have been preceded by long coſtiveneſs, ſo that a ſtagnation and induration of fæces in the colon are to be ſuſpected. In ſuch caſes a ſtool ought to be firſt procured, if poſſible, by laxative medicines, aided by the uſe of emollient glyſters injected repeatedly, in order to ſoften the hardened fæces, and facilitate their expulſion. But even in thoſe circumſtances of coſtiveneſs, Dr. Cullen juſtly remarks, when, without inflammation, the violence of the ſpaſm is to be ſuſpected, when vomiting prevents the exhibition of purgatives, and when with all this the pain is extremely urgent, opium is to be employed, not merely as an anodyne, but alſo as an antiſpaſmodic, neceſſary to favour the operation of purgatives; and it may be ſo employed, when, either at the ſame time with the opiate, or not long after it, a purgative can be exhibited; and in all caſes where the colic comes on without any previous coſtiveneſs, and ariſes from cold, from paſſions of the mind, or other cauſes which operate eſpecially on the nervous ſyſtem, opium proves a ſafe and certain remedy. Firſt Lines, § 1445.

3. As the ſpaſmodic pains of colic are neceſſarily increaſed by the ſtagnant fæces, it is always important to excite the action of the bowels, and to procure free natural ſtools. Therefore, as we have already ſtated, either ſoon after or in conjunction with an opiate, ſome cathartic medicine ſhould be adminiſtered, either by the mouth or in a glyſter, or both. If the conſtipation has been but of ſhort duration, the neutral ſalts will generally be adequate to the purpoſe of procuring evacuations; ſuch as the magneſia vitriolata, for inſtance, or the cryſtals of tartar, which laſt Dr. Cullen recommends. They both have the advantage of being conveniently repeated at ſhort intervals, in ſmall quantities, until the deſired effect is produced; and they are alſo not liable to diſagree with the ſtomach. The caſtor oil, *oleum ricini*, is alſo a mild and tolerably certain purgative, which may be advantageouſly uſed where there is no ſickneſs preſent. If more active means are required, a few grains of calomel, either alone or combined with a ſmall quantity of jalap or rhubarb, may be employed. But the more draſtic cathartics ſhould be avoided, becauſe they are apt to be rejected by the ſtomach; but particularly becauſe, if they do not ſucceed in removing the obſtruction, their great irritating qualities are liable to excite inflammation, or to increaſe it, if it has already commenced.

The diſeaſe, however, is often confined to the colon, or large inteſtine, and therefore remedies may be applied immediately to the part affected, by means of glyſters. Large quantities of warm water, injected by a proper ſyringe, have frequently had the effect of removing the pain and ſpaſmodic ſtricture of the colon, partly by the ſoothing effects of the warmth, and partly by mechanical dilatation. Opium may alſo be adminiſtered in this way, eſpecially in combination with neutral ſalts, in a large glyſter of warm water, with conſiderable advantage. Theſe emollient glyſters act alſo powerfully in aid of laxative medicines taken by the mouth, particularly where the latter is impeded in their operation by a collection of indurated fæces; for while the periſtaltic motion of the bowels is rouſed by the laxatives in the upper part of the canal, the obſtruction is ſoftened, and looſened in the lower part, by the glyſter. A ſolution of aſafœtida may be frequently adminiſtered with advantage, in the form of a glyſter, as it tends both to relieve the pain by its antiſpaſmodic qualities, and alſo to ſtimulate the lower bowel, to evacuation. But where there is very obſtinate conſtipation, no glyſters are generally more efficacious than thoſe made of turpentine, properly ſuſpended in water, by means of mucilage, or the yolk of an egg. As a laſt reſource, injections of tobacco ſmoke, or of an infuſion of tobacco, are uſually employed, and are powerful ſtimulants to the inteſtines. There are ſeveral caſes, however, on record, in which, after every purgative medicine had failed, and the moſt acrid glyſters had proved ineffectual, the action of the bowels has been fully excited by throwing cold water on the lower extremities. Two caſes of this kind may be found in the Medical Tranſactions of the College of Phyſicians, vol. iii., and another in the Edinburgh Medical Eſſays, vol. v. p. 190. See Cold.

Colica *Pictonum*, or *Colic of Poictou*, is a ſpecies of the diſeaſe peculiar in reſpect to the cauſe, from which it originated, in the progreſs of its ſymptoms, and in the paralytic condition of the body, which it leaves behind. This colic is endemial in ſome countries, and has alſo been at times epidemical in others, where it is not commonly prevalent. It firſt received the name of colica pictonum, by which it is now generally deſignated, from Citois, or Citeſius, as he calls himſelf, phyſician to cardinal Richelieu, it having been epidemic in Poictou to a great extent in 1572. See "Diatriba, de novo et populari apud Pictones dolore Colico Bilioſo," in his "Opuſcula Medica," Paris, 1639. It has been likewiſe denominated *colica damnonienſis*, or *Devonſhire colic*, by Huxham and others, ſince it is endemic in that county; and *painters' colic*, becauſe frequently occurring among painters; and alſo *colica ſaturnina*, becauſe it originates, perhaps invariably, from the operation of the poiſon of lead. In the Weſt Indies, where it is alſo endemic, it is called the *dry belly-ache*. Sauvages has conſtituted it a *genus* diſtinct from colic, under the title of rachialgia.

But although Citois firſt diſtinguiſhed the diſeaſe by a peculiar name, it was well known long before his work appeared. It was equally familiar to the people of Picardy, Britanny, and other provinces of France, as well as in Moravia, Sileſia, and many parts of Germany. (See Langius Epiſt. Med. Droëtus Conſil. Nov. de Peſtilentia, cap. 5.—1572.) A colic, which terminated in paralyſis of the limbs, a termination, we believe, with ſir George Baker, peculiar to colica pictonum, had been deſcribed by Paulus Ægineta, (cap. 18) "de reſolutione ex colico morbo oborta;" by Avicenna and ſome other Arabian phyſicians; and by ſeveral continental writers, Fernelius, Hollerius, Foreſtus, &c. as well as by our countryman, John of Gaddeſden, in his "Roſa Anglica," cap. 20, prior to the time of Citois. The reader who is deſirous of obtaining a minute hiſtorical view of the diſeaſe will be amply gratified by the peruſal of the treatiſe of Tronchin, "De Colica Pictonum, Jena 1771," and of the excellent papers of ſir George Baker, in the three volumes of the Medical Tranſactions of the Col. of Phyſicians of London.

The attack of colica pictonum is generally preceded by a ſenſe of weight and uneaſineſs, about the region of the ſtomach or umbilicus, accompanied with ſome languor and diminution of appetite. At length ſlight pains are felt, which remit at times, and are particularly aggravated after eating; theſe in a ſhort time become continued, and extremely ſevere, ſo that the patient lies chiefly on his belly; or toſſing about, with expreſſions of the greateſt agony. The eyes become dull, and the complexion pale, and of a dirty or livid colour. The pulſe is often quickened by the ſevere irritation of pain, and the ſkin, though generally cold and damp, is occaſionally rather hot; but there appears to be no tendency in this diſeaſe to inflammation. The ſtomach is in ſome caſes extremely irritable, and rejects whatever is ſwallowed, and the conſtipation is obſtinate. The pain often ſhoots, or is fixed in the back, and the limbs alſo are painful. When theſe ſymptoms occur in painters, plumbers, white-lead manufacturers, poliſhers of glaſs, or perſons of other occupations, in which they are expoſed to the action of the poiſon of lead, there can be no doubt of this ſpecies of colic being preſent. After ſeveral attacks of colica pictonum, a paralyſis commonly affects the fingers, or the whole hand and fore arm, ſo that the former become contracted, and the hands, when the arms are extended horizontally, hang nevertheleſs at a right angle to the arms; the *extenſor* muſcles being in both caſes more paralyſed than the *flexors*.

The exciting *cauſe* of colica pictonum appears to be, in all inſtances, as we have already ſtated, the poiſon of lead. The deleterious powers of this metal, eſpecially in the form of oxyd, or in combination with an acid, have been long well known; nor are they confined to the human ſpecies. Dr. Percival has recorded many examples of the poiſonous effects of lead, when given to hounds, cats, linnets, geeſe, ducks, and other poultry. (Obſervations and Experiments on the Poiſon of Lead.) And its power of exciting colic and paralyſis has alſo been long underſtood: ſince theſe effects have been frequently traced to the accidental or deſigned uſe of the metal, as medicine, or in the food and drink. During the 16th and 17th centuries, when the ſaturnine ſalts, eſpecially the acetite of lead, or, as it is vulgarly called, ſugar of lead, were adminiſtered in large doſes medicinally, the colica pictonum, and paralyſis, in their ſevereſt forms, appear to have frequently occurred. Nevertheleſs, it was not until the inveſtigations of ſir George Baker were publiſhed, that the poiſon of lead was ſuſpected even to be the common, much leſs the excluſive cauſe of colica pictonum. Such is the difficulty of attaining truth and ſound experience in medicine! In thoſe countries where the diſeaſe was endemic, it was attributed to a free uſe of the ſub-acid wines, or other ſuch liquors, peculiar to the reſpective diſtricts, with which, in fact, it was very obviouſly connected. In the various provinces of France and Germany, where it has been obſerved to be epidemic in different ſeaſons, it has been clearly obſerved to prevail among perſons who drank freely of thoſe ſub-acid fermented liquors, by Sennertus, Spigelius, Cardanus, Citois, and many other writers. The colic of Devonſhire is always attributed to the uſe of the cyder of that county, according to Huxham and Muſgrave. The latter briefly remarks, "hanc (ſcil. colicam) acre facit pomaceum, ſiquidem eos huic aſſuetos ſolum afficit, annis hoc potu divitibus graſſatur, pomona negante vix datur." Muſgrave de Arthritide Symptomatice. Tronchin De Col. Pict. p. 32. In the Weſt Indies, the endemic colic, called the dry belly-ache, is obſerved to be the conſequence of drinking freely of the newly diſtilled rum; and this liquor is therefore univerſally conſidered as the cauſe of the diſeaſe. But beſides theſe peculiar fermented liquors, and other metallic poiſons, as well as lead, authors have aſſigned ſeveral cauſes to colica pictonum; ſuch are, the remains of imperfectly cured fevers, gout and rheumatiſm, interrupted perſpiration, ſcurvy, melancholia, and emotions of the mind. See Tronchin. Loc. Cit. To theſe latter circumſtances, however, no one now attributes the origin of colica pictonum. The only doubt which can exiſt at preſent, is, whether thoſe ſub-acid and ſpirituous liquors poſſeſs any property capable of producing the diſeaſe, independently of an impregnation with lead.

It has been remarked, that the cyder of Devonſhire produced the colic much more frequently and extenſively, than that of other countries, as of Herefordſhire; and the wines of ſome diſtricts on the Continent excited the diſeaſe, when ſimilar wines of other diſtricts did not. Sir George Baker aſcertained, that a ſmall quantity of lead was employed in ſeveral of the mills, in which the apples were bruiſed for the manufacture of cyder, to faſten the iron cranks, which connected the ſtone-work. It is well known, too, that in ſeveral countries on the continent, the practice of ſweetening the wines with litharge, and other preparations of lead, was very common, and that in their diſtricts the colic was particularly prevalent. Dr. Moſeley obſerves, that he was cautioned by Dr. Menghin, of Inſpruck, to avoid all ſweet wines whatever, but particularly the common tavern wines upon the road, in the Tyrol and in Italy. He adds, that he never deviated from this advice but once, and paid dearly for it at Viterbo. (Treatiſe on Tropical Diſeaſes. p. 527.) On the other hand, colica pictonum is very prevalent in this metropolis, and other large towns; yet we have never ſeen an inſtance, which was not decidedly traced to the operation of lead. A great proportion of houſe-painters and plumbers, ſuffer the diſeaſe at ſome period of their life; and a very minute quantity of lead will produce it in ſome conſtitutions. Dr. Fothergill has recorded ſeveral caſes, in which the complaint was occaſioned in perſons employed in painting with water-colours, who were in the habit of pointing the pencil in the mouth. One of the ſevereſt caſes which we have witneſſed, occurred in a woman, who was occaſionally occupied in cleanſing poliſhed glaſs of the remains of the putty, which had been uſed for the purpoſe of poliſhing. It is farther to be added, that in many ſpecimens of cyder, which were analyzed by ſir George Baker, a ſmall portion of lead was detected. And in the new rum of the Weſt Indies, which excited the colic throughout ſome regiments of ſoldiers, while others were totally free from it, Dr. Hunter diſcovered, by analyſis, the preſence of lead. This lead appears to be depoſited after a certain time, probably within a year, and the rum loſes its noxious quality. See Med. Tranſact. vol. iii. Sir George Baker. Ibid. Dr. Fothergill Med. Obſ. and Inquiries, vol. v. On the whole, therefore, we are ſatisfied of the correctneſs of the concluſion of ſir George Baker, that colica pictonum is occaſioned excluſively by the poiſon of lead.

The *cure* of colica pictonum muſt be attempted on the ſame principles, which we have already laid down for the cure of colic in general; in as much as it conſiſts, like the other ſpecies, in a ſpaſmodic conſtriction of ſome portion of the inteſtinal canal. But in this form of colic there appears to be little diſpoſition to inflammatory action; and the doubts and apprehenſions, which ſome practitioners have expreſſed, of the propriety of adminiſtering opiates, until ſome evacuation from the bowels has been procured, are altogether unſupported by experience. We are ſatisfied, that, wherever colic can be decidedly traced to the operation of lead, the moſt effectual, and the only ready cure, is to be found in the adminiſtration of a large doſe of opium, to be repeated at ſhort intervals, until the pain (and of courſe the ſpaſmodic ſtricture) is relieved. When this effect has been produced, there is ſeldom any difficulty in exciting the action of the bowels, and procuring proper evacuations of fæces; after which, the cure is ſoon completed by tonics and cordials. This practice of firſt relieving the pain and conſtriction by opiates, before the bowels are attempted to be forced by purgative medicines, was ſtrongly recommended by Dr. Warren (Med. Tranſact. vol. ii.); and was alſo employed by Dr. Darwin, (Zoonomia, vol. ii.). The practice, therefore, is ſupported by reaſon, experience, and authority; and the apprehenſions, that opium is liable to excite inflammation in colica pictonum, are altogether hypothetical and gratuitous. As aſſiſting the anti-ſpaſmodic operation of opiates, the warm bath, fomentations, &c. as mentioned under the head of Colic, may be reſorted to with benefit.

For the cure of the palſy, which ſucceeds to colica pictonum, little can be done by the adminiſtration of drugs. The uſe of the waters of Bath is generally found to be productive of advantage. There ſeems to be a tendency in the conſtitution, eſpecially in recent caſes, to recover itſelf, if the exciting cauſe is avoided, and this may be aided by the local ſtimulus of warm water, friction, &c. and, above all, perhaps, by mechanical ſupport to the paralyzed hands. Dr. Pemberton has recommended, that, for this purpoſe, the patient ſhould have his hand and fingers extended upon a ſort of battledore, tied to the fore-arm, which ſhould be worn daily. He affirms that, in ſeveral inſtances, a perfect cure of the paralyſis from lead has been effected in the courſe of a few weeks. (Treatiſe on Diſ. of the abdominal Viſcera.) It is obvious that the return of colica pictonum, and of the palſy which ſucceeds it, can only be effectually prevented by relinquiſhing thoſe avocations, which neceſſarily expoſe the patient to the influence of the poiſonous metal which excites the diſeaſe; or by refraining from thoſe liquors with which any of its preparations are intermixed.

Colica, in *Ancient Geography*, a country of Aſia, near mount Caucaſus, in the country of the Coraxes. Pliny ſays that it was a country of Pontus, in which the ſummits of mount Caucaſus directed their courſe towards the Riphæan mountains.

COLICARIA, a place of Italy, in Ciſalpine Gaul, according to the Itinerary of Antonine; 25 miles from Hoſtilia. M. d'Anville places it W. of Vicus Serninus, and N.E. of Mutina.

COLICÆ Arteriæ, in *Anatomy*, are the arteries which ſupply the colon. There are generally three of theſe: the *colica dextra*, which ſupplies the aſcending colon, and the *colica media*, which is diſtributed to the tranſverſe arch of the inteſtine, come from the ſuperior meſenteric artery; the *colica ſiniſtra*, which ſupplies the deſcending colon, ariſes from the inferior meſenteric trunk. See Arteries.

COLIC-Shell, in *Natural Hiſtory*, a name given by ſome to the *porcellana*, or *concha venerea*, from its ſuppoſed virtue in curing that diſeaſe.

Colic-Stone, the name given by ſome modern authors to a ſtone found in New Spain, and ſome other parts of America, and eſteemed of great virtues there in the cure of the colic, and in the diſeaſes of the womb. It is a ſpecies of jaſper very nearly approaching to the lapis nephriticus, and called by the natives *tlayotic*, and by the Spaniards, *piedra de hyada*. It is of a conſiderable weight and hardneſs, and is of a duſky green colour, without any variegations. The Indians cut it into various forms, ſometimes of men, ſometimes of their idols; ſometimes alſo they figure it into long and even columns, and ſometimes into round and flat pieces. All theſe are nicely poliſhed, and thoſe of the laſt ſhape are what are principally uſed in the cure of the colic. They wet theſe with their ſpittle, and then rubbing them, till hot, with their hands, they apply them to the navel in a fit of the colic; and they ſay, that they immediately carry it off, by determining the humours to paſs off, either upwards or downwards, or both ways. They ſometimes cut this ſtone into flat plates alſo, with two holes cut at each end, by means of which it may be worn, tied to the wriſt by a riband, and it is ſuppoſed thus to be a preſervative from all diſeaſes of this kind, and from many others.

COLIGNON, François, in *Biography*, an engraver, native of Nancy, who, after he had ſtudied under Callot, and ſpent ſome time at Rome, eſtabliſhed himſelf in Paris in 1640, as an engraver and print merchant. His works, which are numerous, conſiſt principally of views of buildings, gardens, and plans of cities, executed in a ſpirited manner, not unlike that of Iſrael Silveſtre, or Stefano della Bella. Amongſt theſe is a plan of the city of Malta, with the ancient fortifications, and a ſet of prints repreſenting the buildings erected at Rome under pope Sixtus V. He likewiſe engraved ſome prints from Raffaele, the Carracci, Dominichino, and ſeveral other maſters of the Italian ſchool. Strutt. Heinecken.

COLIGNY, Gaspard de, a character of conſiderable diſtinction in the civil wars of France, was born in 1517, and trained to the knowledge of arms at a very early period. Of his youthful exploits nothing is mentioned worthy of hiſtorical record. In 1550, he was a colonel-general in the infantry, and employed in forming a pacification between England and France. He was ſhortly after raiſed to the poſt of admiral, and was engaged in many important ſervices for his king and country, in one of which he was taken priſoner by the Spaniards. Upon the death of his royal maſter, Henry II. he united himſelf with the Huguenots, and avowed his adherence to the Proteſtant religion. Excepting the prince of Condé, he was at the head of the party, both in matters of diplomacy and as a ſoldier. He took up arms againſt the Guiſes who had planned the extirpation of the Huguenots, and although in ſeveral battles he had the mortification of being obliged to retire from the field, yet his courage and intrepidity never failed him; when wounded, and his friends lamenting over his ſituation, he obſerved, that in his profeſſion a man ſhould regard death and life on equal terms. By his talents and bravery the Huguenots, though defeated, were ſufficiently formidable to conclude a peace. They had increaſed ſo much in numbers, and the progreſs which their doctrines were ſtill making, was ſuch, that it was imagined they would ſhortly have become the predominant religion in France. Coligny was invited to the court, and the king, with thoſe about him, uſed every means of flattery and deluſion to throw the admiral off his guard. He ſuſpended his uſual prudence, and became reconciled to the chiefs of the party who not long before had offered a large reward to any one who would aſſaſſinate him. He who had defied equally the power and menaces of royal authority could not wholly withſtand the ſolicitations of his enemies, who, to anſwer their own ſiniſter views, had put on the maſk of friendſhip. Inattentive to the preſages of his firmeſt adherents, he refuſed to leave Paris, and was himſelf the firſt victim of the infamous maſſacre which took place, not only in the capital, but in almoſt all the provinces on St. Bartholemew's day, 1572. He had, only two days before, been wounded by a hired aſſaſſin, named Maurevel, as he was returning from the Louvre, and was on that account confined to his room, when a party, headed by his implacable enemy, the duke of Guiſe, broke open the door where the admiral was ſitting. Beſme, one of the duke's domeſtics, approached him with a drawn ſword, "Young man," ſaid the gallant but diſabled Coligny, "you ought to reſpect my age, but act as you pleaſe, you can only ſhorten my life a very few days." The ſavage pierced his body in many places, and then threw his body into the ſtreet, where it was expoſed for three days, to the inſults of the populace, and then hung by the feet on a gibbet. He was afterwards privately buried in the chapel of Chantilly. Such was the end of admiral Coligny, who, before the commencement of hoſtilities, was deſirous of ſecuring to his party that liberty of conſcience in the New World which was denied to them in the Old. Permiſſion was granted him to conduct the Huguenots to the Floridas, and they actually ſailed in 1562, but through the miſmanagement of thoſe to whom the buſineſs was principally entruſted, the project failed, and he was reſerved to exhibit in Europe invincible courage as a ſoldier, great ſkill and prudence as a politician, and a degree of conſtancy in his religious principles worthy the cauſe in which he had embarked, and from the defence of which he never once deviated.

Coligny had two brothers who diſtinguiſhed themſelves in the ſame cauſe, and took part in all the principal actions. One of them, Odet, had attained the rank of cardinal in the church, and ſet the honourable example of quitting his preferment, and uniting himſelf at the call of conſcience to the Proteſtant intereſt. He joined his brothers in arms, was married, ſolemnly depoſed, and retired to England, where he was poiſoned by a domeſtic in 1571. Nouv. Dict. Hiſt. Univerſal Hiſt.

Coligny, in *Geography*, a town of France, in the department of the Ain, and chief place of a canton, in the diſtrict of Bourg; 12 miles N. of Bourg. The place contains 1658, and the canton 9764 inhabitants: the territory comprehends 177½ kiliometres, and 9 communes.

COLIHAUT, a town on the weſtern ſide of the iſland of Dominica.

COLIMA, a large and rich town of America, in the country of Mexico, and province of Mechoacan, ſituated in one of the moſt pleaſant and fertile vallies of the country, producing cocoa, caſſia, and other valuable commodities, beſides ſome gold; of the breadth of eight leagues, and extending to the ſea. Near it is a mountain of the ſame name, with a volcano, deſcribed by Dampier as having two ſharp peaks, from which ſmoke and flame continually iſſue. A famous plant, called *oleacazan*, is ſaid to grow in the neighbourhood, which is reckoned by the natives a catholicon for reſtoring decayed ſtrength, and a ſpecific againſt all ſorts of poiſon. Colima lies 110 miles W. of Mechoacan. N. lat. 19° 50′. W. long. 104° 46′.

COLIMER, a town of France, in the department of the Orne, and diſtrict of Mortagne; 4 miles W. of it.

COLIN, a town of Bohemia, in the circle of Caarzim, with a ſtrong caſtle; 28 miles E. of Prague.

Colin, *grand colin*, in *Ornithology*, the name given by Buffon to the Mexican quail, *tetrao novæ hiſpaniæ;* which ſee.

COLINDA, in *Geography*, a town of Hindooſtan, in the province of Bengal; 28 miles S. of Comillah.

COLINE'E, a town of France, in the department of the Northern Coaſts, and chief place of a canton, in the diſtrict of Loudéac. The place contains 465, and the canton 5530 inhabitants: the territory includes 127½ kiliometres, and 6 communes.

COLINIA, in *Ancient Geography*, a name given to the iſle of Cyprus.

COLIPHIUM, a name given by Athenæus, and ſome other authors, to coarſe bread made of meal with the bran among it, and ſuch as is eaten by the poorer people in moſt countries.

The word is derived from κωλον, *a limb*, and ιφι, *ſtrength*, and is a very expreſſive word, as this ſort of bread makes people robuſt and ſtrong, and is greatly preferable to any other kind for people of ſtrong conſtitutions, who uſe hard labour or much exerciſe. It ſignifies alſo a kind of food compoſed of bread, new cheeſe, and roaſted fleſh, which Pythagoras taught the athletæ to uſe, who before had been uſed to live on figs.

COLIR, an officer in China, who inſpects what paſſes in every court or tribunal in the empire; and though himſelf not in the number, yet is aſſiſting at all aſſemblies, the proceedings whereof are communicated to him.

He is properly what we may call an *inſpector;* he gives ſecret intelligence to the court; and even, on occaſion, accuſes the mandarins of their faults openly; and that not only of faults in their public offices, but even in private life. To keep him impartial, he is kept independent; by having the poſt for life. Theſe colirs make even the princes of the blood tremble.

COLIS, in *Ancient Geography*, a country of India, near the ſea. The rivers Hypanis and Megarſes run towards the confines of this country.

COLISEUM, the name given to the amphitheatre of Veſpaſian at Rome, either from its magnitude, or from Nero's coloſſal ſtatue. Under the article Amphitheatre, an account has been already given of its dimenſions and contrivance. We have here only to ſay a few words on its hiſtory. It ſtands upon the ſpot formerly occupied by a pond encloſed within the walls of Nero's gilded houſe. The pond being dried up, Flavius Veſpaſian, A.D. 72, began this celebrated edifice, for public exhibitions, on a plan formed by Auguſtus, in the then centre of the city. The time which it took in building is not exactly agreed upon by hiſtorians; but the greater part appears to have owed its origin to Titus, who employed ſuch of the Jews upon it as were brought in ſlavery to Rome. When the Goths plundered the city, whatever about the Coliſeum was precious, portable, or profane, the ſtatues of the gods and heroes, and the coſtly ornaments of ſculpture, which were caſt in braſs or overſpread with leaves of ſilver and gold, became the firſt prey of conqueſt and avarice. The vacant ſpace, in the centre, was converted into a fair or market; the artiſans of the Coliſeum are mentioned in an ancient ſurvey; and the chaſms, which are ſtill diſcerned among the maſſy ſtones, were either perforated or enlarged to receive the poles that ſupported the ſhops or tents of the mechanic trades. (Donatus, Roma Vetus et Nova, p. 285.)

Reduced to its native majeſty, ſays Mr. Gibbon, the Flavian amphitheatre was contemplated with awe and admiration by the pilgrims of the north; and their rude enthuſiaſm broke forth in a ſublime proverbial expreſſion, which is recorded in the eighth century, in the fragments of the venerable Bede. "As long as the Coliſeum ſtands, Rome ſhall ſtand; when the Coliſeum falls, Rome will fall; and when Rome falls, the world will fall." (Beda in Excerptis ſeu Collectaneis apud Du-Cange Gloſſar, med. et infimæ Latinitatis, tom. ii. p. 407. Edit. Baſil.) The ſame learned writer makes mention of a paſſage in Muratori, from which he gathered, that toward the end of the eleventh or beginning of the twelfth century, during a time of faction, a numerous garriſon was lodged in its encloſure.

In 1332, we find a bull-feaſt celebrated here, after the manner of the Moors and Spaniards. It is deſcribed, ſays Mr. Gibbon, from tradition rather than memory, by Ludovico Buonconte Monaldeſco, in the moſt ancient fragments of Roman Annals, (Muratori Script. Rerum Italicarum, tom. xii. p. 535,536.) and however fanciful they may ſeem, they are deeply marked with the colours of truth and nature. A convenient order of benches was reſtored, and a general proclamation, as far as Rimini and Ravenna, invited the nobles to exerciſe their ſkill and courage in this perilous adventure. The Roman ladies were marſhalled in three ſquadrons, and ſeated in three balconies, which, on this day, the third of September, were lined with ſcarlet cloth. The fair Jacova di Rovere led the matrons from beyond the Tyber, a pure and native race, who ſtill repreſent the features and character of antiquity. The remainder of the city was divided as uſual between the Colonna and the Urſini; the two factions were proud of the number and beauty of their female bands; the charms of Savella Urſini are mentioned with praiſe; and the Colonna regretted the abſence of the youngeſt of their houſe, who had ſprained her ancle in the garden of Nero's tower. The lots of the champions were drawn by an old and reſpectable citizen; and they deſcended into the *arena*, or pit, to encounter the wild bulls, on foot as it ſhould ſeem, with a ſingle ſpear. Amidſt the crowd, our annaliſt has ſelected the names, colours, and devices of twenty of the moſt conſpicuous knights. Several of the names are the moſt illuſtrious of Rome, and the eccleſiaſtical ſtate; Malateſta, Polenta, Della Valle, Cafarello, Savelli, Capoccio, Conti, Annibaldi, Altieri, Corſi; the colours were adapted to their taſte and ſituation; the devices were expreſſive of hope or deſpair, and breathed the ſpirit of gallantry and arms. The pride or prudence of the Urſini reſtrained them from the field, which was occupied by three of their hereditary rivals, whoſe inſcriptions denoted the lofty greatneſs of the Colonna name. The combats were dangerous and bloody. Every champion ſucceſſively encountered a wild bull; and the victory may be aſcribed to the quadrupeds, ſince no leſs than eleven were left on the field, with the loſs of nine wounded, and eighteen killed on the ſide of their adverſaries. Some of the nobleſt families might mourn, but the pomp of the funerals, in the churches of St. John Lateran, and St. Maria Maggiore, afforded a ſecond holiday to the people.

This uſe of the amphitheatre, he adds, was a rare, perhaps a ſingular feſtival; the demand for the materials was a daily and continual want, which the citizens could gratify without reſtraint or remorſe. In the fourteenth century, a ſcandalous act of concord ſecured to both factions the privilege of extracting ſtones from it, as a free and common quarry; and Poggius laments that the greater part of theſe ſtones had been burnt to lime by the folly of the Romans. To check this abuſe, and to prevent the nocturnal crimes that might be perpetrated in the vaſt and gloomy receſs, Eugenius IV. ſurrounded it with a wall; and by a charter, long extant, granted both the ground and edifice to the Olivetan Monks. After his death, the wall was overthrown in a tumult of the people; and had they themſelves reſpected the nobleſt monument of their fathers, they might have juſtified the reſolve that it ſhould never be degraded to private property. The inſide was damaged; but in the middle of the ſixteenth century, an æra of taſte and learning, the exterior circumference of one thouſand ſix hundred and twelve feet was ſtill inviolate; a triple elevation of fourſcore arches, which roſe to the height of one hundred and eight feet. Of the preſent ruin, the nephews of Paul III. are the guilty agents; and every traveller who views the Farneſe palace, may curſe the ſacrilege and luxury of theſe upſtart princes. A ſimilar reproach is applied to the Barbarini; and the repetition of injury might be dreaded from every reign, till the Coliſeum was placed under the ſafeguard of religion, by the moſt liberal of the pontiffs, Benedict XIV. who conſecrated a ſpot, which perſecution had ſtained with the blood of ſo many Chriſtian martyrs. (Gibbon's Decline and Fall, vol. vi. p. 635—640.)

Gammucci, Scamozzi, Serlio, Maffei, and ſeveral others occur among the more valuable writers on the Flavian amphitheatre, excluſive of thoſe who have written on the general antiquities of Rome. Some curious particulars alſo may be gathered from "L'Anfiteatro Flavio," "del Cavalier Carlo Fontana," fol. Haia. 1725; and ſome more elaborate details in "Joh. Maranzoni delle Memorie ſacre et profane dell Anfiteatro Flavio di Roma, volgarmente detto il Coloſſe, Diſſertazione," 4to. Rom. 1746. See alſo "Wilkins's deſcription of Ancient and Modern Rome," vol. i. p. 115. and "Tappen's Profeſſional Obſervations on the Architecture of the Ancient and Modern Buildings in France and Italy," p. 151.

The term *Coliſeum* is alſo given to two other amphitheatres; that of the emperor Severus, and the amphitheatre of Capua.

COLISTA, in *Biography*, an eminent performer on the organ at Rome, 1770. He was at this time organiſt of St. John Lateran, the moſt ancient church in Chriſtendom. The organ of this church, which is the largeſt in Rome, was built in 1549, and has undergone two repairs ſince; the one in 1600, by Luca Blaſi Perugino, and a ſecond, a few years ſince, under the direction of the preſent organiſt. It has thirty-ſix ſtops, two ſets of keys, long eighths, an octave below double F. and goes up to E. in altiſſimo. It has likewiſe pedals; in the uſe of which Signor Coliſta is very dextrous. His manner of playing this inſtrument ſeems to be the true organ ſtyle, though his taſte is rather ancient; indeed the organ ſtyle ſeems to be better preſerved throughout Italy than it is with us; as the harpſichord is not ſufficiently cultivated to encroach upon that inſtrument. Signor Coliſta played ſeveral fugues, in which the ſubjects were frequently introduced on the pedals, in a very maſterly manner. But it ſeems as if every virtue in muſic was to border upon ſome vice; for this ſtyle of playing precludes all grace, taſte, and melody; while the light, airy harpſichord kind of playing, deſtroys the *ſoſtenuto* and richneſs of harmony and contrivance of which this divine inſtrument is ſo peculiarly capable.

COLITES, in *Natural Hiſtory*, a name given by ſome writers to a ſtone ſuppoſed to imitate the human *penis*, or *teſtes*, ſeparately, or both together.

COLIUS, in *Ornithology*, the name of the red creeper, β in Moehring's genera of birds, *certhia mexicana* of Gmelin, Trochilus coccineus, Linn. Syſt. nat 6.

Colius, a genus of the paſſerine order, diſtinguiſhed by having the bill ſhort, thick, convex above, and flat beneath; upper mandible bent down at the tip; noſtrils ſmall, ſituated at the baſe of the bill, and nearly covered with feathers; tongue jagged at the tip; tail long and cuneated.

The birds of the colius tribe are moſtly inhabitants of Africa and India. The number of ſpecies at preſent known amount to ſeven, two only of which are deſcribed by Linnæus, the *colius capenſis*, conſidered by that naturaliſt as appertaining to the loxia or croſs-bill tribe, and named by him loxia colius; the other, *colius ſenegalenſis*, which Linnæus claſſes with the butcher birds, under the name of lanius macrourus.

Briſſon firſt propoſed to form a diſtinct genus of thoſe birds under the title of *colius*, which was afterwards adopted by Buffon, under that of *coliou*. The genus *colius*, is inſerted in the Gmelinian edition of the Syſtema Naturæ, and by Dr. Latham in his Index Ornithologicus. Coly is the Engliſh name aſſigned to this genus of birds in the ſynopſis of the laſt-mentioned writer.

Species.

Capensis. Exterior tail feathers white on the outſide; body cinereous. beneath whitiſh. Gmel. Colius capitis bonæ ſpei. Briſſ. Le coliou du cap de B. Eſp. Buff. Vielle, &c. Cape coly. Lath.

This bird inhabits the Cape of Good Hope, and is alſo found in the woods in the ſouthern parts of Africa. Its length is rather more than ten inches; the bill is grey with the tip black; the head and neck purpliſh aſh; breaſt vinaceous; upper tail coverts purpliſh bay; lower coverts, with the belly whitiſh; lower wing-coverts black; legs grey, and armed with black claws.

Senegalensis. Vinaceous-greyiſh; tail blueiſh; head creſted. Gmel.. Colius ſenegalenſis criſtatus. Briſſ. Coliou huppé du Senegal. Buff. Senegal Coly. Lath.

According to Latham, this ſpecies is the ſame ſize as the preceding; Gmelin and Vielle deſcribe it as being about the ſame bulk, but meaſuring two inches more in length. As in capenſis the bill is grey with the tip black; the head is decorated with a creſt of long feathers of a ſea green colour, the reſt of the head, neck, breaſt, belly, and lower part of the back grey; wings and tail grey brown; the middle feathers of the tail eight in number, the outer ones ſcarcely an inch in length.

Erythropus. Blueiſh aſh, beneath whitiſh; head creſted; rump purple, with a white ſtreak in the middle; leſs red; all the toes turned forward. Gmel. Le coliou a croupion blanc. Vielle. White-backed coly. Lath.

This bird is a native of the Cape of Good Hope. Its length is twelve inches. The head is ornamented with a creſt ſimilar to that of the Senegal coly; its back is of a cheſnut purple, with a large white band on the lower part, the reſt of the plumage above is aſh-colour, beneath whitiſh; its legs are yellow with a reddiſh tinge, and the claws are black. The ſpecies is called by Dr. Latham, colius leuconotus. Ind. Orn.

Striatus. Grey; abdomen rufous with tranſverſe black ſtreaks; tail green. Colius ſtriatus. Gmel. Le coliou rayé. Buff. Radiated coly. Lath.

Rather larger than either of the former ſpecies, meaſuring in length about thirteen inches; the two middle tail feathers eight inches long. This is an elegant bird, and inhabits the Cape of Good Hope.

Panayensis. Cinereous tinged with yellowiſh; beneath rufous; breaſt ſtriated with black; head creſted. Gmel. Coliou de l'iſle de Panay. Buff. Panayan coly. Lath.

A native of the Iſle of Panay. Size that of the common groſbeak. The feathers on the head are ſtraight and very long, and form a creſt which the bird can elevate at pleaſure. The bill is black; legs pale fleſh colour.

Viridis. Shining green; hind head, and eyelids ſilky black; wings and legs blackiſh. Green Coly. Lath. Le Coliou vert. Vieille.

A native of New Holland. The length is twelve inches. The front and bill are black, wings and tail blackiſh, the general colour of the plumage fine green.

Indicus. Cinereous, beneath rufous; hind head, chin, lores, and naked orbits of the eyes yellow. Indian coly. Lath. Le Coliou des Indes. Vieille.

Length fourteen inches. General colour of the plumage cinereous aſh above, and reddiſh beneath; black, except the baſe, which is red; the legs are red with black claws

COLL, in *Geography*. See Col.

COLLABANG, a town of Hindooſtan, in the Malwa country; 44 miles W. of Chandaree.

COLLADO, Diego, in *Biography*, a Spaniſh Dominican, was born at Eſtramadura, at the cloſe of the ſixteenth century, and ſtudied at Salamanca. He went as a miſſionary to Japan in 1621, a time when Chriſtians were expoſed by the natives to every ſpecies of perſecution. Meeting with little or no ſucceſs, he returned to Rome in 1625, and after ſome years he obtained regular permiſſion to preach the goſpel in China, Japan, and other eaſtern countries. In 1635, he ſailed with twenty-four of his brethren, and having arrived at the Philippines, he attempted to eſtabliſh ſeveral convents, from which miſſionaries were to be ſent out. This project did not ſucceed, and Collado was recalled by the king to Spain; in his voyage home he was ſhipwrecked, and loſt his life at Manilla. He died in 1638, leaving behind him many works; of theſe the principal are, a "Japoneſe Grammar and Dictionary in Latin." "A continuation of Hyacinth Orfanels Hiſt. Eccleſiaſtica Japon." "Dictionarium Linguæ Sinenſis, cum explicatione Latina et Hiſpanica, charactere Sinenſi et Latino." Gen. Biog.

COLLAERT, Adrian, an engraver and print-ſeller of Antwerp. He is ſaid to have received the firſt inſtructions in his art, in the place of his nativity; after which he repaired to Italy to complete his ſtudies. He contributed not a little, by his aſſiduity, and the facility of his graver, to the numberleſs ſets of prints of ſacred ſtories, huntings, landſcapes, flowers, fiſh, &c. with which the ſtates of Germany and Flanders were at that time inundated. Many of theſe are apparently from his own deſigns, and others from Martin de Vos, Theodore Bernard, P. Breughel, John Stradanus, Hans Bol, and other maſters. His ſtyle of engraving is at the ſame time maſterly and neat, and his knowledge of drawing appears to have been conſiderable; but his prints partake of the defects of his contemporaries, with reſpect to effect of Chiaro-ſcuro; his maſſes of light and ſhade being too much ſcattered, and too equally powerful. The following are amongſt his numerous performances. "The life of Chriſt in 36 ſmall prints." "The twelve months, ſmall circles from H. Bol." "The women of Iſrael chanting the pſalm of praiſe, after the deſtruction of the Egyptians in the Red Sea." This artiſt flouriſhed according to Strutt and Heinecken about 1530—1550.

Collaert, Hans or John, an excellent draughtſman and engraver, ſon to the foregoing artiſt. He ſtudied ſome time in Rome, and afterwards ſettled in his native place, Antwerp, where he aſſiſted his father in moſt of his great works; and afterwards publiſhed a prodigious number of prints of his own, nowiſe inferior to thoſe of Adrian. The works attributed by ſome to one Herman Coblent, are by Heinecken, ſuppoſed to be by this maſter. His prints, according to Strutt, are dated from 1555, to 1622, ſo that he muſt have lived to a great age.

We ſhall only notice the following amongſt his numerous performances: "the life of St. Francis in 16 prints lengthways, ſurrounded by groteſque borders." "Time and truth," a ſmall upright print beautifully engraved, from J. Stradanus; "the laſt Judgment," a large print, encompaſſed with ſmall ſtories of the life of Chriſt. M. Heinecken mentions a print by an artiſt, who ſigns himſelf William Collaert, and ſuppoſes him the ſon of John Collaert. Strutt. Heinecken.

COLLAR *for Horſes*, from *collier*, Fr. and *collum*, Lat. the *neck*, it being the part to which it is applied. It is not improbable that the uſe of the horſe in draft ſervice was prior to that of his being rode, and hence it is reaſonable to infer, that the uſe of the collar, or ſome ſuch apparatus, was nearly coeval with his firſt domeſtication, or only ſecond, perhaps, to the uſe of the pack or pannier, which, as being the moſt ſimple way of employing the horſe, would firſt ſuggeſt itſelf to his poſſeſſor.

To any one employing horſes in draft, the conſtruction of the collar, and the proper adjuſtment of it, cannot be a matter of indifference, as the quantity of force he can exert, and of work which he may be made to perform, will depend in ſome degree upon the due application of it, as well as it may ſerve, work being made eaſy to him, to prolong the period of his ſervices.

The collar at preſent in uſe for the lighter kind of draft horſes, may be thus deſcribed: it conſiſts of a frame formed of ſtraw, of the exterior figure of the baſe or lower part of the neck; this ſtraw is brought together, and firmly bound round by ſtrong leather, which is ſewed over it; behind this a ſofter cuſhion or pad is formed, and attached to the former by its leather being reflected over it, and to which it is firmly ſewed; as the draft could not be attached to ſuch materials, two rods, or ſtays of iron, paſs between the collar and pad, having ſtaples, loops, or eyes, to which the traces, cords, or chains for draft, are affixed; theſe rods are eaſily opened or cloſed, and adapted to the ſize of the neck by ſtraps and buckles at the upper or lower end, or both, the elaſtic materials of the collar and pad readily yielding to the figure theſe deſcribe; ſome of theſe are cloſed only by an hinge at the end, and it muſt be obvious that they will admit of much variety of ſtructure in this reſpect; theſe irons are termed the *hames*, probably from carrying the hamus or hook to which the traces are affixed, and on heavy draft horſes they are formed of two ſtout pieces of wood, plated with iron, to which the ſtaples are affixed, and theſe, as the former, are drawn together or relaxed at either extremity by ſtraps or chains, and as they are made to riſe conſiderably above the withers, it is uſual to place the bearing rein over them, which, in horſes of lighter draft, are carried to the hook of the ſaddle. All the collars we recollect to have ſeen, may be reduced to the above general principles of conſtruction. This collar ſhould not be large enough to get upon the ſhoulders, and good room ſhould be left at its lower part for the freedom of breathing.

For cattle employed in huſbandry, another deſcription of collar is uſed, termed the *yoke*, and which is ſtill very much in uſe in the weſtern parts of England. It appears to be conſtructed nearly as follows: Two heavy pieces of wood as large as a man's arm, or larger, form an oblong arch, whoſe ſides are nearly upright, and almoſt parallel to each other; this is placed over the withers of the beaſt; and through a hole made in the two extremities of this yoke, paſſes a long ſtick or rod, which is tranſverſely perforated to receive two pegs, which prevent the yoke from ſliding along upon this rod. The two beaſts being brought abreaſt, the ſame rod is made to paſs through both the yokes, and being faſtened by the pegs, the cattle are prevented from going from, or coming nearer to, each other; a ring, ſituated in the middle between the two, and through which the ſame ſtick alſo paſſes, ſerves to attach the draft by a chain paſſing between the two oxen.

This conſtruction has a truly ruſtic appearance, and, one ſhould ſuppoſe, would be but little liable to be out of order. The heavy, and often unneceſſary, weight of the yoke has been objected to, as has alſo the effect of the ſolid wood reſting on the neck or ſhoulders; and it is becoming more uſual to employ collars inſtead of this; as, however, the head of the ox, from its ſize, will not admit a collar over it that would fit the neck, it is made, on this account, to open at the top or bottom, and to cloſe after it is on, by a chain or a ſtrap. It is obvious, however, that the complication of traces is prevented by the yoke, and the regularity and evenneſs of the work are eaſily ſeen by the ſituation of the croſs-piece or ſtick paſſing ſtraight through the two yokes.

The war-chariot of the ancients appears to have been uſed with the latter kind of tackling, of which a lucid, uſeful account has been given us by governor Pownall. (See Berenger's Horſemanſhip, vol. ii. p. 271.) A pole in this inſtance paſſed between the two horſes, reſting, by its extremity, upon the croſs-piece, from the yokes about breaſt-high; a ſpike riſing from this paſſed through a perforation in the extremity of the pole, which was then laſhed to it firmly by a ſtrong thong of leather; the axletree of the carriage extended the whole width of the two horſes, or if four were uſed, as in the *quadriga*, a pole paſſed from the *jugum* between each pair of horſes, though on ſome occaſions one pole ſerved for the whole four, paſſing in the middle between them, ſo that the two outſide horſes were laſhed to the vehicle ſomewhat in the manner of what, in modern days, are termed outriggers.

The collar in uſe with them, termed *lepadna*, was a ſort of thick, broad, leathern belt, conſiſting, according to the repreſentations of it on ancient ſculptured buildings, to all appearance "of ſeveral folds of leather ſtuck together and bound at the edges, and ſo cut and ſhaped as to fit the neck and breaſt without preſſing or pinching in one part more than another when buttoned on;" and upon this ſort of collar, if we miſtake not, appears to have reſted the yoke.

To this apparatus alſo belonged the *maſchaliſteris*, or body girth, being a broad leathern belt paſſing round the cheſt, and fixed to the *jugum* and the *lepadna* by the *jugalia lora*. This body-girth appears to have been uſeful principally in ſtopping and keeping the carriage ſteady, the yoke in drawing.

The reins paſſed through the two rings placed on the top of the jugum above the withers.

"The axletrees of theſe machines were made of extraordinary length, which enabled them to paſs in full career over all kinds of ground, over heaps of arms or ſlaughtered bodies, without the danger of an over-turn."

The body itſelf of this carriage was ſimply fixed to the axletree, without being, as in modern times, ſuſpended from it by chains or ſprings, and then again was fixed to the pole, or *temo*, ſo that the whole formed one fixed, and, in reſpect to its parts, immoveable machine.

Of this nature it is evident, from the deſcriptions of Homer, were thoſe uſed in the ſiege of Troy; and of the ſame kind it is alſo clear were thoſe in uſe with the ancient Britons when ſubdued by Julius Cæſar, and to whom this art appears to have been diſcloſed, by colonies arriving in Britain, and trading with her from the eaſtern parts of the Mediterranean. The aſtoniſhing monuments of the Druids, who were the prieſts of theſe colonies, are alſo corroborating proofs of this being the actual ſource of their communication.

To return, however, to the ſubject of the collar, we may, in concluding this imperfect account, remark, that it is not every ſervant, having the care of horſes, that knows better than that the collar ſhould reſt for its principal ſupport againſt the ſhoulders, which, however, it ought in no wiſe to do, or but in a very ſecondary way, as in ſuch caſe it would tend to oppreſs the movements of the ſhoulder, and the prominent points of bone upon the ſhoulder-blade, would get rubbed and ſore, as there is nothing but ſkin, covering them; their ſolid reſiſtance would ſoon occaſion the ſkin to be worn through, or be much injured and ſore, for the place where the collar ſhould reſt is not there, but the baſe of the neck, which in this part is particularly well covered with ſtout fleſhy muſcles to a great depth, affording a kind of elaſtic cuſhion, that effectually ſaves the ſkin from irritation by the preſſure or friction of the collar, and which circumſtance cannot be too much attended to.

Some horſes, it is true, have necks but ill calculated for this kind of harneſs, being very lean and devoid of muſcle, and with ſuch we may often obſerve the head is unuſually large, ſo much ſo, that a collar that would fit the neck could not paſs over it; in this caſe the breaſt-harneſs muſt be had recourſe to, or a collar opening at the top, as we have already deſcribed for the oxen.

In reſpect to the uſe of the horſes in draft, it might admit of ſome inquiry to what point of the collar, or rather hames, the draft ſhould be moſt properly fixed; one ſhould, however, on a firſt view, be led to imagine, that about the middle of the depth of the collar, or rather below that, would be the moſt advantageous point for inſerting the hook for the draft; in the yoke it would appear that the point of draft was too low, but we do not venture to form an opinion upon a ſubject we have ſo little conſidered, but merely preſent it as worthy the conſideration of thoſe who may be intereſted in its diſcuſſion. Where the horſe is much uſed with the collar in hot weather, or indeed at all ſeaſons, waſhing the parts preſſed upon frequently with cold water hardens them, and prevents the ſweat from collecting and injuring the ſkin.

COLLAR is an ornament worn by the kings and heralds at arms, judges, chief magiſtrates, and others; as alſo by the knights of ſeveral orders, hanging over their ſhoulders on their mantle. Collars uſually conſiſt of a chain of gold enamelled, frequently ſet with cyphers, or other devices, appropriate to the ſeveral orders, with the badge ſuſpended at the bottom. The collar of the moſt noble order of the Garter, weighs 30 ounces troy, is of gold, and contains 26 roſes, all within garters enamelled, and as many knots (in alluſion to the ſovereign and his companions), from which is pendant the badge, being the figure of St. George on horſeback, in armour, encountering a dragon with a tilting ſpear; and we often find on old monuments and ſeals, the collar ſurrounding the arms of the knight. For the collars of the other orders, ſee an account of them under their reſpective heads.

COLLAR, in *Roman Antiquity*, a chain fixed round the necks of ſlaves who had run away, after they were taken, with an inſcription, denoting that they were deſerters, and requiring them to be reſtored to their proper owners.

COLLARS, in *Antiquity*, were not only worn by way of ornament, but alſo as amulets, againſt incantations, &c.

COLLAR, *knights of the*, a military order in the republic of Venice, called alſo the order of *St. Mark*, which ſee.

COLLAR, *Lord Mayor's*. See CHAIN.

COLLAR *of Brawn*. See BRAWN.

COLLAR, in *Building*. See CINCTURE.

COLLAR *of the plough*, a term uſed in agriculture to expreſs a ring of iron, which is fixed to the middle of the beam, and ſerves to receive the ends of two chains, the lower one called the *tow chain*, and the upper one called the *bridle-chain*. The lower chain is fixed at its other end to the box, and the upper, or bridle-chain, to the ſtake which runs parallel with the left hand crow-ſtaff. Theſe chains, by means of this collar, and their other inſertions, ſerve to join the head and tail of the plough together. In ſome places the bridle-chain is not fixed to the collar, but to the beam itſelf, by means of a pin; and this is the better way on many accounts. See PLOUGH.

COLLAR-*beam*, in *Carpentry*, a piece of timber placed horizontally between the heads of two queen-poſts in a truſs. See ROOF.

COLLAR, in *Ship Building*, the upper part of a ſtay; alſo a rope formed into a wreath, by ſplicing the ends together with a heart or dead-eye, ſeized in the bight, to which the ſtay is confined at the lower end. There is alſo a collar, or garland, about the main-maſt head, which is a rope wound about there, to ſave the ſhrouds from galling.

COLLARED, or GORGED, in *Heraldry*, ſignifies the wearing a collar round the neck of any beaſt.

COLLAREDO, in *Geography*, a town of Italy, in the duchy of Tuſcany, 4 miles W. of Parana.

COLLARES, or COLARES, a town of Portugal, in the province of Eſtramadura, 10 miles N. of Caſcaes.

COLLARINO, GORGERIN, or NECKING, in *Architecture*, that part of a column which is included between the lower fillet of the capital, and the upper aſtragal of the ſhaft. Thus the collarino is only found in the modern Tuſcan order, the Roman, and modern Doric; (See *Plate* XVI. of *Architecture;*) and ſometimes, though rarely, in the Ionic order.

COLLATERAL, any thing, place, country, &c. ſituate by the ſide of another. The word is compounded of *con*, with, and *latus*, ſide.

COLLATERAL *arteries of the arm*, in *Anatomy*. Under this general name are included thoſe branches, which, ariſing from the humeral artery in its courſe along the arm, communicate with the recurrent branches of the arteries in the fore-arm. The profunda humeri major, is called *collateralis magna;* the profunda minor, and one or two other ſmall branches, are named *collaterales minores*. See ARTERIES.

COLLATERAL *Points*, in *Coſmography*, the intermediate points, or thoſe between the cardinal points. The collateral points are either primary, which are thoſe removed by an equal angle on each ſide from two cardinal points, or ſecondary; which, again, are either thoſe of the firſt or ſecond order. The firſt are thoſe equally diſtant from a cardinal and firſt primary; the latter equally diſtant from ſome cardinal primary, and the firſt ſecondary.

COLLATERAL *Winds*, are thoſe blowing from collateral points. See WIND. Such are the north-eaſt, ſouth-eaſt, north-weſt, ſouth-weſt, &c. with their ſubdiviſions.

COLLATERAL, in *Genealogy*, is underſtood of thoſe relations, which proceed from the ſame ſtock or anceſtor, and in this reſpect they agree with thoſe that are lineal; but they differ in this reſpect, that they do not deſcend one from the other. Accordingly, collateral kinſmen are ſuch as lineally ſpring from one and the ſame anceſtor, who is the *ſtirps*, or root, the *ſtipes*, trunk, or common ſtock, from whence theſe relations are branched out. Thus, if John Stiles hath two ſons, who have each a numerous iſſue, both theſe iſſues are lineally deſcended from John Stiles, as their common anceſtor; and they are collateral kinſmen to each other, becauſe they are all deſcended from this common anceſtor, and all have a portion of his blood in their veins, which denominates them "conſanguineous." See CONSANGUINITY.

COLLATERAL *Deſcent*. See DESCENT.

COLLATERAL *Aſſurance*, in *Law*, is a bond, or other ſecurity, made over, and beyond the deed itſelf, for the performance of covenants between man and man; thus called, as being external, and without the nature and eſſence of the covenant. Crompton ſays, that to be ſubject to the feeding of the king's deer, is collateral to the ſoil within the foreſt. It may be added, that liberty to pitch booths in a fair, or another man's ground, is collateral to the ground.

COLLATERAL *Condition*. See CONDITION.

COLLATERAL *Warranty*. See WARRANTY.

COLLATERAL *Cut*, in *Artificial Navigation*, ſignifies the ſame with arm or branch of a canal. See CANAL.

COLLATERAL *Bee-boxes*, in *Rural Economy*. See HIVE.

COLLATIA, in *Ancient Geography*, a city that ſtood on the borders of Latium, and the country of the Sabines, between the Præneſtine way and the left bank of the Anio, about ſix miles from Rome.

This town was taken by Tarquinius Priſcus, who left in it a garriſon to awe the inhabitants. Tarquinius Collatinus, the huſband of Lucretia, raviſhed by Sextus Tarquinius, was of this town. In Strabo's time it was only a village. M. l'Abbe Chaupy has found its ruins in a place called *Corcollo*.—Alſo, a town of Italy, in Apulia, near mount Garganus, according to Pliny. The inhabitants were denominated Collatini; and the territory Collatinus Ager.

COLLATIO *Bonorum*, in *Law*. See DISTRIBUTION and HOTCHPOT.

COLLATION, in *Canon Law*, the conferring, or beſtowing a benefice by a biſhop, who has it in his own gift, or patronage, and this he does, *jure pleno*.

Collation differs from inſtitution in this, that the latter is performed by the biſhop, at the motion or preſentation of another; and the former on his own motion.

Beſides, by collation, the church is not full; for the higheſt patron may at any time remove the collatee, except he hath a right to collate, which plenary by collation may be pleaded; the biſhop's collation, in this reſpect, is no more than a temporary proviſion for celebration of divine ſervice, till the patron preſents.

Collation alſo differs from preſentation, as the latter is properly the act of a patron, offering his clerk to the biſhop to be inſtituted into a benefice; whereas the former is the act of the biſhop himſelf. The collator can never confer a benefice on himſelf.

Collation differs from a common preſentation, as it is the giving of the church to the parſon; and preſentation is the giving, or offering of the parſon to the church. But collation ſupplies the place of preſentation and inſtitution;

and amounts to the ſame as inſtitution, where the biſhop is both patron and ordinary. 1 Lil. Abr. 273.

In the Romiſh church the pope is the collator of all the benefices, even elective ones, by prevention; ſetting aſide conſiſtorial benefices, and thoſe in the nomination of lay-patrons. Prelates and biſhops are called ordinaries, or ordinary collectors.

If the ordinary collator neglect to exerciſe his right for ſix months, the ſuperior collator may collate by devolution. Thus, if the biſhop neglect, the metropolitan may confer; then the primate; and ſo on from degree to degree. In France, the king, according to the old conſtitution, was the collator of all the benefices whereof he is patron, excepting conſiſtorial ones, to which he had only the nomination, and the pope, by virtue of the concordat, was obliged to confer on whomſoever the king nominates. For the reſt, he was direct and abſolute collator; and might confer them, by virtue of a kind of prieſthood annexed to the royalty.

Other lay-patrons have ſeldom more than a mere preſentation; the collation properly belonging to the biſhop; yet there are ſome abbots who have the full right of collation. The canoniſts reckon two kinds of collation; the one free and voluntary, the other neceſſary. The firſt depending on the mere will of the collator, who may chuſe whom he pleaſes to fill the vacancy. In the latter, the collator is not at his liberty; which is the caſe where a benefice has been reſigned, or changed, and that reſignation or permutation allowed of by the ſuperior; for here the collator is obliged to grant the proviſion to the reſignatory, or compermutant.

It is a maxim in the new canon law, *collationes ſunt in fructibus*; "Thoſe who have the fruits of a benefice, have the collation." But in that caſe, the word collation is uſed for preſentation. See Lapse and Presentation.

Collation, in *Common Law*, is the compariſon, or preſentation of a copy to its original, to ſee whether or not it be conformable: or the report, or act of the officer who made the compariſon. A collated act is equivalent to an original, provided all the parties concerned were preſent at the collation.

Collation is alſo uſed among the Romaniſts for the meal or repaſt made on a faſt-day, in lieu of a ſupper.

Only fruits are allowed in a collation: F. Lobineau obſerves, that anciently there was not allowed even bread in the collations in lent: nor anything beſide a few comfits, and dried herbs, and fruits; which cuſtom, he adds, obtained till the year 1513. Cardinal Humbert obſerves further, that in the middle of the eleventh century, there were no collations at all allowed in the Latin church in the time of Lent; and that the cuſtom of collations was borrowed from the Greeks; who themſelves did not take it up till about the eleventh century.

Collation, in *Scots Law*, denotes the right which an heir has of throwing the whole heritable and moveable eſtates of the deceaſed into one maſs, and ſharing it equally with others in the ſame degree of kindred, when he thinks ſuch ſhare will be more than the value of the heritage to which he had an excluſive title.

Collation, *collatio*, συμβολη, in *Rhetoric*, is uſed for Comparison.

But Scaliger diſtinguiſhes, alleging, that in collation, one thing is compared to another that has preceded it; and that the contrary happens in compariſon. That to which any thing is compared is called protaſis, and that which is compared is called antapodoſis.

Collation is alſo popularly uſed for a repaſt between dinner and ſupper.

The word collation, in this ſenſe, Du-Cange derives from *collocutio, conference*; and maintains, that originally collation was only a conference, or converſation on ſubjects of piety, held on faſt-days in monaſteries; but that, by degrees, the cuſtom was introduced, of bringing in a few refreſhments; and that by the exceſſes to which thoſe ſober repaſts were at length carried, the name of the abuſe was retained, but that of the thing loſt.

Collation *of ſeals*, denotes one ſeal ſet on the ſame label, on the reverſe of another.

COLLATIONE *facta uni poſt mortem alterius*, in *Law*, a writ directed to the juſtices of the Common Pleas, commanding them to iſſue their writ to the biſhop, for the admiſſion of a clerk, in the place of another preſented by the king, who died during the ſuit between the king and the biſhop's clerk; for, judgment once paſſed for the king's clerk, and he dying before admittance, the king may beſtow his preſentation on another. Reg. Orig. 31.

Collatione *heremitagii*, a writ whereby the king conferred the keeping of an hermitage upon a clerk.

Collatione-*Cut*, denotes a ſide arm or branch of a Canal.

COLLATIONIS *forma*. See Contra.

COLLATIVE *Advowſons*. See Advowson.

COLLE, John, in *Biography*, a voluminous writer on medicine, was born at Belluno, in 1558; he ſtudied medicines at Padua, under Capivaccius, and was made doctor in that faculty in 1584. At Venice he practiſed medicine about fifteen years, when he was promoted to be firſt phyſician to the duke of Urbino. In 1591, he was called to fill the chair of profeſſor of medicine at Padua, which poſt he held with diſtinguiſhed credit to the time of his death, which happened in 1631.

Among his works are "Medicina Practica, ſive Methodus cognoſcendorum et curandorum omnium affectuum peſtilentialium;" containing a hiſtory of epidemic diſeaſes, fol. 1617. In 1610, a ſpecies of pleuriſy prevailed, he ſays, which did not bear bleeding in the arm. It was moſt ſucceſsfully combated by cupping, glyſters, and mild cathartics. "Coſmitor mediceus triplex in quo exercitatio totius artis medicæ deciſa, ac conſultationes medicinales, et queſtiones practicæ enucleatæ proponuntur," Venet. 1621, folio. The book is dedicated to Coſmo the Second, and contains a rational ſyſtem of medicine, with numerous uſeful practical obſervations. "De morbo gallico, et ejus ſymptomatibus," 4to. 1628, contains a brief hiſtory of this diſeaſe. He gave the decoction of the woods, and when they failed he had recourſe to ointments and fumigations, with mercury. For the titles of the remainder of his works, ſee Haller's Biblioth. Med. Pract. &c. Eloy Dict. Hiſt.

Colle, Raffaello del, ſo called from the place of his nativity, a ſmall town near the city of St. Sepolcro; was a painter of very extraordinary merit, though the circumſtance of his chief performances exiſting in the environs of the retired ſpot where he was born, has occaſioned his being but little known. He is ſaid to have been, in his youth, the diſciple of Raffaelle d'Urbino, and to have painted from that great maſter's deſigns, the ſtories of the Deluge, and the Adoration of the Golden Calf, in the Loggia of the Vatican. After the death of Raff. d'Urbino, he aſſiſted Giulio Romano in many of his great works at Rome, as well as in thoſe of the palace of Te at Mantua.

At St. Sepolcro are two altar-pictures by Raffaello del Colle which poſſeſs great ſpirit and beauty, and are worthy of that ſchool in which his talents were matured: the firſt in the church of S. Rocco, repreſents the reſurrection of our Saviour, where the majeſty and triumph in the figure of

Chriſt are finely contraſted by the aſtoniſhment and terror of the guards employed to keep watch; the other, in the church of St. Franceſco outſide the city, deſcribes the aſſumption of the virgin, and is replete with all the graces of deſign and colouring. The periods of the birth and death of this maſter are unknown; we find, however, that he aſſiſted Vaſari in the decorations made for the reception of Charles V. at Florence in the year 1536. Langi. Storia Pitt. Orlandi.

Colle, Charles, ſecretary and reader to the duke of Orleans, was born at Paris in the year 1709. He exhibited an early taſte for poetry, and was author of various dramatic pieces. He was alſo a ſong writer, and obtained the name of the French Anacreon. For his ſong written on the capture of Port Mahon, he was rewarded with a penſion of 600 livres. He died in 1783, and his works have been collected in 3 vols. 12mo; under the title of "Theatre de Societè:" his verſes are neat, and in general well turned, but they are not unfrequently chargeable with indecency. Nouv. Dict. Hiſt.

Colle, in *Geography*, a town of Italy, in the duchy of Tuſcany, the ſee of a biſhop, ſuffragan of Florence; 25 miles ſouth of Florence.

Colle *Dunenzo*, a town of Naples, in the province of Abruzzo Citra; ſeven miles north of Civita Borella.

Colle *Duo*, a town of Naples, in the province of Abruzzo Ultra; 23 miles S.W. of Aquila.

Colle *Salvieta*, a town of the duchy of Tuſcany; 10 miles from Piſa.

COLLEAGUE, a companion, partner, or aſſociate in the ſame office, or magiſtrature. See Adjunct and Associate.

The word is particularly uſed in ſpeaking of the Roman conſuls, and emperors.

COLLECHIO, in *Geography*, a town of Italy in the Parmeſan; four miles weſt of Parma.

COLLECT, Collection, a voluntary gathering of money, for ſome pious or charitable purpoſe.

Some ſay, the name *collect*, or *collection*, was uſed, becauſe thoſe gatherings were anciently made on the days of *collects*, and in *collects*, *i.e.* in aſſemblies of Chriſtians; but it was more probably, *quia colligebatur pecunia*.

Collect is ſometimes alſo uſed for a tax, or impoſition, raiſed by a prince for any pious deſign.—Thus hiſtories ſay, that in 1166, the king of England, coming into Normandy, appointed a collect for the relief of the Holy Land, at the deſire, and after the example, of the king of France. See Croisade.

Collect, in the liturgy of the church of England, and the maſs of the Romaniſts, denotes a prayer accommodated to any particular day, occaſion, or the like.

In the general, all the prayers in each office are called *collects*; either becauſe the prieſt ſpeaks in the name of the whole aſſembly, whoſe ſentiments and deſires he ſums up by the word *oremus*, *let us pray*, as is obſerved by pope Innocent III., or becauſe thoſe prayers are offered when the people are aſſembled together; which is the opinion of Pamelius on Tertullian.

The congregation often is in ſome ancient authors called *collect* The popes Gelaſius and Gregory are ſaid to have been the firſt who eſtabliſhed collects. Deſpenſe, a doctor of the faculty of Paris, has an expreſs treatiſe on collects, their origin, antiquity, authors, &c

COLLECTION, Collectio, in *Logic*, a term uſed by ſome for what is commonly called Syllogism, and Ratiocination.

COLLECTIVE *Idea*, is a complex idea, which unites many ideas of the ſame kind under one name, or under one view: as army, dictionary, flock, &c. See Complex and Compounded *Idea*.

COLLECTIVE, in *Grammar*, a term applied to a word that expreſſes a multitude; though itſelf be ſingular. Thus, troop, company, and army, are nouns *collective*.

COLLECTOR, a perſon nominated by the commiſſioners of any duty, the inhabitants of a pariſh, or the like, to raiſe or gather any tax, &c. See Receivers.

Collector, in *Electricity*, is a ſmall appendage to the prime conductor of the electrical machine, generally conſiſting of pointed wires, affixed to that end of the prime conductor which ſtands contiguous to the glaſs globe, or cylinder, or other electric of the machine. Its office is to receive the electricity, whether poſitive or negative, from the excited electric, much more readily than the blunt end of the prime conductor would be able to receive it without that appendage.

In the ſimple, or rather defective, conſtruction of electrical machines towards the beginning of the laſt century, an iron or braſs chain, ſupported in an horizontal poſition by means of ſilk ſtrings, formed the prime conductor; and one extremity of that chain hanging perpendicularly down before the globe of glaſs or ſulphur, or other electric, performed the office of collector. Sometimes inſtead of the chain, a gun barrel, ſupported horizontally upon ſilk ſtrings, was uſed for a prime conductor, and from one end of the barrel a piece of chain came down before the electric, by way of collector. Several years ago, the late ſir William Watſon, M. D. conſtructed an electrical machine, in which four glaſs globes, ſet one above the other, were excited at the ſame time. This machine, it ſeems, is ſtill in exiſtence at the Britiſh Muſeum. A gun barrel formed the prime conductor, and from one end of this barrel a ſort of metallic fringe came down and collected the electricity from the four globes, which it touched in the anterior part of their ſurface. In other machines a ſort of taſſel of gilt paper formed the collector. But, though this taſſel, or chain, or fringe, might anſwer the purpoſe ſufficiently, at a time when the excitation of the electric was weak, in conſequence of the imperfect conſtruction of the machines, ſmall ſize of the electric, and eſpecially for want of the amalgam, which, ſince it was introduced by Mr. Canton, has greatly increaſed the power of the machines; they were in proceſs of time found leſs uſeful, and as the ſcience was improved, other methods were adopted; for when the electricity is copiouſly ſupplied, thoſe collectors diſſipate a great portion of it into the ſurrounding air, or the adjacent ſolids; ſince the diſperſion of electricity from the ſurface of a certain body, ſeems to be greater than in the ſimple proportion of the quantity of electricity in that body.

In Dr. Prieſtley's electrical machine, which he deſcribed in his Hiſtory of Electricity, (part v. ſec. ii.) the prime conductor is an hollow copper veſſel of a pear-like form, the upper part of which is furniſhed with a long bent wire in the form of an arch. The farther end of this wire comes near the glaſs globe, and is formed into a ring, in which are hung ſome ſharp pointed wires, that play lightly upon the ſurface of the globe when it is in motion. This form of the prime conductor, bent wire, &c. is, however, very improper on various accounts. But with reſpect to the collector, there is no occaſion to place the pointed wires ſo near as to touch the glaſs globe or cylinder. In Nairne's patent electrical machine, in which the conductors are placed parallel to the axis of the glaſs cylinder, a number of pointed wires, little more than an inch in length, are fixed on the ſide of the conductor, and are ſituated ſo as to come with their points within the diſtance of about a quarter of an inch from the ſurface of the glaſs cylinder. Indeed pointed wires, fixed immediately on the blunt end of the prime conductor, from about one quarter of an inch to three inches in length, according to the ſize and ſhape of the machine, and directed towards the glaſs globe, or cylinder, or plate, of the electrical machine, ſo that their pointed extremities may ſtand at the diſtance of about half an inch from the glaſs ſurface, form the beſt ſort of collector; and ſuch have been uſed in the beſt and moſt powerful machines, conſtructed by Nairne, Dollond, Adams, Cuthbertſon, Jones, and other eminent philoſophical inſtrument makers.

In order to aſcertain what number of pointed wires would be ſufficient to form the collector for any particular electrical machine, ſeveral experiments were made ſome years ago, by a few ſcientific gentlemen. They ſucceſſively placed at the end of the prime conductor, one, two, three, and many more, pointed wires; and with each number examined the length and power of the ſpark drawn from the end of the prime conductor; the revolution and excitation of the cylinder being continued as equally as it was poſſible. They alſo repeated the ſame experiments with machines of various ſizes. Upon the whole they found, that a ſingle ſharp pointed wire between two and three inches in length, imbibed nearly as much electricity from the largeſt cylinder, as any number of wires; and two or three wires ſet parallel to, and at about one inch diſtance from each other, (which in an electrical machine with a very large cylinder acted very little better than a ſingle wire) was the utmoſt number of wires, that need be uſed for a collector. A greater number, by reaching too far beyond the protection of the blunt end of the conductor, and by coming nearer to the pillars of the machine, ſerve only to diſſipate the electricity.

The particular ſhapes of the collectors for the various forms of electrical machines are exhibited in ſeveral of the plates belonging to electricity in this Cyclopædia.

Collectors, in *Botany*, ſuch ſtudents as have attempted the knowledge of plants, without reducing it to any certain ſcience, being barely employed about obſerving, or getting together the various ſpecies. Linnæi Fund. Bot. p. 1.

COLLEDA, in *Geography*, a town of Germany, in the circle of Upper Saxony, and country of Thuringia, 12 miles N. of Weimar, and 16 N.N.E. of Erfurt.

COLLEGATARY, in the *Civil Law*, a perſon to whom is left a legacy in common with one or more other perſons. If the thing be bequeathed *in ſolido*, the portion of a deceaſed collegatary accrues to the reſt.

COLLEGE, an aſſemblage of ſeveral bodies, or ſocieties; or even of ſeveral perſons into one ſociety.

College, *collegium*, among the Romans, was uſed for an aſſemblage of ſeveral perſons employed in the ſame functions, and, as it were, bound together to act, or ſerve in concert. The pontifices, augures, ſeptemviri epulones, and quindecemviri, were called the four colleges of prieſts. When divine honours were decreed to Auguſtus, after his death, a fifth college was added, compoſed of his prieſts, hence called "Collegium ſodalium Auguſtalium." (Tac. Annal. iii. 64. Dio. lvi. 46. lviii. 12.). So "Flavialum collegium" denoted the prieſts of Titus and Veſpaſian. (Suet. Dom. 4.). To each of the colleges of pontifices, augures, and quindecemviri, Julius Cæſar added one, and to the ſeptemviri three. (Dio. xlii.). After the battle of Actium, a power was granted to Auguſtus, of adding to theſe colleges as many extraordinary members as he thought proper; which power was exerciſed by the ſucceeding emperors; ſo that the number of theſe colleges was from that time very uncertain. (Dio. li. 20. liii. 17.). They ſeem, however, to have retained their ancient names. But the name of *collegium* was applied not only to ſome other fraternities of prieſts, beſides thoſe above enumerated, but to any number of perſons joined in the ſame office, as the conſuls, prætors, quæſtors, and tribunes. Moreover, it ſerved indifferently for thoſe employed in the offices of religion, of government, the liberal arts, and even mechanical arts, or trades; ſo that the word properly ſignified what we call a *corporation*, or *company*. In the Roman empire, there were not only the *college of augurs*, and the *college of capitolini*, *i. e.* of thoſe who had the ſuperintendence of the capitoline games; but alſo colleges of artificers, *collegia artificum*; college of carpenters, *fabricorum*, or *fabrorum tignariorum*; of potters, *figulorum*; of founders, *ærariorum*; the college of lockſmiths, *fabrorum ferrariorum*; of engineers of the army, *tignariorum*; of butchers, *laniorum*; of dendrophori, *dendrophororum*; of centonaries, *centonariorum*; of makers of military caſques, *ſagariorum*; of tent-makers, *tabernaculariorum*; of bakers, *piſtorum*; of muſicians, *tibicinum*, &c.

Plutarch obſerves, that it was Numa who firſt divided the people into colleges. Finding, upon his acceſſion, the city torn to pieces by the two rival factions of Sabines and Romans, he thought it a prudent and politic meaſure to ſubdivide theſe two into many ſmaller ones, by inſtituting ſeparate ſocieties of every manual trade and profeſſion. This he did to the end, that each conſulting the intereſts of their college, whereby they were divided from the citizens of the other colleges, they might not enter into any general conſpiracy againſt the public repoſe.

Theſe political conſtitutions, originally invented by the Romans, were afterwards much conſidered by the civil law, in which they were called "univerſitates," as forming one whole out of many individuals; or "collegia," from being gathered together. They were adopted alſo by the canon law, for the maintenance of eccleſiaſtical diſcipline; and from them our ſpiritual corporations are derived. See Corporation.

Colleges were diſtinguiſhed from other ſocieties, not formed into colleges by public authority, in this, that thoſe who compoſed a college, were qualified to treat of the common intereſts of their college, which was, as it were, a member of the ſtate, and had a common purſe; an agent to negotiate their affairs; ſent deputies to the magiſtrates when they wanted to treat with them; might make ſtatutes and by-laws, for the adminiſtration of their college, &c.

There are various colleges on foot among the moderns, built on the model of thoſe of the ancients; as the three colleges of the empire, *viz.* the *college of electors*, *college of princes*, and *college of cities*. This diſtinction is ſaid to have been eſtabliſhed, at the diet of Frankfort, in the year 1580.

College *of Electors*, is the body of electors, or their deputies, aſſembled in the diet at Ratiſbon. The election of emperor is required to be made at Frankfort by the golden bull; though ſome emperors have been elected at Ratiſbon. See Elector.

College *of Princes*, is the body of princes, or their deputies, at the diet of Ratiſbon.

This college of the princes of the empire is more extenſive, as to number, but leſs powerful than the electoral college, which, with the emperor, is at the head of the Germanic body. Theſe princes, as well as the electors, are divided into two claſſes, ſecular, as dukes, margraves, landgraves, burgraves, counts, &c.; and eccleſiaſtic, ſuch as archbiſhops, biſhops, abbots, &c. that immediately hold of the empire. Thoſe who compoſe this college, have the right of ſitting in the diets, or general aſſemblies, with a deliberative and deciſive voice, and contribute to the neceſſities of the empire, according to the tax eſtabliſhed by the matricular book, or regiſter of the ſtates. The princes of both orders, in the former ſtate of the German empire, held immediately of the emperor and the empire; they had power to appoint judges for the adminiſtration of juſtice, which ſome of them exerciſed as ſovereigns, while others were limited to certain ſums, above which all cauſes depending muſt be decided by appeal to the chamber of Spire. They were allowed to eſtabliſh new laws, create magiſtrates, grant letters of grace, reſpite, ſafe conduct, majority, and legitimation. They had the right to ſucceed to baſtards, to raiſe and quarter ſoldiers, erect univerſities, coin money, make arms, and caſt artillery, to increaſe the number of their fortreſſes, and ſecure them with garriſons; make alliances among themſelves, as well as with ſtrangers, for their common defence; and, in a word, to reign in their territories as the emperor reigned in the empire. For the change in the German empire that has recently occurred, ſee CONFEDERATION and GERMANY.

COLLEGE *of Cities*, is, in like manner, the body of deputies which the ſeveral imperial and free cities ſend to the diet. Theſe cities, which were formerly numerous and important, are now reduced to the following ſix, *viz.* Hamburgh, Augſburg, Lubeck, Nuremburg, Frankfort, and Bremen. The cities of Ratiſbon and Wetzlar are no longer conſidered as imperial, but enjoy an abſolute neutrality, even during the wars of the empire, the firſt as the ſeat of the diet, and the ſecond as that of the imperial chamber. See CONFEDERATION and GERMANY.

COLLEGE, *Electoral*, in the late organization of the French conſtitution, denotes a certain claſs of perſons, nominated by the aſſembly of canton (ſee CANTON) for each diſtrict and department. The electoral colleges of diſtrict have a member for every 500 inhabitants domiciliated within the diſtrict; but the number of members cannot exceed 200, nor be leſs than 120. The electoral colleges of departments have a member for every 1000 inhabitants domiciliated within the department; and theſe members cannot exceed 300, nor be under 200. The members of the electoral colleges are for life. If any member of the electoral college be denounced to government for any act contrary to honour or the intereſt of the country, the government invites the college to declare its will; but no number under three fourths of the votes ſhall deprive the denounced member of his place in the college. A place is loſt in the electoral colleges for the ſame cauſes that deprive a perſon of the right of citizen. It is alſo forforfeited without any legitimate obſtruction, by non-attendance at their ſucceſſive meetings. The firſt conſul appoints the preſidents of electoral colleges for each ſeſſion; and the preſident alone has the police of the electoral college, after it is aſſembled. The electoral colleges appoint for each ſeſſion two ſcrutineers and a ſecretary.

For the purpoſe of the formation of electoral colleges of departments, there ſhall be prepared in every department, under the direction of the miniſter of finance, a liſt of 600 of the citizens, who ſtand higheſt in the rolls of contributions, landed chattel, and ſumptuary, and upon the roll of patents. The aſſembly of canton ſhall take from this liſt the members which it is to appoint to the electoral college of the department. The firſt conſul may add to the electoral colleges of diſtricts 10 members, choſen from the citizens belonging to the legion of honour, or who have rendered ſervices. It may alſo add to every electoral college of department 20 citizens, of whom 10 ſhall be taken from the 30 of the firſt conſideration in the department; and the 10 others either from the members of the legion of honour, or citizens who have rendered ſervices. He is not confined for theſe nominations to any fixed period in point of time. The electoral colleges of diſtrict preſent to the firſt conſul two citizens domiciliated within the diſtrict for every vacant place in the council of diſtrict. One at leaſt of theſe citizens ought to be neceſſarily choſen from without the electoral college that preſents him. The councils of diſtrict are to be renewed, a third at a time, every three years. The electoral colleges of diſtricts preſent to every meeting two citizens, to form part of the liſt from which the members of the tribunate are to be choſen: and one at leaſt of theſe citizens muſt be choſen from without the electoral college that preſents him. Both may be taken from without the department. The electoral colleges of department preſent to the firſt conſul two domiciliated within the department for every vacant place in the council-general of department. One of theſe, at leaſt, muſt be taken from without the electoral college that preſents him. The councils-general of department are to be renewed by a third every five years. The electoral colleges of department preſent to every meeting two citizens to form the liſt from which are to be appointed the members of the ſenate, one of whom muſt be taken from without the college that preſents him; and both may be taken from without the department. The electoral colleges of department and diſtrict preſent, each of them, two citizens domiciliated within the department, to form the liſt from which are to be choſen the members of the deputation to the legiſlative body; one of theſe muſt be taken from without the college that preſents him. There muſt be three times as many different candidates upon the liſt formed by the union of the preſentations of the electoral college of department and diſtrict, as there are here vacant places. The ſame perſon may be a member of a council of commune, and of an electoral college of diſtrict or department. A perſon cannot be at the ſame time a member of a college of diſtrict, and of a college of department. The members of the legiſlative body and tribunate cannot aſſiſt at the ſittings of the electoral college, of which they will make part. All the other public functionaries have a right to aſſiſt and vote at them. No aſſembly of canton ſhall proceed to the nomination of the places belonging to it in an electoral college until theſe places are reduced to two-thirds. The electoral colleges cannot aſſemble but by virtue of an act of convocation iſſued by government, and in the place appointed for them. They cannot occupy themſelves with any operations except thoſe for which they are convened, nor continue their ſittings beyond the time fixed by the act of convocation. If they exceed theſe limits, the government has a right to diſſolve them. The electoral colleges can neither directly nor indirectly, under any pretext whatever, correſpond between themſelves. The diſſolution of an electoral body operates the renewal of all its members.

COLLEGE *of Cardinals*, or the *ſacred college*, is a body compoſed of the three orders of cardinals, *viz.* cardinal-biſhops, cardinal-prieſts, and cardinal-deacons.

Each order has its dean, or chief. The dean of the cardinal-biſhops is always the biſhop of Oſtia. See CARDINAL.

COLLEGE is alſo uſed for a public place, endowed with certain revenues, where the ſeveral parts of learning, both divine and human, are taught, in ſchools, halls, or claſſes, appointed for that purpoſe.

An aſſemblage of ſeveral of theſe colleges conſtitutes an univerſity.

Among the Greeks, the lyceum and academy were celebrated colleges: the latter of which has given its name to our univerſities, which in Latin are called *academiæ*. With them, the houſe or apartment of each philoſopher, or rhetor, might be eſteemed a kind of college of itſelf. See ACADEMY, and LYCEUM.

The Romans came late into the inſtitution of ſuch colleges; they had, however, ſeveral founded by their emperors; eſpecially in Gaul; the chief whereof were thoſe of Marſeilles, Lyons, Beſançon, and Bourdeaux.

The Jews, and Egyptians too, have had their colleges; the chief of the firſt were thoſe of Jeruſalem, Tiberius, Nardea, Pompodita, Sura, and Babylon; the laſt is ſaid to have been inſtituted by Ezekiel, and to have ſubſiſted in the time of Mahomet.

Colleges of this kind have been generally in the hands of thoſe conſecrated to the offices of religion; the Magi in Perſia, the Gymnoſophiſts in the Indies, and the Druids in Gaul and Britain, had the care of educating youth in the ſciences.

After Chriſtianity became eſtabliſhed, there were almoſt as many colleges as monaſteries; Charlemagne, in his Capitulars, injoining the monks to inſtruct youth in muſic, grammar, and arithmetic; but this calling the monks from their ſolitude, and taking up too much of their time, the care of the colleges was at length put into the hands of thoſe who had nothing elſe to do.

In the canon law, it is ſaid, three perſons make a college, *tres collegium faciunt*.

The eſtabliſhment of colleges or univerſites is a remarkable æra in literary hiſtory. The ſchools in cathedrals and monaſteries confined themſelves chiefly to the teaching of grammar. But in colleges, profeſſors were appointed to teach all the different parts of ſcience. The time that ought to be allotted to the ſtudy of each was aſcertained. A regular form of trying the proficiency of ſtudents was preſcribed; and academical titles and honours were conferred on ſuch as acquitted themſelves with approbation. A good account of the nature and origin of theſe is given by Seb. Bacmeiſterus "Antiquitates Roſtochienſes, ſive, Hiſtoria Urbis et Academiæ Roſtoch, ap. Monumenta inedita Rer. Germ, per E. S. de Weſtphalen," vol. iii. p. 781. Leipſ. 1743. The firſt obſcure mention of theſe academical degrees in the univerſity of Paris (from which the other univerſities in Europe have borrowed moſt of their cuſtoms and inſtitutions) occurs A.D. 1215. (Crevier, "Hiſt. de l'Univ. de Paris," tom. i. p. 296, &c.). They were completely eſtabliſhed A.D. 1231. It is unneceſſary to enumerate the ſeveral privileges to which bachelors, maſters, and doctors were entitled. One circumſtance is ſufficient to demonſtrate the high degree of eſtimation in which they were held. Doctors in the different faculties contended with knights for precedence, and the diſpute was terminated in many inſtances by advancing the former to the dignity of knighthood, which was accompanied with high prerogatives. It was even aſſerted, that a doctor had a right to that title without creation. Bartolus taught—"doctorum actualiter regentem in jure civili per decennium effici militem ipſo facto." (Honoré de St. Marie, Diſſert. p. 165.) This was called "Chevalerie de Lectures," and the perſons advanced to that dignity, "milites clerici." Theſe new eſtabliſhments for education, together with the extraordinary honours conferred on learned men, greatly increaſed the number of ſcholars. In the year 1262, there were 10,000 ſtudents in the univerſity of Bologna; and it appears from the hiſtory of that univerſity, that law was the only ſcience taught in it at that time. In the year 1340, there were 30 000 in the univerſity of Oxford. (Speed's Chron. ap. Anderſon's "Chron. Deduction of Commerce." vol. i. p. 172.) In the ſame century 10,000 perſons voted on a queſtion agitated in the univerſity of Paris, and as graduates alone were admitted to that privilege, the number of ſtudents muſt have been vaſtly great. (Velly's "Hiſt. de France." tom. xi. p. 147.) There were, indeed, few univerſities in Europe at that time; but ſuch a number of ſtudents may nevertheleſs be produced as a proof of the extraordinary ardour with which men turned to the ſtudy of ſcience in thoſe ages. It ſhews likewiſe that they began to conſider other profeſſions beſides that of a ſoldier as honourable and uſeful. See Robertſon's Hiſt. Ch. V. vol. i. p. 389, &c.

For an account of the colleges of Cambridge and Oxford; ſee theſe articles. For thoſe of Scotland, ſee ABERDEEN, ST. ANDREW'S, EDINBURGH, and GLASGOW. For thoſe of Ireland, ſee DUBLIN and IRELAND.

In America they have alſo many colleges. The moſt ancient, as well as the principal, literary eſtabliſhment in this country is Harvard college, or univerſity, which was founded at Newtown, ſince called Cambridge, in the province of Maſſachuſetts, in the year 1638. It derives its name from the Rev. John Harvard of Charleſtown, who left a legacy of 779*l.* 17*s.* 2*d.* ſterling, being one half of his eſtate, to the further endowment of it. In 1650, this college received its firſt charter from the court, appointing a corporation conſiſting of ſeven perſons, *viz* a preſident, five fellows, and a treaſurer, to have perpetual ſucceſſion by election to their offices, under the title of "The Preſident and Fellows of Harvard College." After the declaration of the independence of the United States, the fore-mentioned charter was eſtabliſhed by the conſtitution of Maſſachuſetts; and the governor and lieutenant governor for the time being, together with the council and ſenate of the commonwealth, the preſident for the time being, and the congregational miniſters of the following ſix towns, *viz.* Cambridge, Watertown, Charleſtown, Boſton, Roxbury, and Dorcheſter, were declared ſucceſſors of the old board of overſeers, who had been appointed for its ſuperintendence in the year 1642. The executive government conſiſts of the preſident, three profeſſors, four tutors, and the librarian, who ſuperintend the morals of the ſtudents and the obſervance of the ſtanding laws, and make diſcretionary regulations in caſes not provided for by the laws. The profeſſors and tutors give inſtruction in the univerſity. It has a profeſſor of divinity, a profeſſor of mathematics and natural philoſophy, and a profeſſor of Hebrew and other Oriental languages, who is alſo profeſſor of the Engliſh language. The two firſt of theſe profeſſorſhips were founded by Mr. Thomas Hollis of London, merchant, who, together with others of his family, furniſhed the college with the philoſophical apparatus, and a number of valuable books; the divinity profeſſorſhip in 1722; the mathematical profeſſorſhip in 1726; the profeſſorſhip of Hebrew, &c. by the Hon. Thomas Hancock, eſq. in 1765. Theſe ſeveral profeſſorſhips bear the names of their founders. Foundations are laid for two other profeſſorſhips, *viz.* one of rhetoric and oratory, and another of natural religion, moral philoſophy, and civil polity, by the legacies of Nicolas Boylſton, eſq. of Boſton; and the Hon. John Alford, eſq. of Charleſtown. In 1782 a medical inſtitution was formed in the univerſity. It conſiſts of three profeſſorſhips, *viz.* one of anatomy and ſurgery, one of the theory and practice of phyſic, and another of chemiſtry and the materia medica. Among the preſidents and profeſſors of this univerſity, we find ſeveral perſons eminently diſtinguiſhed both by natural abilities and acquired accompliſhments. The ſtudents are annually examined in the ſeveral branches of education as far as their courſe has been completed, before a committee of the corporation and overſeers. The courſe of education is completed in the univerſity in four years, at the end of which term, thoſe ſtudents, who have complied with other requiſites, are candidates for the degree of bachelor of arts, which is conferred after the public performance of appointed literary exerciſes; and at the end of three years from the time of their receiving this degree, they may be admitted to that of maſter of arts, if there be no legal impediment. All academical degrees are publicly conferred by the preſident, on the commencement day, which is the third Wedneſday in July, annually. This, it is ſaid, is one of the moſt ſplendid anniverſaries in the United States. From the eſtabliſhment of this college to the year 1794, 3399 young perſons received its honours, of whom 1079 became miniſters of the goſpel. This moſt ancient of all the American literary inſtitutions has furniſhed, both for the church and ſtate, its full proportion of eminently learned and uſeful men. The college poſſeſſes ſome funds, ariſing from the eſtate of Edward Hopkins, eſq. of Great Britain, for the ſupport of graduates, and alſo from a legacy of 400*l.*, bequeathed by governor Bowdoin, for the encouragement of reſident graduates and under-graduates. The public buildings belonging to the univerſity are Harvard hall, appropriated to public rooms, ſuch as a chapel, a dining-room, library, philoſophy chamber, an apartment for the philoſophical apparatus, which is reſpectable, though deficient in aſtronomical inſtruments, Hollis hall and Maſſachuſetts hall, which contain private rooms, and are occupied by the tutors and ſtudents, and Holden chapel, now occupied by ſome of the medical profeſſors. The ſum of 8000*l.* was raiſed by a lottery in 1794, towards erecting another hall, for the accommodation of ſtudents. The library conſiſts, as we are informed, of about 13,000 well-ſelected and valuable books, the number of which is increaſing by donations, and by the income of a legacy, bequeathed by the late Thomas Hollis, eſq. of London. The muſeum of the univerſity, which has been indebted to the munificence of Dr. Lettſom of London in 1794, and to that of the French Republic in the following year, is furniſhed with a handſome collection of natural and artificial curioſities. The colleges are ſituated in a pleaſant and healthful part of Cambridge. Their diſtance from the centre of Boſton is eight miles by the way of Roxbury, $4\frac{1}{2}$ miles over Charles river bridge, and $3\frac{1}{2}$ miles over Weſt Boſton bridge. The latitude of Harvard hall, determined by obſervations, is 42° 23′ 28″, and W. longitude from Greenwich 4^{h} 44^{m} 30^{s} in time, or 71° 7′ 30″.

An academy in Williamſtown, in Berkſhire county, founded and endowed ſeveral years ſince by Col. Ephraim Williams, and in 1790 provided with a brick edifice, containing 24 rooms for ſtudents, a large ſchool-room, a dining hall, and a room for public ſpeaking, was erected in 1793 into a college by an act of the legiſlature, under the name of "Williams' College," in honour of its liberal founder.

The general aſſembly of the ſtate granted a charter in 1764, for founding a college under the name of "The Truſtees and Fellows of the College or Univerſity, in the Engliſh colony of Rhode iſland and Providence plantations." The number of truſtees is 36, of whom 22 are of the Baptiſt denomination, 5 of the denomination of Friends, 5 Epiſcopalians, and 4 Congregationaliſts. The preſident muſt be a Baptiſt; the profeſſors and other officers for inſtruction are not reſtricted to any particular denomination. This inſtitution was firſt founded at Warren, in the county of Briſtol; but removed in 1770 to Providence, where an elegant building was erected for its accommodation. It has 48 rooms for ſtudents, and 8 of a larger ſize for public uſe. This inſtitution is under the inſtruction of a preſident, a profeſſor of divinity, a profeſſor of natural and experimental philoſophy, a profeſſor of mathematics and aſtronomy, a profeſſor of natural hiſtory, and three tutors. It has a library of between two and three thouſand volumes, and a valuable philoſophical apparatus. The funds of the college, at intereſt in the treaſury of the ſtate, amount to about 2000*l.*

Yale college, in the ſtate of Connecticut, was founded in 1700; and remained at Killingworth until the year 1707; then at Saybrook until 1716, when it was removed to New-Haven, where it was fixed. Governor Yale was one of its principal benefactors, and in honour of him it was named, in 1718, "Yale College." Its building furniſhes chambers for lodging 120 ſtudents, a chapel, a dining-hall, a houſe for the preſident, and another for the profeſſor of divinity. Its library conſiſts of about 3000 volumes, and it is provided with a competent philoſophical apparatus. The college muſeum is a repoſitory of many natural curioſities. The firſt charter of incorporation was granted by the general aſſembly of Connecticut in 1701; renewed in 1723; and in 1745, the truſtees were incorporated by the name of "The Preſident and Fellows of Yale college, New-Haven." And by an act of the general aſſembly, paſſed in 1792, the governor, lieutenant-governor, and the ſix ſenior aſſiſtants in the council of ſtate, are appointed to be for ever, by virtue of their offices, truſtees and fellows of the college, in addition to the former corporation. The corporation is empowered to make laws, to hold eſtates, to continue their ſucceſſion, to elect and conſtitute all officers for inſtruction and government, and to confer all the learned degrees. The immediate executive government is in the hands of the preſident, profeſſors, and tutors. The preſent officers and inſtructors of the college are, a preſident, a profeſſor of divinity, and a profeſſor of natural philoſophy and aſtronomy, and three tutors. The number of ſtudents, at an average, is about 150, divided into four claſſes. The funds of the college, before the liberal addition made by a grant of the general aſſembly in 1792, conſiſted of rents of lands to the amount of 800*l.* a year, about 800*l.* raiſed by fees of the ſtudents for tuition, beſides funds for the ſupport of two profeſſorſhips. The ſeveral claſſes are examined twice in the year; and a public commencement is held annually on the 2d Wedneſday in September. From the year 1700 to 1793, there had been educated and graduated at this univerſity about 2303 perſons; about 800 of whom had been ordained to the work of the miniſtry.

King's college, in the city of New York, was principally founded by the voluntary contributions of the inhabitants of the province, aſſiſted by the general aſſembly and the corporation of Trinity church; and in 1754, a royal charter and grant of money being obtained, a number of gentlemen were incorporated by the name of "The governors of the college of the province of New York, in the city of New York, in America;" which charter granted various privileges, and among others, that of conferring all ſuch degrees as are uſually conferred by the Engliſh univerſities. The charter provides, that the preſident ſhall be always a member of the church of England; but at the ſame time, no teſt of their religious perſuaſion was required from any of the fellows, profeſſors, or tutors; and the advantages of education were equally extended to ſtudents of all denominations. The building is an elegant ſtone edifice, with four ſtair-caſes, having in each 12 apartments, and containing alſo a chapel, hall, library, muſeum, anatomical theatre, and a ſchool for experimental philoſophy. Since the revolution, the

the legiſlature has paſſed an act, conſtituting 12 gentlemen, the governor and lieutenant-governor always included "ex officiis," a body corporate and politic, by the name of "The Regents of the Univerſity of the State of New York." This body has powers to grant charters of incorporation for erecting colleges and academies through the ſtate, to viſit them whenever they think proper, and to make a report of their ſtate to the legiſlature once a year. King's college is now called "Columbia College;" and by an act paſſed in 1787, it was put under the care of 24 gentlemen, who are a body corporate by the name of "The Truſtees of Columbia college, in the city of New York." They poſſeſs all the powers veſted in the governors of King's college before the revolution, or in the regents of the univerſity, ſince the revolution. The regents of the univerſity have power to confer the higher degrees, and them only. The annual revenue ariſing from the eſtate belonging to the college amounts to 1,535 *l.* currency. Columbia college conſiſts of two faculties; one of arts and another of phyſic. The firſt has a preſident and ſeven profeſſors; and the ſecond a dean and ſeven profeſſors. The ſtudents attending both the faculties in 1795, amounted to 140. The officers for inſtruction and government in the faculty of each, are a preſident, a profeſſor of mathematics and natural philoſophy, a profeſſor of logic and geography, and a profeſſor of languages. To theſe have been lately added a profeſſor of chemiſtry and agriculture, a profeſſor of oriental languages, a profeſſor of law, and a profeſſor of the French language. In the faculty of phyſic, the dean is lecturer on clinical medicine in the New York hoſpital, and there are the profeſſorſhips of botany, of anatomy, of the obſtetric art, of materia medica, of the inſtitutes of medicine, of ſurgery, and the practice of phyſic. The library and muſeum were deſtroyed during the war. Upwards of 800 *l.* granted by the legiſlature, has been expended in books for augmenting the library. The philoſophical apparatus is new and complete.

Another college by the name of "Union college, in the town of Shenectady in the ſtate of New York," was incorporated by the regents of the univerſity in 1794.

In New Jerſey there are two colleges, one at Princetown, called Naſſau hall; the other at Brunſwick, called Queen's college. The former was firſt founded by charter about the year 1738, and enlarged in 1747. The charter delegates a power of granting "to ſtudents of the ſaid college, or to any others thought worthy of them, all ſuch degrees as are granted in either of our univerſities, or any other college in Great Britain." It has 23 truſtees, the governor of the ſtate, and the preſident of the college, are, "ex officiis," two of them. The eſtabliſhment in 1796, conſiſted of a preſident, who is alſo profeſſor of moral philoſophy, theology, natural and revealed, hiſtory, and eloquence; two profeſſors, one of mathematics and natural philoſophy, including aſtronomy, and another of chemiſtry, conſidered not only in its relation to medicine, but to agriculture and manufactures; and a grammar maſter. In the winter ſeſſion there are generally from 70 to 80 ſtudents in the four claſſes of the college; and in ſummer from 80 to 90. The preſent annual income of the college is by fees of the ſtudents, and otherwiſe, about 1000*l.*; and it has alſo funds in poſſeſſion. The library of the college was almoſt wholly deſtroyed by the late war; but it has collected, by means of donations, and out of the wreck of the former library, about 2,300 volumes. Its philoſophical apparatus, worth about 500 *l.* was deſtroyed in the war. The college edifice is a handſome ſtone building, containing 42 chambers, for the accommodation of ſtudents, a dining-hall, chapel, and room for the library. Its ſituation is ſingularly pleaſant and healthful. This college has furniſhed a number of civilians, divines, and phyſicians, of the firſt rank in America. The charter for Queen's college, at Brunſwick, was granted juſt before the war, in conſequence of an application from a body of the Dutch church. Its funds, raiſed wholly by free donations, amounted, ſoon after its eſtabliſhment, to 4000 *l.*; but they were conſiderably diminiſhed by the war. This college at preſent exiſts only in name.

The univerſity of Pennſylvania, founded and endowed by the legiſlature during the war, was lately united with the college of Philadelphia. This college was founded by charter about 50 years ago. In the weſtern part of this ſtate, at Carliſle, is Dickinſon college, founded in 1783, and named after his excellency John Dickinſon, author of the "Pennſylvania Farmer's Letters," and formerly preſident of the ſupreme executive council of this ſtate. It has a principal, three profeſſors, a philoſophical apparatus, a library, conſiſting of nearly 3000 volumes; 4000 *l.* in funded certificates, and 10,000 acres of land, the laſt, the donation of the ſtate. In 1787, the number of ſtudents in this college amounted to 80; and it has ſince increaſed every year. In 1787, a college was founded at Lancaſter, and honoured with the name of Franklin college, after Dr. Franklin. This college is deſigned for the Germans, in which they may educate their youth in their own language, and in conformity to their own habits; the Engliſh language, however, is taught in it. Its endowments are nearly the ſame with thoſe of Dickinſon college. Its truſtees conſiſt of Lutherans, Preſbyterians, and Calviniſts, German and Engliſh, of each an equal number. The principal is a Lutheran, and the vice-principal a Calviniſt.

In 1782, a college was inſtituted at Cheſtertown, in that county, in the ſtate of Maryland, and honoured with the name of Waſhington college, after preſident Waſhington. It is under the management of 24 viſitors, or governors, with power to ſupply vacancies, and hold eſtates, whoſe yearly value ſhall not exceed 6000 *l.* current money. By a law, enacted in 1787, a permanent fund was granted to this inſtitution, of 1250 *l.* a year, currency, out of the monies ariſing from marriage licenſes, fines, and forfeitures on the eaſtern ſhore.

St. John's college was inſtituted in 1784, under the care of 24 truſtees, empowered to fill up vacancies, and to receive an annual income of 9000 *l.* A permanent fund is aſſigned this college, of 1750 *l.* a year, out of the monies ariſing from marriage licences, ordinary licences, fines, and forfeitures on the weſtern ſhore. This college is eſtabliſhed at Annapolis. The two colleges conſtitute one univerſity, by the name of "the univerſity of Maryland," whereof the governor of the ſtate for the time being, is chancellor, and the principal of one of them vice-chancellor, either by ſeniority or by election. The chancellor is empowered to call a meeting of the truſtees, under certain circumſtances, which meeting is ſtyled "the convocation of the univerſity of Maryland," who are to frame the laws, preſerve uniformity of manners and literature in the colleges, confer the higher degrees, determine appeals, &c.

The Roman catholics have alſo erected a college at George-town, on Potomak river, for the promotion of general literature. In 1785, the methodiſts inſtituted a college at Abington, in Hartford county, by the name of Cokeſbury college, after the name of Thomas Coke, and Francis Aſbury, biſhops of the methodiſt epiſcopal church. The ſtudents are to conſiſt of the ſons of travelling preachers, the ſons of annual ſubſcribers, the ſons of the members of the methodiſt ſociety, and orphans, and are to be inſtructed in Engliſh, Latin, Greek, logic, rhetoric, hiſtory, geography, natural philoſophy, and aſtronomy; and when the finances of the college will admit, they are to be taught the Hebrew, French, and German languages. This college was erected, and is ſupported wholly by ſubſcription and voluntary donations.

The college of William and Mary, in the ſtate of Virginia, was founded in the time of king William and queen Mary, who granted to it 20,000 acres of land, and a penny per pound duty on certain tobaccos exported from Virginia and Maryland, which had been levied by the ſtatute of 25 Car. II. The aſſembly alſo gave it, by temporary laws, a duty on liquors imported, and ſkins and furs exported. From theſe reſources it received upwards of 3000 *l*. The buildings are of brick, and ſufficient for the accommodation of about 100 ſtudents. By its charter, it was to be governed by 20 viſitors, and to have a preſident and ſix profeſſors, who were incorporated under this charter; a profeſſorſhip of the Greek and Latin languages, a profeſſorſhip of mathematics, one of moral philoſophy, and two of divinity, were eſtabliſhed. To theſe were annexed, for a ſixth profeſſorſhip, a conſiderable donation by Mr. Boyle of England, for the inſtruction of the Indians, and their converſion to Chriſtianity. This was called the profeſſorſhip of Brafferton, from an Engliſh eſtate purchaſed with the monies given. There are now ſix profeſſorſhips, one of moral philoſophy, natural philoſophy, and the belles lettres, one of mathematics, one of law, one of modern languages, and two of humanity. The philoſophical apparatus is complete, and the library extenſive.

The academy, in Prince Edward county, has been erected into a college, by the name of "Hampden Sydney college."

The legiſlature of Virginia, while Kentucky belonged to that ſtate, made proviſion for a college in it, and endowed it with very conſiderable landed funds. A library was alſo formed for its uſe. This college has not flouriſhed of late; another has been eſtabliſhed, and conſiderable funds collected for its ſupport.

The general aſſembly in North Carolina paſſed a law in 1789, incorporating 40 gentlemen, five from each diſtrict, as truſtees of the univerſity of N. Carolina. To this univerſity they gave, by a ſubſequent law, all the debts due to the ſtate, from ſheriffs or other holders of public money, and which had been due before the year 1783. They alſo gave it all eſcheated property within the ſtate. A conſiderable quantity of land has alſo been given to the univerſity. The truſtees have fixed on Chapel hill, in Orange county, for the ſite of the univerſity. The buildings in this elevated and agreeable ſituation have been completed, and the academical ſtudies commenced in January, 1795.

In the ſtate of Tenneſſee they have now three colleges eſtabliſhed by law, *viz.* Greenville college in Greene county, between Greenville and Nolychuckey river, inſtituted by act of aſſembly in 1794, and placed under the management of a preſident, who has collected, in money and books for its foundation, about 5000 dollars, and 14 truſtees. They have alſo Blount college, at Naſhville, and Waſhington college in the county of the ſame name.

Three colleges have lately been incorporated by law in South Carolina; one at Charleſton, one at Winnſborough, in the diſtrict of Camden, and the other at Cambridge, in the diſtrict of Ninety-ſix.

In the ſtate of Georgia, the charter containing their preſent ſyſtem of education, ſupported with funds ariſing from about 50,000 acres of land, was paſſed in the year 1785; in conſequence of which, a college, with ample and liberal endowments, was inſtituted in 1801 at Louiſville, a high and healthy part of the country, near the centre of the ſtate. The funds originally deſigned to ſupport the literary orphan-houſe, founded by the Rev. George Whitefield, have been veſted by the legiſlature, in 1792, on the demiſe of the counteſs of Huntingdon, to whom Mr. Whitefield beqeathed this property as truſtee, in 13 commiſſioners, with independent powers, for carrying on the original intention of Mr. Whitefield into execution; and, in compliment to the counteſs, the ſeminary is called Huntingdon college.

In 1791, the legiſlature of the ſtate of Vermont paſſed an act for eſtabliſhing an univerſity at Burlington, on lake Champlain, in a delightful ſituation, on the ſouth ſide of the Winouſki, or Onion river, and appointed 10 truſtees. The ſum of 6000*l*. was ſecured by donation, part of which is to be applied to the erection of buildings, and part ſettled as a fund for the ſupport of the inſtitution. In the ſeveral grants made by this ſtate, about 33,000 acres of land have been reſerved for the uſe of this univerſity.

Dartmouth college, ſo called after the right honourable William, earl of Dartmouth, one of its principal benefactors, is ſituated in the townſhip of Hanover, and ſtate of New Hampſhire, on a beautiful plain, about half a mile E. of Connecticut river, in N. lat. 43° 33′. It was founded by Dr. Wheelock in 1769, who obtained for it a royal charter, with a view of civilizing and chriſtianizing the children of Pagans. After ſurviving many embarraſſments during the war, it is now one of the moſt flouriſhing ſeminaries in the United States. Its funds conſiſt chiefly of lands, amounting to about 80,000 acres of increaſing value. Its revenue ariſing from the lands, in 1793, amounted annually to 140*l*. and by certain contracts then made, would amount in twelve years to 650*l*. The income from tuition is about 600*l*. per annum. The number of under-graduates, is, on an average, about 150*l*. The ſtudents are under the immediate government and inſtruction of a preſident, who is alſo profeſſor of hiſtory; a profeſſor of mathematics; a profeſſor of languages; and two tutors. The college is furniſhed with a handſome library and a philoſophical apparatus tolerably complete. A new college built of wood, 150 by 50 feet, and three ſtories high, was erected in 1786, containing 36 rooms for ſtudents. Three other public buildings belong to the college.

In 1801, an act paſſed for eſtabliſhing an univerſity in the town of Athens, in the ſtate of Ohio, which now bears the name of the "Ohio Univerſity." The corporation is to conſiſt of the governor of the ſtate, for the time being, the preſident, and not more than 15 nor leſs than 10 truſtees. The preſent endowment of this inſtitution conſiſts of two townſhips of land, amounting to 46,080 acres. Congreſs, in 1787, covenants with the Ohio company to give theſe lands in perpetuity for the purpoſes of an univerſity.

Jefferſon college, ſo named after the reſpectable and intelligent preſident, is a new foundation in the Miſſiſſippi territory.

Bowdoin college is ſituated in the diſtrict formerly called the province of Maine, in the village of Brunſwick, upon the river called by the Indian natives Androſcoggin, which name it ſtill retains. The legiſlature, about the year 1794, incorporated certain perſons for the purpoſe of eſtabliſhing an univerſity or college in the diſtrict of Maine, under the name of Bowdoin college, ſo called after the honourable James Bowdoin, eſq. late governor of the Maſſachuſetts. The legiſlature granted ſeveral townſhips of unſettled lands within the diſtrict of Maine to the college as a fund for its ſupport, and the ſon of the gentleman above-named has been a very liberal benefactor to the inſtitution. Buildings have lately been erected for the accommodation of the ſtudents and preſident. The library, apparatus, and profeſſorſhips of the college are yet upon a limited ſcale; but its ſituation is favourable, and the activity of its patrons and friends, among whom we may mention, Benjamin Vaughan and Charles Vaughan, eſqs. cannot fail to promote its growing proſperity.

College, *Chelſea*. See Hospital and Chelsea.

College *of Civilians*, commonly called *Doctors Commons*; a college founded by Dr. Harvey, dean of the arches, for the profeſſors of the civil law reſiding in this city; where uſually, likewiſe, reſides the judge of the arches court of Canterbury, judge of the Admiralty, of the prerogative court, &c. with other civilians; who all uſed to live, as to diet and lodging, in a collegiate manner, commoning together: whence the appellation of *Doctors Commons*.

Their houſe being conſumed in the great fire, they all reſided at Exeter-houſe in the Strand, till 1672; when their former houſe was rebuilt, at their own expence, in a very ſplendid manner. To this college belong, beſides other officers, a number of proctors: who make themſelves parties for their clients, manage their cauſes, &c.: and ſeveral courts, maritime and eccleſiaſtical, as thoſe of arches, admiralty, prerogatives, delegates, and conſiſtory. The doctors are ſuch as having graduated at one of the univerſities, are afterwards admitted of the college of advocates belonging to theſe courts.

College, *Dulwich*. See Allen.

College, *Greſham*, or College *of Philoſophy*, a college founded by ſir Thomas Greſham, and endowed with the revenue of the Royal Exchange, and other premiſſes; one moiety of this endowment the founder bequeathed to the mayor and aldermen of London, and their ſucceſſors, in truſt, that they ſhould find four able perſons to read, within the college, divinity, geometry, aſtronomy, and muſic, who are choſen by a committee of the common-council, conſiſting of the lord-mayor and three aldermen and eight commoners, and allowed each, beſides lodging, fifty pounds, per annum. The other moiety he left to the company of mercers, to find three other perſons, choſen by a committee of that company, conſiſting of the maſter and three wardens, during their office, and eight of the court of aſſiſtants, to read law, phyſic, and rhetoric, on the ſame terms; with this limitation, that the ſeveral lectures ſhould be read in term-time, every day in the week, except Sundays: in the morning in Latin, in the afternoon the ſame in Engliſh: but that in muſic to be read only in Engliſh. As the ſettlement of this college could not take place till after the death both of ſir Thomas Greſham and his lady, the two corporations could not proceed to act till the month of December, 1596, after the deceaſe of lady Greſham. Accordingly, in the choice of the firſt ſeven profeſſors, which was completed before the 31ſt of March in the following year, when they took their ſeveral apartments in the manſion-houſe, according to the allotment then made, the electors ſeem to have been deſirous of manifeſting an equal regard to both the univerſities; ſo that three were choſen from Oxford, and three from Cambridge, and the ſeventh, who was a graduate of both, upon the recommendation of queen Elizabeth.

By 8 Geo. III. cap. 32. the building appropriated to this college was taken down, and the exciſe-office erected in its room. Each of the profeſſors is allowed fifty pounds per annum, in lieu of the apartments, &c. relinquiſhed by them in the college, and is permitted to marry, notwithſtanding the reſtriction of ſir Thomas Greſham's will. The lectures are now read in a room over the Royal Exchange; and the city and mercers' company are required to provide a proper place for this purpoſe.

In this college formerly met the Royal Society, that noble academy, inſtituted by king Charles II. and celebrated throughout the world, for their improvements in natural knowledge. See their hiſtory and policy, under Royal *Society*.

College *of Heralds*, or College *of Arms*, a corporation founded by king Richard III., who, by charter bearing date the 2d of March, in the firſt year of his reign, made the kings, heralds, and purſuivants of arms, one body corporate by the name of "Le garter regis armorum Anglicorum, regis armorum partium auſtralium, regis armorum partium borealium, regis armorum walliæ, et heraldorum, proſecutorum, ſive purſevandorum armorum;" empowered them to have and uſe a common ſeal, and granted to them and their ſucceſſors, for the uſe of the twelve principal officers of the corporation, a houſe with its appurtenances, then called Colde Arbor, and ſituated within the pariſh of All-Hallows the Leſs, in the city of London; they finding a chaplain to celebrate maſs daily in the ſaid houſe, or elſewhere at their diſcretion, for the good ſtate of health of Anne his queen, and Edward, prince of Wales, during their lives, and for their ſouls after their deceaſe.

In conſequence of the Act of Reſumption, paſſed in the firſt year of the reign of king Henry VII., this houſe was ſeized into the king's hands, becauſe it was ſuppoſed to belong perſonally to John Writhe, garter, who then lived in it, and not to the officers of arms in their corporate capacity.

The officers of arms, during the reigns of Henry VII. and Henry VIII., frequently petitioned the throne for a grant of ſome houſe or place wherein to hold their aſſemblies, but without ſucceſs. King Edward VI., however, in a charter dated the 4th of June, in the third year of his reign, and by authority of parliament, endeavoured to make them ſome amends, by confirming to them all their ancient privileges, as to be free and diſcharged from all ſubſidies, in all realms where they make their demoure; as alſo from all tolls, taxes, cuſtoms, impoſitions, and demands, as well from watch and ward, as from the election to any office of mayor, ſheriff, bailiff, conſtable, ſcavenger, church-warden, or any other public office of what degree, nature, or condition ſoever.

Philip and Mary, by their charter bearing date the 18th day of July, in their firſt and ſecond years, re-incorporated the kings, heralds, and purſuivants of arms by their former names; and to the intent that they might reſide together, and conſult and agree amongſt themſelves for the good of their faculty, and for the depoſiting and ſecure preſervation of their records, inrolments, and other documents and papers, granted to them a meſſuage, with its appurtenances, called Derby Houſe, ſituate in the pariſh of St. Benedict and St. Peter, within the city of London, and in the ſtreet leading from the ſouth door of the cathedral church of St. Paul, to a place there called Paul's Wharf, and then late in the tenure of ſir Richard Sakevyle, knight, but theretofore parcel of the poſſeſſions of Edward, earl of Derby, and to be by the ſaid corporation held in free burgage of the city of London.

In the great fire of London, anno 1666, the college was entirely conſumed: but the heralds had the good fortune to ſave all their muniments and books, which were depoſited in the palace at Whitehall; from whence they were afterwards removed into the palace at Weſtminſter, near to the Court of Requeſts, whereupon public notice was given in the London Gazette, that the Heralds' Office was there kept. The college was afterwards rebuilt, and, as a regular quadrangular building, is conſidered one of the beſt deſigned and handſomeſt brick edifices in London, particularly the hollow archway of the great gate, which is eſteemed a ſingular curioſity.

The corporation conſiſts of three kings of arms, Garter, Clarenceux, and Norroy, ſix heralds, *viz.* Windſor, Cheſter, Lancaſter, Somerſet, York, and Richmond, and four purſuivants, *viz.* Portcullis, Rougedragon, Bluemantle, and Rouge-Croix; who all take precedency, according to the dates of their reſpective patents.

Arms of the college; argent, a croſs gules between four doves riſing azure.

Creſt. On a ducal coronet or, a dove riſing azure.

Supporters. Two lions rampant guardant argent, ducally gorged or.

College *of Heralds* in Scotland, conſiſts of Lyon king at arms, ſix heralds, and ſix purſuivants, and a number of meſſengers.

College *of Juſtice.* See Court *of* Justice.

College *of Merchants.* See Burse.

College, *Military, Royal,* was inſtituted in 1799, under the direction of twelve commiſſioners, a governor, and profeſſor of mathematics. It conſiſts of two departments, the ſenior, eſtabliſhed at Wycombe, and the junior at Marlow, in Buckinghamſhire, each under the care of a commandant, ſuperintendant, and adjutant, and under the inſtruction of a number of profeſſors, in different branches of ſcience and literature.

College *of Phyſicians,* a corporation of phyſicians in London; who, by ſeveral charters and acts of parliament of Henry VIII. and his ſucceſſors, have certain privileges, whereby no man, though a graduate in phyſic of any univerſity, may, without licence under the ſaid college ſeal, practiſe phyſic in, or within ſeven miles of London, under the penalty of paying 5*l.* for every month they practiſed; with power to adminiſter oaths, fine and impriſon offenders in that and ſeveral other particulars: to ſearch the apothecaries ſhops, &c. in and about London, to ſee if their drugs, &c. be wholeſome, and their compoſitions according to the form preſcribed by the ſaid college in their diſpenſatory. By the ſaid charter they, and their licentiates, are alſo freed from all troubleſome offices: as to ſerve on juries, be conſtable, keep watch, provide and bear arms, &c. The project and plan of this inſtitution were formed by Dr. Thomas Linacre, phyſician to Henry VIII., and patronized by cardinal Wolſey, at whoſe deſire the king granted a charter, Sept. 23d, A. D. 1518, incorporating ſeveral perſons of the medical claſs into a body, community, and perpetual college. To this college Henry granted various rights, powers, and immunities by his charter; ſuch as a right to elect a preſident annually for the government of the college; to have a common ſeal; to purchaſe lands to a certain value; to ſue and be ſued by the name and title of "The preſident and community of the college of phyſicians in London;" and to make laws and regulations for the good government of the college, &c. &c. This charter was confirmed by parliament, A. D. 1523, 15 Hen. VIII. This inſtitution was intended and calculated to raiſe the reputation of the medical profeſſion, and prevent the people from being impoſed upon by bold and ignorant adventurers, who ſported with their lives, and robbed them of their money. Theſe two acts of parliament, which were for ſome time ſtrictly executed, had one remarkable effect: by greatly diminiſhing the number of practitioners, they made the regular practice of phyſic and ſurgery exceedingly lucrative. "The moſt effectual ſecurity againſt poverty," ſays Eraſmus (Oper. t. v. p. 661.) "is the art of medicine, which of all arts is the moſt remote from mendicity."

The ſociety had anciently a college in Knight-Rider-ſtreet, the gift of Dr. Linacre. Since that they have had a houſe built for them by the famous Dr. Harvey, in 1652, at the end of Amen-Corner, which he endowed with his whole inheritance in his life-time; but this being burnt in the great fire in 1666, a new one was erected at the expence of the fellows, in Warwick-lane; with a noble library, given partly by the marquis of Dorcheſter, and partly by ſir Theodore Mayerne.

Of this college there are at preſent, a preſident, four cenſors, eight electors, a regiſter, and a treaſurer, choſen annually in October: the cenſors have by charter power to ſurvey, govern, and arreſt all phyſicians, or others practiſing phyſic, in, or within ſeven miles of London; and to fine, amerce, and impriſon them at diſcretion.

The number of fellows was anciently thirty, till king Charles II., who renewed their charter in 1663, increaſed their number to forty; and king James II. giving them a new charter, allowed the number of fellows to be enlarged, ſo as not to exceed fourſcore; reſerving to himſelf and ſucceſſors the power of placing and diſplacing any of them for the future. Since that time, they have been limited to no certain number, but remain candidates a year, before their admiſſion as fellows.

The college is not very rigorous in aſſerting their privileges; there being a great number of phyſicians, ſome of very good abilities, who practiſe in London, &c. without their licence, and are connived at by the college: yet, by law, if any perſon, not expreſsly allowed to practiſe, take upon him the cure of any diſeaſe, and the patient die under his hand, it is deemed felony in the practiſer.

According to the conſtitution of the college, or at leaſt of certain by-laws which have been enacted, not, however, invariably adhered to, all phyſicians, but the graduates of Oxford and Cambridge, are excluded from the fellowſhip of the college. A late writer, in favour of the licentiates, after citing a variety of ſtrong paſſages from the ſpeeches of lord Mansfield and other judges, proceeds to remark; "It is aſſerted then upon the higheſt legal authority, that the college of phyſicians are unwarranted in making by-laws, which infringe the deſign and intention of the crown and parliament in their inſtitution; and it has been proved that the by-laws, which exclude all graduates but thoſe of Oxford and Cambridge from the fellowſhip of the college, without any inveſtigation of their competency and fitneſs, are founded in uſurpation;—an uſurpation which cannot be juſtified by any poſſible conſtruction of the charter, or acts confirming it. It is, therefore, demonſtrated, that ſuch by-laws are illegal, and that they may be annulled, and their pernicious conſequences aboliſhed." The practical concluſion, with reſpect to thoſe whom the college will at preſent admit only to the rank of licentiates, is to claim admiſſion to fellowſhips "under the charter of incorporation itſelf, on the broad baſis of individual qualification, without the leaſt regard to places of ſtudy, or to local graduation." The claim, however, has not yet been allowed. See Dr. Ferris's General View of the Eſtabliſhment of Phyſic as a Science in England, &c." 8vo. 1795.

College. *Royal, of Phyſicians,* in Scotland, is a corporation of phyſicians at Edinburgh, eſtabliſhed by patent of Charles II. 29th November, 1681. This college conſiſts of a preſident, two cenſors, a ſecretary, and the ordinary ſociety of fellows. They have ſimilar rights and privileges with thoſe of the Engliſh college.

In Ireland there is likewiſe a college of Phyſicians, conſiſting of a preſident, vice-preſident and cenſor, treaſurer, and a number of fellows.

College *of Singers*, at Rome. It is allowed unanimouſly by eccleſiaſtical writers, that it was the learned and active pope Gregory the Great, whoſe pontificate began in 590, who collected the muſical fragments of ſuch ancient hymns and pſalms as the firſt fathers of the church had approved, and recommended to the primitive Chriſtians; and that he ſelected, methodized, and arranged them in the order which was long continued at Rome, and ſoon adopted by the chief part of the weſtern church.

The anonymous author of his life publiſhed by Caniſius, ſpeaks of this tranſaction in the following words: "This pontiff compoſed, arranged, and conſtituted the *antiphonarium*, and chants uſed in the morning and evening ſervice." And Fleury, in his Hiſt. Eccleſ. tom. viii. p. 150, gives a circumſtantial account of the *ſcola cantorum*, inſtituted by St. Gregory. It ſubſiſted three hundred years after the death of that pontiff, which happened in 604, as we are informed by John Diaconus, author of his life. The original *antiphonarium* of this pope was then ſubſiſting; and the whip with which he uſed to threaten to ſcourge the boys; as well as the bed on which he reclined in the latter part of his life, when he viſited the ſchool in order to hear them practiſe. Two colleges were appropriated to theſe ſtudies; one near the church of St. Peter, and one near that of St. John Lateran; both of which were endowed with lands.

It ſeems as if a college of ſingers for the education and exerciſe of the ſingers in the ſervice of the papal chapel had always ſubſiſted at Rome from the time of its eſtabliſhment by Gregory.

It was from this college that the reſt of Europe had maſters to inſtruct the prieſts and choral ſingers in canto firmo. We learn from Venerable Bede, and from William of Malmſbury, that Auſtin the monk, commonly called the Engliſh apoſtle, who was ſent from Rome by pope Gregory the Great, to convert the Saxons, inſtructed them in eccleſiaſtical muſic.

Bede tells us, that when Auſtin and the companions of his miſſion, had their firſt audience of king Ethelbert in the Iſle of Thanet, they approached him in proceſſion, ſinging litanies; and that, afterwards, when they entered the city of Canterbury, they ſung a litany, and at the end of it, *Allelujah*.

Venerable Bede was himſelf an able muſician; and he informs us, that in 680, John, Præcentor of St. Peter's in Rome, was ſent over by pope Agatho to inſtruct the monks of Weremouth in the art of ſinging, and particularly to acquaint them with the manner of performing the feſtival ſervices throughout the year, according to that which was practiſed at Rome. And ſuch was the reputation of his ſkill, that "the maſters of muſic from all the other monaſteries of the north came to hear him; and prevailed on him to open ſchools for teaching muſic in other places of the kingdom of Northumberland."

And Charlemagne, finding the Roman chant ſuperior to that of France, procured maſters of pope Adrian, from the college of ſingers, eſtabliſhed by Pope Gregory, to teach his ſubjects throughout his extenſive dominions. And Theodore and Benedict, two chanters of great learning and abilities, who had been inſtructed by St. Gregory himſelf, were elected for that purpoſe. Adrian likewiſe granted to him *antiphonaria*, or choral books of that ſaint, which he had written himſelf in Roman notes.

Adrian; Stephen, monk of Canterbury; friar James, and many others, are celebrated by Bede for their ſkill in ſinging after the Roman manner. It was then the cuſtom for the clergy to travel to Rome for improvement in muſic, as well as to import maſters of that art from the Roman college. At length the ſucceſſors of St. Gregory, and of Auſtin his miſſionary, having eſtabliſhed a ſchool for eccleſiaſtical muſic at Canterbury, the reſt of the iſland was furniſhed with maſters from that ſeminary.

It would be eaſy to prove, that good taſte in canto firmo, as well as in dramatic muſic, has at all times been derived from the Italian ſchool. Much has been ſaid by travellers, and writers on muſic, of the refined and poliſhed manner of performing the famous *miſerere* of Allegri, in the pontifical chapel; and it will be eaſy to judge of the abilities of the ſingers educated in the Roman college, to do juſtice to every compoſition in that ſervice, from the account given by Angellini Bontempi, in his "Hiſtory of Muſic," of their education and courſe of ſtudy. "The diſciples of the Roman ſchool," ſays this author, "were obliged to exerciſe themſelves in difficult intonations an hour every day, in order to acquire a facility of execution; another was ſpent in the practice of ſhakes; another in rapid paſſages; another in the ſtudy of literature, and another in taſte and expreſſion, in the preſence of the maſter, who obliged them to ſing before a mirror, in order to avoid every grimace or improper motion of the muſcles, either by furrowing the forehead, knitting the brows, or diſtorting the mouth: and all theſe ſtudies were but the employments of the morning. In the afternoon, half an hour was ſpent in harmonics, or the theory of ſound; another in counterpoint, upon a plain ſong; an hour in receiving rules of compoſition from the maſter, and putting them in practice on paper; another in the ſtudy of languages; and the reſt of the day in practiſing on the harpſichord, in compoſing a motet or anthem, a ſong, or in ſome other kind of writing, ſuitable to the genius and progreſs of the ſcholar: and theſe were the common exerciſes on thoſe days, when the ſtudents were not allowed to quit the college; but when they were permitted to go out, they frequently went to ſing at the echo, without the Porta-Angelica, near mount Marius, where, by liſtening to the anſwers, or reflection of the paſſages, they could judge of their own defects; at other times they were either employed in ſinging at the muſical performances in the churches of Rome on days of feſtivals, or, at leaſt were allowed to go thither to hear the great profeſſors who flouriſhed in the pontificate of Urban VIII., who reigned from the year 1624 to 1644. At their return to college, they employed the reſt of their time in practiſing after theſe models, and in giving reaſons to the maſter for what they did; who, in his turn, uſed to read lectures upon the moſt refined and uſeful myſteries of the muſical art." Hiſtoria Muſica, Perugia, 1695.

College, *Sion*, or the college of the London clergy; which has been a religious houſe time out of mind, ſometimes under the denomination of a priory, ſometimes under that of a ſpital, or hoſpital; at its diſſolution under 31 Hen. VIII. it was called Elſyn's *Spital*, from the name of its founder, a mercer, in 1329.

At preſent it is a compoſition of both, *viz.* a college for the clergy of London, who were incorporated in 1630, in purſuance of the will of Dr. White, under the name of the *Preſident and Fellows of* Sion-College; and an hoſpital for ten poor men, and as many women.

The officers of the corporation are the preſident, two deans, and four aſſiſtants; who are annually choſen from among the rectors and vicars of London; and are ſubject to the viſitation of the biſhop. The fellows of this college are all the incumbents of pariſhes within the city and its liberties. They have a good library, built and ſtocked by Mr. Simpſon, and furniſhed by ſeveral other benefactors, chiefly for the clergy of the city, without excluding other ſtudents on certain terms; and a hall, with chambers for ſtudents, generally occupied by the miniſters of the neighbouring pariſhes.

College *of Surgeons, Royal,* was incorporated by charter in 1800, under a maſter, two governors, and 18 aſſiſtants. Its houſe is in Lincoln's Inn Fields. There is alſo at Edinburgh a royal college of ſurgeons of late inſtitution, under a preſident, treaſurer, and honorary fellows. This college is authoriſed for carrying into execution a ſcheme for providing for their wives and children, &c.; and for examining and licenſing, if found qualified, all practitioners in ſurgery, within certain limits.

College *de Propaganda Fide,* was founded at Rome in 1622, by Gregory XV. and enriched with ample revenues. It conſiſts of thirteen cardinals, two prieſts, one monk, and a ſecretary; and was deſigned for the propagation and maintenance of the Roman religion in all parts of the world. The funds of this college have been very conſiderably augmented by Urban VIII. and many private donations. Miſſionaries are ſupplied by this inſtitution, together with a variety of books ſuited to their ſeveral appointments. Seminaries for their inſtruction are ſupported by it, and a number of charitable eſtabliſhments connected with it, and conducive to the main object of its inſtitution.

Another college of the ſame denomination was eſtabliſhed by Urban VIII. in 1627, in conſequence of the liberality of John Baptiſt Viles, a Spaniſh nobleman. This is ſet apart for the inſtruction of thoſe who are deſigned for the foreign miſſions. It was at firſt committed to the care of three canons of the patriarchal churches; but ever ſince the year 1641, it is under the ſame government with the former inſtitution.

College, *Veterinary,* a recent inſtitution formed at St. Pancras, in the vicinity of London, for the reformation and improvement of farriery, under the direction of a preſident, 10 vice-preſidents, a profeſſor, and treaſurer. This inſtitution cannot otherwiſe than be regarded by every reflecting perſon, as an object of national importance as well as of private utility; and in both theſe views merits liberal encouragement.

Colleges *of common law.* See Inns *of Court,* and Chancery.

Colleges *for diſabled ſoldiers, ſeamen, &c.* See Hospitals.

Collegial. See Collegiate.

COLLEGIANS, Collegiani, Collegiants, in *Eccleſiaſtical Hiſtory,* a religious ſect formed among the Arminians and Anabaptiſts in Holland, about the beginning of the ſeventeenth century; ſo called, becauſe of their colleges or meetings, twice every week, where every one, females excepted, has the ſame liberty of expounding the Scripture, praying, &c.

They are ſaid to be all either Arians, or Socinians; they never communicate in the college, but meet twice a year from all parts of Holland at Rhinſbergh, whence they are alſo called *Rhinſberghers,* a village two miles from Leyden, where they communicate together; admitting every one that preſents himſelf, profeſſing his faith in the divinity of the holy Scriptures, and reſolution to live ſuitably to their precepts and doctrines, without regard to his ſect or opinion. They have no particular miniſters, but each officiates as he is diſpoſed. They never baptize without dipping.

At Rhinſberg they have ample and convenient houſes for the education of orphans, and the reception of ſtrangers; and here they remain together during the ſpace of four days, which are employed in hearing diſcourſes that tend to edification, and exhortations that are principally deſigned to inculcate brotherly love, and ſanctity of manners. Thoſe of the brethren that reſide in the province of Frieſland, have an annual meeting at Lewarden, where they adminiſter the ſacraments, as the conſiderable diſtance at which they live from Rhinſberg renders it inconvenient for them to repair thither twice a-year. Their community comprehends perſons of all ranks, orders, and ſects, who profeſs themſelves Chriſtians; though their ſentiments concerning the perſon and doctrine of the divine founder of Chriſtianity be extremely different. It is kept together, and its union maintained, not by the authority of rulers and doctors, the force of eccleſiaſtical laws, the reſtraining power of creeds and confeſſions, or the influence of certain poſitive rites and inſtitutions, but merely by a zeal for the advancement of practical religion, and a deſire of drawing inſtruction from the ſtudy of the holy ſcriptures. In ſuch a community, in which opinion is free, and every one is permitted to judge for himſelf in religious matters, diſſenſions and controverſies can ſcarcely be ſuppoſed to occur. However diſſenſions took place, the conſequence of which was a diviſion of the collegiants into two parties, which held their aſſemblies ſeparately, at Rhinſberg. This diviſion happened in the year 1686; but it was healed about the commencement of the following century, by the death of thoſe who had principally occaſioned it; and then the collegiants returned to their former union and concord. Moſh. E. H. vol. v.

COLLEGIATE, or Collegial *churches,* are thoſe which have no biſhop's ſee, yet have the ancient retinue of the biſhops, the canons, and prebends. Such are, among us, Weſtminſter, Rippon, Windſor, &c. governed by deans and chapters.

Of theſe collegiate churches, there are two kinds; ſome of royal foundation, others of eccleſiaſtical foundation; each of them, in matters of divine ſervice, regulated in the ſame manner as the cathedrals.

There are even ſome collegiate churches which have the epiſcopal rights. Some of theſe churches were anciently abbeys; which, in time, were ſecularized. The church of St. Peter's, Weſtminſter, was anciently a cathedral; but the revenues of the monaſtery being, by act of parliament, 1 Eliz. veſted in the dean and chapter, it commenced a collegiate church.—In ſeveral cauſes, the ſtyling it cathedral, inſtead of collegiate church of Weſtminſter, has occaſioned error in the pleadings.

Collegiate *auditors.* See Auditor.

Collegiate *churches, vergers of.* See Verger.

COLLEONE, Bartholomew, in *Biography,* was born in the year 1400, of a family of diſtinction at Bergamo, in Italy. He was famous among the ſoldiers of fortune, having been trained from his youth in the military art. He firſt ſerved under Bracchio de Montone, and then entered into the ſervice of the queen of Naples, who was indebted to him for the recovery of her dominions. He rendered important ſervices to the Venetians, by whom he was handſomely rewarded; but owing to a quarrel with a noble Venetian, he went over to the duke of Milan, and ſerved with great reputation, firſt under Viſconti, and then under Francis Sforza. He again enliſted in the Venetian ſervice; and was in 1458, made their generaliſſimo; an office which he held twenty years with the higheſt reputation to himſelf, and to the terror of the enemies of the republic. Colleone was a patron of literature, and was fond of the company of learned men, to whoſe diſcuſſions on philoſophical ſubjects he always paid the moſt marked attention. He founded monaſteries, built churches, and inſtituted various charities. But notwithſtanding theſe inſtances of his liberality, he amaſſed great wealth, which he bequeathed to public purpoſes. He died in 1475, at his caſtle of Malpaga ; and the ſenate of Venice erected an equeſtrian ſtatue to his memory. In his youth, Colleone was diſtinguiſhed as well for his courage, as for bodily ſtrength and agility ; and it is aſſerted that when completely armed, he could run faſter than the lighteſt footman, and without arms he could ſurpaſs a horſeman on full gallop. This vigour he preſerved to almoſt the laſt. In the latter part of his life he was held in ſo much eſtimation, that no prince or perſon of rank, however exalted, who travelled in the part of the country in which he lived, ever neglected to pay him a viſit. On his dying bed, he gave it, as advice to the Venetians, that they ſhould never give ſo much power to a general as he had poſſeſſed. After his death 4000 ſoldiers refuſed to obey any other chief, and ſerved 15 years without a leader, diligently practiſing the diſcipline he had taught them. Moreri.

COLLEONI, Girolamo, a painter of Bergamo, whoſe ſtyle ſo much reſembled that of Titian, that his picture of the marriage of St. Caterina in the gallery of the Carrara family, was for a long time conſidered the work of that great maſter ; till at length the inſcription Hiernymus Colleo, 1555, was diſcovered, and the credit of the performance reſtored to its right owner. It is ſaid of this maſter, that having found inferior artiſts and ſtrangers preferred to the honour of executing public works, whilſt he himſelf was paſſed by unnoticed, he formed the reſolution to quit his ungrateful country, and ſought an aſylum at the court of Madrid. Before, however, he departed, he painted the figure of a horſe, of the merit of which no idea can now be formed, except from the prodigious encomiums beſtowed upon it by various writers : under the picture was this proverb : *nemo propheta in patria.* Beſides the picture abovementioned in the Carrara gallery, there are ſtill ſome remains of his freſco in Bergamo. He flouriſhed as early as 1532. Lanzi. Storia Pitt.

COLLET, John, an Engliſh painter, whoſe pictures of ludicrous ſubjects, in the manner of Hogarth, are well known. Heinecken mentions ſeveral prints from his works, and two were etched by himſelf ; one of which repreſents antiquarians ſmelling at the chamber pot of queen Boadicea ; and the other, a monkey, who is pointing to a very dark picture of Moſes ſtriking the rock, probably in ridicule of the connoiſſeurs of that period, who thought every piece deſerving of notice, in proportion as it was black and unintelligible. Strutt ſays, that Collet flouriſhed in 1760, and Heinecken informs us, that he died in 1780.

Collet, Philibert, was the ſon of a notary, and was born at Chatillon-les Dombes, in 1643. He purſued his ſtudies at Lyons, in the college of the Jeſuits, of which order he became a noviciate, but quitted their ſociety at the age of 22, and dedicated himſelf to the profeſſion of the law. By the liberality of ſentiment which he diſplayed in his writings, he excited an ill-founded ſuſpicion, that he was an enemy to religion. This imputation has, indeed, been in all ages the lot of thoſe who have impugned eccleſiaſtical abuſes, and could not fail to be levelled at Philibert, who attacked the power of the prieſts, in a " Treatiſe on Excommunications ;" a " Tract on Uſury ;" " Diſcourſes on Tythes and Alms," and on the " Cloyſtering of Nuns." He died in 1718, after a ſolemn declaration, that he did not repent of any of theſe publications which had excited againſt him no ordinary degree of prejudice.

Collet, Richard, a performer on the violin with a full tone and ſtrong hand. He was leader of the band at Vauxhall, from its firſt opening to the death of Jonathan Tyers, where he executed the compoſitions of Corelli, Handel, Geminiani, very accurately, but without taſte or expreſſion ; ſo that he always remained an inelegant player.

Collet, Thomas, a ſecond rate violoncello player, in a much lower form than his brother. He was lame upon one of his legs ; and upon his inſtrument his hand could hardly be ſaid to be otherwiſe.

Collet, Peter, a prieſt and doctor of theology, was born in the year 1693, at Ternay, a town in the province of Vendome, in France. His works, which treat chiefly on ſubjects of controverſial divinity, are very voluminous, but not very valuable. The principal of them are " Theologia Moralis Univerſa," in 17 vols. 8vo. ; " Inſtitutiones Theologicæ," in 7 vols. 12mo. ; and the " Life of St. Vincent de Paul," in 2 vols. 4to. He died in 1770, having ſuſtained, through a long and active life, the character of a pious and learned divine.

Collet, in the *Glaſs Trade*, that part of a glaſs veſſel which, in the manufacture, ſticks to the hollow iron by which the metal is firſt taken out of the melting pot. This is broken off before the veſſel is faſhioned, and is never ſeen in the leaſt mark, when finiſhed.

Theſe they throw together, and afterwards grind down, and put into the green glaſs metal, for the pureſt green glaſs, but never into any other, though they be the product of the fineſt virgin metal.

Collet, among *Jewellers*, the ſmall horizontal plane, or face, at the bottom of the brilliant.

Collet *de Canon*, the ſmalleſt or moſt diminiſhed part of the cannon, lying between the aſtragal and muzzle.

Collet-de Dezes, *le*, in *Geography*, a town of France, in the department of the Lozere, and diſtrict of Mende, 12 miles S. of Villefort.

COLLETIA, in *Botany*, (ſo named from Collet, a French botaniſt.) Lam. Ill. 359. Willd. 411. Juſſ. 380. Vent. 3. 472. Claſs and order, *pentandria monogynia*. Nat. Ord. *Rhamni*, Juſſ. *Rhamnoideæ*, Vent.

Gen. Ch. *Cal.* one-leafed, pitcher-ſhaped, permanent at the baſe, furniſhed on the inſide with five ſquamiform plaits called petals by Ventenat; border five-cleft; ſegments egg-ſhaped, reflexed. *Cor.* none. *Stam.* Filaments five, awl-ſhaped, very ſhort, inſerted at the top of the calyx between the ſegments of the border ; anthers egg-ſhaped. *Piſt.* Germ ſuperior, trigonous; ſtyle cylindrical; ſtigma three-lobed. *Peric.* Capſule tricoccous, ſeated on the permanent baſe of the calyx; cocci ſomewhat kidney-ſhaped, cohering at the inner ſide. *Seeds* ſolitary.

Eſſ. Ch. Calyx pitcher-ſhaped, five-cleft, with five ſquamiform plaits on the inſide. Corolla none. Capſule tricoccous, with three ſeeds.

Sp. 1. C. *ſpinoſa*. Lam. Illuſt. tab. 129. Joſeph Juſſieu. Commerſon. " Leaves oblong-elliptical, entire or ſlightly toothed at the tip." A very ſpinous, much-branched ſhrub. *Branches* nearly oppoſite, without leaves on the upper part, and furniſhed with long lateral and terminal ſpines. *Leaves* near the bottom of the branches, ſmall, on ſhort petioles. *Flowers* lateral, nodding ; peduncles ſhort, one-flowered, ſolitary, or two together, generally at the baſe of the ſpines. A native of Peru and Brazil. 2. C. *ſerratifolia*. Vent. Choix des plantes. " Leaves oblong, obtuſe, acutely ſerrated ; flowers without petals, *i. e.* without the ſquamiform plaits." A ſhrub, with the habit of a lycium. 3. C. *ephedra*. Vent. Choix des plantes. " Leafleſs ; branches erect, implicated, ending in a ſpine ; flowers glomerated at the knots of the branchlets." The two laſt ſpecies are natives of Peru, diſcovered by Dombey. Not having preſent acceſs to Ventenat's ſplendid work, we have taken the ſpecific characters from the Annals of Botany.

COLLETICS, Colletica, from κολλητικος, ſomething that has the virtue of gluing together, of κολλα, *gluten*, in *Medicine*, ſuch remedies as join and glue together the ſeparated parts, or lips, of a wound or ulcer; and thus re-eſtabliſh them in their natural union.

Among colletics are ranked litharge, aloes, myrrh, &c. See Agglutinant.

COLLI, Le, in *Geography*, a town of Naples, in the province of Abruzzo Ultra; 15 miles weſt of Celano.

Colli *interſpinales*, in *Anatomy*. See Interspinales.—*Intertranſverſales*. See Intertransversales.—*Tranſverſalis*. See Transversalis.

COLLICIÆ, is uſed by ſome, as Steno, for the carunculæ *lacrymales*.

COLLIER, Jeremy, in *Biography*, an Engliſh nonjuring biſhop, was born at Stow Qui, or Quire in Cambridgeſhire, Sept. 23, 1650. He was educated by his father, a clergyman, and ſome time maſter of the free-ſchool at Ipſwich, and in 1669 he was admitted a poor ſcholar of Caius college, under the tuition of Mr. John Ellys. Here he took his degrees, and was afterwards ſucceſſively ordained deacon and prieſt, by the biſhops of Ely and London. For ſome time he officiated as chaplain to the counteſs dowager of Dorſet at Knowle; he was afterwards preſented with the living of Ampton, in Suffolk, where he reſided till 1685, when he reſigned on being appointed lecturer at Gray's Inn. After the revolution he refuſed to take the oaths, and became a zealous partizan of the abdicated ſovereign. On account of a pamphlet entitled "The Deſertion diſcuſſed," which he publiſhed in 1688 in oppoſition to one by Dr. Burnet; he was impriſoned in Newgate, from whence he was diſcharged without trial, and between this period and the year 1692, he publiſhed ſeveral other pamphlets which rendered him an object of extreme jealouſy to the crown. He became ſtill more obnoxious to government by a journey at this time into Kent, which led to a ſuſpicion that he held a correſpondence with the exiled James; he was accordingly arreſted, examined before the earl of Nottingham, and committed to the Gate-houſe. He was again releaſed for want of evidence of any criminal deſigns, and was admitted to bail. So ſtrict, however, were Mr. Collier's principles, that he ſhortly after condemned his own want of conſiſtency in giving bail; upon which he ſurrendered himſelf before lord chief juſtice Holt, in order that he might free his ſureties, and was committed to the King's Bench, but upon the application of his friends, that excellent and upright judge diſcharged him in a few days. He then publiſhed a juſtification of himſelf, in a work entitled "The Caſe of giving Bail to a Pretended Authority examined." This was followed by ſeveral other tracts, which, though hoſtile to the new order of affairs, do not appear to have excited the attention of government. But, in 1696, he openly, in conjunction with two other nonjuring clergymen, abſolved, at the place of execution, ſir John Friend, and ſir William Perkins, who had been convicted of engaging in the aſſaſſination plot. For this he was proſecuted to outlawry, in which ſtate of legal incapacity he remained unmoleſted through the remainder of his life. Between the years 1697 and 1707, Mr. Collier publiſhed three volumes of eſſays on moral ſubjects, which obtained a very favourable reception by his contemporaries, but they are now fallen into diſrepute. In 1698, he obtained a large ſhare of celebrity for his piece entitled "A ſhort View of the Immorality and Prophaneneſs of the Engliſh Stage, together with the Senſe of Antiquity on this Argument." Mr. Collier in this work attacked moſt of the dramatic writers of the day, with ſo much force and ability, that thoſe who ventured to engage with him in the controverſy, were, in the public opinion, completely defeated. Without noticing the other tracts which he wrote on this ſubject, we paſs on to his tranſlation of Moreri's Great Hiſtorical Dictionary, which conſiſted of four volumes folio, publiſhed at different times, with the addition of a great number of new articles. During the reign of queen Anne, ſeveral ineffectual attempts were made to reconcile Mr. Collier to the exiſting government. Preferment in the church was offered to him, which he rejected, and he maintained his principles to the laſt. In 1702, he publiſhed the firſt volume "Of an Eccleſiaſtical Hiſtory of Great Britain," which he followed by a ſecond in 1714. This work, on which he beſtowed great pains, was not remarkable for the impartiality, which it behoves the faithful hiſtorian to maintain in all ſubjects of diſpute. His attacks on the principles and conduct of ſome of the moſt active promoters of the reformation, and of others who held oppoſite opinions to thoſe which he had himſelf embraced, expoſed him to the cenſures of literary characters of the firſt reſpectability, particularly of the biſhops Nicholſon, Burnet, and Kennet. Previouſly to the appearance of the ſecond volume of his hiſtory, Mr. Collier had been privately conſecrated a biſhop by Dr. Hickes. In 1725 he publiſhed "Diſcourſes upon Practical Subjects," which was his laſt work of any moment, and on the 26th of April, in the following year, he died of the ſtone, a diſeaſe to which he had been ſubject many of the laſt years of his life.

Biſhop Collier was a man of intrepid courage, indefatigable induſtry, and of the moſt unſullied integrity. It is much to be regretted that a perſon of ſuch talents, and poſſeſſed of ſo great a degree of ardour, had not embarked in a better cauſe, and thus have been diſtinguiſhed on the ſide of civil and religious liberty, on which the beſt intereſts of man depend. Biog. Brit.

Collier, in *Geography* a town of America, in North Carolina; 11 miles N.E. of Wilmington.

Collier *Rouge*, of Buffon's *Natural Hiſtory*, the white-tailed humming-bird, *trochilus leucurus*. Gmel.

Collier's *Reach*, in *Geography*, a place on the borders of the Black-water river in Eſſex, at which the Chelmer and Black-water navigation up to Chelmsford commences. See Canal.

COLLIERS, are veſſels employed to carry coals from one port to another; and ſerving as an excellent nurſery for ſeamen.

COLLIERY. Under the article Coal we have recently given the hiſtory of its mines and trade in Britain, its laws, the claſſification and deſcription of different ſorts of coal, the practice of coal-mining, and ſome of the principles to be obſerved in ſearching for coals; this laſt part admitting of farther and more general elucidation, we ſhall reſume the ſubject in this place, and treat of the different opinions which naturaliſts have held, reſpecting the origin and formation of coals.

Mr. Richard Kirwan, a moſt indefatigable collector of facts relating to geology, when ſpeaking of carboniferous ſoils or coal meaſures (Geological Eſſay, p. 290, &c.), ſtates theſe to be either chiefly argillaceous or arenilitic, or both together, or of the trap kind, or calcareous; the circumſtances of theſe, and of the coal found among them moſt worthy of notice, he ſtates to be the following; *viz.*

1°. They commonly form diſtinct ſtrata, or beds, one over the other to a great depth. The ſtrata of coal are uſually called *ſeams* (beds); it is very ſeldom found in irregular heaps (pipe-veins, bellies, neſts), or veins (loads, fiſſures, rake-veins, &c.).

2°. Theſe ſeams are ſcarcely ever found *ſingle*, but thoſe whoſe thickneſs does not exceed 14 or 15 inches, are rarely worked. At Whitehaven five were lately worked, at Newcaſtle three, at Liege 20. The higheſt ſeams, and next the ſurface, are generally the worſt (ſee §. 7°), but the deepeſt are not always the beſt.

3°. The thickneſs of different beds of coal is variable, from half an inch or leſs to 5 or 6 feet; but not unfrequently it amounts to 25 or 30 feet, and in ſome rare inſtances to 80 feet or more. No ſuch ſeam as this laſt has occurred in Great Britain.

4°. Seams of coal generally occupy a conſiderable extent both in length and breadth, and whatever the thickneſs of each may be, it is commonly conſtant for a conſiderable ſpace, as a mile or two miles; inſtances of a contrary kind ſeldom occur, unleſs the ſeam be diſturbed by ſome obſtruction (ſee § 16°), or at the extremities of a coal-ſoil, (coal-meaſures), or in an extent exceeding two miles.

5°. In the ſame ſtratum (ſeam) if exceeding 3 or 4 feet in thickneſs, the coal is ſeldom exactly of the ſame quality.

6°. Different ſeams of coal are ſeparated from each other, by at leaſt one, but generally by ſeveral ſtrata of earth or ſtone (See article Coal); theſe, in a conſiderable extent, preſerve alſo an uniform thickneſs.

7°. The uppermoſt ſeam of coal is commonly ſoft and duſty; it is vulgarly called *ſmut*.

8°. Seams of coal, and alſo their concomitant ſtrata, are generally parallel to each other, unleſs an uncommonly thick ſtratum of earth, 150 or 200 feet thick, intervenes. Their number and order are alſo ſimilar, to a conſiderable extent, yet variable in the ſame diſtrict and ſoil.

9°. In many of the concomitant ſtrata, particularly of ſhale, bituminous ſhale, indurated clay, and ſand-ſtone, particles of coal are found interſperſed.

10°. The ſtrata that immediately cover coal, and thence called its *roof* (crop), are ſhale, bituminous ſhale, or ſand-ſtone; rarely any other. But they are alſo often found at a great diſtance above it.

11°. The ſtrata on which coal repoſes, and thence called its *floor*, *ſole*, or *pavement*, are alſo ſand-ſtone, ſhale, indurated clay, or ſemi-protolite (a reddiſh ſand-ſtone or breccia). This laſt would, ſays Mr. Kirwan, in moſt caſes, be found in its floor, if the mines were ſunk deep enough to reach it. Granite has alſo been found in its floor in a few inſtances. In trap ſoils, trap or baſalt is ſaid to form ſometimes the roof, and ſometimes the ſole of a ſeam of coal, but, in ſtrictneſs, it is believed, ſhale moſtly intervenes.

12°. Impreſſions of plants, particularly of the cryptogamic and culmiferous kind, are moſt frequently found in ſhale and bituminous ſhales that accompany coal, or which are found in coal mines, ſometimes on ſand ſtone, but very rarely on the coal itſelf. Roots alſo frequently appear in the indurated clay. Trees carbonated, or bituminated, ſometimes repoſe on coal, or are found under it. Fluviatile (or river) ſhells, muſcles, and land-ſnails, often occur; ſea-ſhells ſeldom.

13°. Argillaceous iron ore is ſometimes met with among the carboniferous ſtrata of an argillaceous ſoil; and martial pyrites, either found, or much oftener oxygenated, and mixed with the ſubſtance of the coal.

14°. The *ſtretch* or *courſe* (drift, run) of ſeams of coal, and of their attendant ſtrata, is commonly between E. and W. or N.E. and S.W. There are, however, a few exceptions to this rule.

15°. The *dip* (or pitch) of coal is exceedingly variable, ſometimes nearly horizontal, ſometimes from 25° to 45°, ſometimes 75°, rarely approaching ſtill more to the perpendicular.

16°. The uniform courſe (or plane) of ſeams of coal, and of the ſtrata that accompany them, is frequently interrupted by obſtructions, called *ſlips*, *dykes*, *troubles*, *faults*, (hitches, traps, breaks, fiſſures, loads, knots). Theſe never fail to elevate (riſe, upcaſt, uptrap) or depreſs (ſink, downcaſt, downtrap) the ſtrata beyond them; or rather, the ſtrata on each ſide of them are found at different heights. This obſervation is general, being found to hold good in every part of Britain, as well as on the continent. The inequality of the height amounts from a few inches to 120 feet, but ſo great an inequality is rare, and has been found only in Derbyſhire. In Germany it ſeldom exceeds, and ſcarcely amounts to, 50 feet.

17°. It has been obſerved in Britain, that if the *ſlip*, &c. overhangs (hades) on one ſide, and conſequently forms an acute angle with the ſeam of coal which it cuts, the continuation of the ſtratum will be found *lower* on the other ſide of the ſlip, and conſequently, *vice verſâ*, if it recedes from (underlays), or forms an obtuſe angle with the ſeam of coal on the one ſide; the continuation of the ſeam will be found higher on the other ſide, as in *Plate* I. *fig.* 1. of *Geology*, where *a* and *b* denote the interrupted ſeam of coal, and *c c*, the obſtruction or *ſlip*, &c.

18°. Theſe *ſlips*, &c. (or the matter filling them) ſometimes conſiſt of indurated clay, ſometimes of ſand-ſtone, both different from ſuch as form the ſtrata, but more frequently of ſome ſpecies of ſtone that never compoſe the ſtrata of coal-mines, except, perhaps, rocks of the trap ſpecies; their thickneſs amounts in various mines, from a few inches to ſeveral yards. Nodules of coal are ſometimes found in the ſlips, and water is frequently lodged in them. They often deſcend from the ſurface to the greateſt known depths.

19°. The diſpoſition of the ſtrata below the ſurface ſeldom conforms to the figure of the ſurface. The former is often regular, when the latter is broken and uneven, and *vice verſâ*; very frequently the ſtrata dip into a hill, againſt the riſe of the ſurface, or croſs it in a right or diagonal line.

20°. The deepeſt mines known are thoſe of Namur, ſome of which are ſaid to deſcend 2400 feet, or 400 fathoms.

21°. The ſeams of coal, where in contact with their *roof*, *floor*, or *ſlip*, have a ſmooth, poliſhed, gliſtening ſurface, which ſhews they were originally ſoft.

To the above we have, in parentheſis, added ſeveral ſynonyms for rendering them more intelligible in different diſtricts; we ſubjoin other general concluſions of this ingenious author, relative to coals, with occaſional ſynonyms of our own, and number them in a ſeries following the above, for the convenience of reference: *viz.*

22°. That the quantity of earthy or ſtony matter in the moſt bituminous coal, bears no proportion to the weight of that coal; bituminous coal is capable of being charred (ſee Coke); and then it is a ſubſtance almoſt entirely reſembling vegetable charcoal, which, on combuſtion, ſcarcely leaves $\frac{1}{30}$th of its weight of argil or ſtony matter. Geol. Eſſ. p. 316.

23°. That mines of *wood-coal* (brown-coal, Bovey-coal, furturbrand) have no uniformity in the thickneſs of their ſeams of wood-coal (as in § 4°); on the contrary, in the moſt conſiderable of theſe, an uniform decreaſe of thickneſs from the place in which the wood was firſt heaped, is obſerved. Ibid 321.

24°. That ſeams of real mineral coal, and thoſe of earth or ſtone that accompany them, are obſerved to preſerve their paralleliſm (noticed § 8°) even after an interruption by a ſlip or dyke, whether elevated or depreſſed. But in mines of wood-coal, no ſuch paralleliſm, nor even any diſtinct number of ſtrata prevail, but the whole appears to be one ſtratum, irregularly divided by maſſes of clay or ſtone. Ibid.

25°. That mines of wood-coal preſent ſudden elevations or depreſſions in the ſame ſtratum; mines of real mineral coal never. Ibid 322.

26°. That there are no ſlips or dykes in wood-coal mines; thoſe of genuine coal abound in them. Ibid.

27°. That wood-coal is frequently covered with round fragments of quartz; genuine coal never. Ibid.

28°. That there is in the muſeum of Florence, a cellular ſand-ſtone, the cells of which are filled with genuine mineral coal. Could this have been wood? Ibid.

29°. That genuine coal is ſeldom found in plains, but wood-coal frequently is, according to Voight Pract. Ibid. 323.

30°. That the impreſſions obſerved on real coal, are thoſe of herbaceous plants, as fern, &c.; the impreſſions of reſiniferous plants have never been diſcovered on the ſtrata that accompany coal, and the trees found are commonly birch or oak. Ibid. 318.

31°. That the traces of land vegetables, and not of marine vegetables, are found on the ſtrata that cover ſeams of coal, or on thoſe on which theſe ſeams reſt, or on both. Sea-ſhells are ſcarcely ever found among them, and much leſs the bones of fiſh: that, on the contrary, reeds or ruſhes, and fluviatile ſhells, have been found in the ſtrata that cover coal. Ibid. 323.

32°. That common ſalt is never found in coal-mines, except when in the neighbourhood of ſalt ſprings; but on the contrary, alum and vitriol. Ibid. 324.

33°. That carbonaceous ſtrata never preſent a conic elevation on both ſides of a diſruptured ſtratum, as would be the natural reſult of an impreſſion from below. Ibid. 337.

34°. That coal is never to be expected in primeval mountains, as granite, gneiſs, &c., but that on the ſides of theſe, particularly if very high, or in the hanging level that ſlopes from them to ſome river or valley, it may be ſought. Ibid. 347.

35°: That there is ſtill a greater probability of finding it in the neighbourhood of mountains of argillaceous porphyry. Ibid.

36°. That it may be ſought with probability of ſucceſs in ſand-ſtone mountains, if ſand-ſtone and clay alternate, or ſand-ſtone, clay, and argillaceous iron ore. Ibid. 348.

37°. That in any elevated land in which ſand-ſtone and ſhale with vegetable impreſſions, or indurated clay and ſhale, or bituminous ſhale, form diſtinct ſtrata, or clay, iron ore, and ſhale, with or without ſtrata of ſand, coal may well be expected. Ibid.

38°. That if ſand-ſtone be found under lime-ſtone, or if they alternate with each other, and, particularly, if indurated clay and ſhale form any of the ſtrata, they afford a probable indication of coal; otherwiſe coal is very rarely found in, or under lime-ſtone. Ibid.

39°. That coal is very ſeldom found with argillite, and ſuch as has been is of the uninflammable kind. Ibid.

40°. That where trap, or whin and clay alternate, and more eſpecially trap and ſand-ſtone, coal may be expected; it is often, but not regularly, found under baſalt; wood-coal is ſometimes found under both. Ibid.

41°. That coal frequently burſts out on the ſurface, or on the ſides of hills, in a withered ſtate, which diffuſes itſelf to a diſtance from its origin, and requires an experienced miner to trace it truly to the ſeam to which it belongs. Ibid.

Such are the valuable obſervations of Mr. Kirwan, on the probable exiſtence of coal in certain ſituations, and on its poſition and relation to the adjoining ſtrata, &c. Theſe obſervations are for the moſt part unexceptionably true, and will be found conſiſtent with what we have delivered on this ſubject, under the article Coal; but a few of them ſeem to require ſome remarks in this place.

§ 3°. Under the names of different collieries we ſhall take occaſion to mention ſuch ſeams of coal as are remarkable for their thickneſs, or other properties. The limitation of two miles, as the extent of regularity in coal ſeams, mentioned in § 4°, ſeems inconſiſtent with the multiplied obſervations of Mr. Smith and other recent obſervers; ſometimes two or more veins of coal which are ſeparated only by thin beds of ſhale, or other bituminous matter unfit for uſe, are found to unite, owing probably to the diffuſion of the earthy matter more generally among the coal, inſtead of its forming diſtinct layers therein; but generally, in purſuing the ſeam further, the coals ſeparate again; the extremities of a coal ſoil, can, in our opinion, only be found in the regular ending or out-crop of the meaſures, (ſee *Ending of* Strata); or, where the ſtrata on one ſide of an obſtruction or fiſſure have been carried away by an abraſion or denudation of the elevated ſtrata, of which we ſhall give ſome account, and mention ſeveral curious inſtances in England, under the term Denudation. We are not inclined to think, that thick intervening meaſures are more likely to alter the paralleliſm of ſeams of coal, as mentioned § 8°, than thin ones; the contrary opinion has probably in ſome caſes ariſen from comparing the ſeam on different ſides of a fault or fiſſure, which hades or declines conſiderably from a vertical poſition. Under the article Coal, we have explained how different borings or ſinkings in the ſame diſtrict, may differ materially, or perhaps entirely, owing to one being begun higher up on the meaſures or ſeries of ſtrata than the other, otherwiſe, we believe, that *the ſame* ſtratum will be found to have the ſame ſucceſſion of ſtrata under it. And here it may be neceſſary to note, that a place being *higher up* on the ſeries of ſtrata, has no relation to its actual elevation compared with the centre of the earth, or with a level line, as truly obſerved by Mr. Whitehurſt, (Enquiry p. 153,) but the loweſt known ſtrata in many diſtricts are ſeen on the greateſt heights; this we ſhall amply illuſtrate by examples, in the progreſs of our work. See *Order of the* Strata.

The ſemiprotolite, mentioned § 11°, certainly has no exiſtence in a large portion of the Britiſh coal-mines, if it exiſts in any of them; the theory adopted by our author, of granite forming the foundation in every inſtance, and generally with a breccia or ſemiprotolite upon it, is diſproved in innumerable inſtances by Mr. Smith's maps and ſections, ſhewing the actual ſucceſſion of ſtrata throughout the country.

We are of opinion with M. Blumenbach (Hanbuch der Natur. Geſch 703), that moſt, if not all, of the vegetable foſſil remains are *incognita*, and cannot be identified with any recent or known plants of the preſent race (§ 12° and 30°). The recent determinations of M. Cuvier declaring moſt of the oſſeous remains from the ſtrata, hitherto diſcovered, to be *incognita*, will probably, we think, when the proper diſtinction is made between the regular ſtrata foſſils, and thoſe which ought, according to our remark, under the article Coal, to be conſidered as *gravel*, as *recent*, or as *peat* foſſils, be much further extended, perhaps ſo far as to include every animal remain which is found actually lodged in the ſtrata; the diſtinction, therefore, between *river* ſhells and *land* ſnails, as accompaniments of coal, nearly to the excluſion of *ſea* ſhells or marine remains, we conſider a mere hypotheſis, as we ſhall take future opportunities of ſhewing.

It is not univerſally true, as mentioned § 16°, that *ſlips*, *dykes*, &c. never fail to elevate or depreſs the ſtrata, or to occaſion an inequality in their levels; (ſee our deſcription of dykes in the article Coal); the inſtances being numerous both in the coal meaſures and other ſtrata, where a fiſſure of conſiderable width makes no ſenſible alteration in the continuity of the planes of the ruptured ſtrata. The alterations of level which fiſſures occaſion, are alſo much greater in numerous inſtances, than our author admits; beſides thoſe mentioned, (Coal), we might ſtate on the authority of Mr. Martin, that down-caſts of 40 to 100 fathoms are not uncommon in the ſtrata of what he denominates the Mineral Baſon of South Wales. (Phil. Trans. 1806. p. 342). That the diſlocations of the ſtrata (§ 17°) have been gentle and gradual, (Geol. Eſſays, 333), we cannot ſuppoſe, much leſs that the extraneous matters which fill the fiſſures (§ 18°) were of prior origin to the ſtrata themſelves, and occaſioned the overhanging or hading of the fiſſures, as our author has ſuppoſed, page 334. We have reaſon to hope, that theſe and ſeveral other hitherto unexplained phenomena of the ſtrata, will be fully made out by the new lights which we ſhall be enabled to throw on the ſubject, ariſing out of the diſcoveries of Mr. Smith, above alluded to.

That ſome rare inſtances have occurred of the ſtrata underneath, dipping in a contrary direction to thoſe near the ſurface, § 19, muſt be admitted, and of which the Somerſetſhire coal-mines deſcribed in the Philoſophical Tranſactions, N°. 360 and 391, by Mr. John Stracey, ſeem an inſtance; but in general it will be found, that the plane of the ſtrata beneath, conforms to any *regular plane* which is to be found on the ſurface, either of a hill or vale, excepting only in the firſt caſe, inſtances where a perfectly ſtraight and ſmooth fracture of the ſtrata has happened, and, in the latter caſe, where ſtagnant water has in times long poſterior to the formation of the ſtrata, made depoſits of mud, &c. in regular horizontal layers, or nearly ſo. This circumſtance is of the utmoſt conſequence to be attended to in tracing the ſtrata of a country, as alſo to note carefully the diſtinction between theſe original planes or facettes of a hill, and the curious curving ſurfaces occaſioned by the ending of ſtrata, or the leſs regular curving of the ſurface, occaſioned by the fracture (generally oblique or hading) and ſubſequent abraſion or rounding of the top and edges of the ſtrata by the action of moſt violent currents of water. The circumſtance mentioned by our author, of the ſtrata dipping into a hill, is obſervable at the endings of moſt of the ſtrata, and on the ruptured ſide of a large portion of hills and mountains, where the break or fiſſure occaſioning the hill was in the run or courſe of the ſtrata, as it lies at preſent, which, according to the obſervations of Charpentier, p. 80, is very generally the caſe; but where the preſent dip is in the direction of the fiſſure, or is inclined in any acute angle thereto, the ſtrata will croſs the riſe of the hill, direct or obliquely as the caſe may be.

The probability will be ſhewn hereafter, that ſome of the diſturbances, or ruptures in the ſtrata, have been confined to a certain number of the upper ſtrata, without affecting thoſe below, and hence regular ſtrata may ſometimes be found, under thoſe which are broken and uneven, as mentioned in this ſection; and the Somerſetſhire coal ſtrata above mentioned may perhaps thus be accounted for. We have never been able to diſcover any thing, in the upper or under ſurface of a ſeam of coal, which demonſtrates its having originally been ſoft, as mentioned § 21°; the gliſtening appearance of the ſurface in ſome partings, ſhews only the great regularity and truth of the planes or lamina, in which the ſtrata were at firſt depoſited. The poliſhed or rather rubbed ſurfaces of the ſlips or dykes in coal mines, and indeed in the ſtrata generally, is a circumſtance which ſeems moſt ſurpriſingly to have been overlooked by writers on this ſubject. Mr. Kirwan only gives it the curſory notice contained in § 21°. This rubbing ſeems to have ariſen from violent mechanical preſſure, and motion to and fro againſt each other, and this ſeems not confined to fiſſures or joints, where the ſtrata are lower on one ſide than on the other, ſo as to be explicable, as the effect of the ſlip, or mere ſinking down of one part, when in cloſe contact with the other; but this apparent wear in the ſurfaces, of even the ſmaller fiſſures, is as obſervable in marl and chalk pits, and all tolerably ſoft ſtrata, where no alteration of the level of the ſtrata has taken place, as where ſuch depreſſion of one ſide of the fiſſure is viſible. See Philoſophical Magazine, vol. xxv. p. 45 and 46, and vol. xxviii. p. 120. See alſo *Elevation of* Strata. The facts and obſervations of Mr. Kirwan on coal, in ſections 23° to 25° above, agree with our remarks under the article Coal, on the unequal and apparently accidental diffuſion of the wood-like ſubſtances which have formed the ſtrata, or rather accumulations of wood-coal. That ſlips or dykes have never been obſerved in wood-coal mines, (§ 26°), can only, we think, have ariſen, from the limited extent of theſe accumulations in the ſtrata, at leaſt of ſuch as are worked; while the excavations in the planes of the ſtrata, as well as vertically in ſhafts, have been incomparably greater in the proper coal diſtricts, than in any other, and therefore it is, that the dykes &c. have there been beſt aſcertained; and from coal-working it has been, that almoſt all our knowledge of the ſtrata has been derived; they were the objects which firſt awakened Mr. Smith's attention to the ſubject of the ſtratification, and by obſervations in the next moſt extenſive field for theſe obſervations, *viz.* the cutting of navigable canals, he was enabled to generalize and extend the important facts, at preſent ſo little known, but to coal-miners, within their own particular diſtrict.

Genuine coal is now very ſeldom worked at its out-crop, as before obſerved, owing to the ſuperior quality of the ſame ſeam, when deeper covered; but wood-coal is generally worked ſo near to the ſurface, as to be opened at top, or uncallowed, inſtead of being mined for; it is no wonder therefore that gravel has been obſerved in contact with it, as obſerved § 27°.

Perhaps the ſpecimen mentioned § 28°, did not contain genuine coal in its cells; we conjecture this, from having ſeen ſpecimens of a reddiſh ſoft ſand-ſtone, which Mr. Farey brought laſt ſummer from the foot of the cliff on the ſea beach, about two miles eaſt of Haſtings in Suſſex, from the vicinity of a cottage called the Grovers, which contained ſo many detached pieces of bitumenized wood, that were an augre-hole to be bored into it, and ſupplied with water, &c. ſomething like the appearance of penetrating a coal vein, might be had in the borings; and it is this ſtratum, dipping under Bexhill, ſituate about 6½ miles to the weſtward, which in the opinion of Mr. F. has been there miſtaken in the borings for a ſeam of coals, but which the improved boring apparatus of Mr. Ryan, mentioned under Coal, would have detected, and ſaved, perhaps, a moſt unparallelled waſte of money, in the meaſures now purſuing.

The remark in § 29°, that genuine coal is ſeldom found in plains, is by no means true; the coal-ſtrata about Bedworth in Warwickſhire, Whibſey Slack near Bradford in Yorkſhire, and numerous other places which we could mention, form extenſive plains; a contrary remark to the above, would perhaps be much nearer to the truth.

It will readily be gathered, from our remarks on § 12°, that we have our doubts, on the diſtinctions between reſiniferous and non-reſiniferous plants, land and marine vegetables, and river and ſea ſhells, as accompaniments of coal, § 30 and 31, and that we incline to the opinion, that further ſearches will claſs all or moſt of them among the incognita of a prior ſtate of aquatic exiſtence.

Impreſſions from below the ſtrata § 33, eſpecially from elaſtic fluids, muſt have formed conic elevations or craters in making their eſcape, and could not have produced that univerſal breaking of the ſtrata which we find; which is indeed ſo univerſal, that a ſingle acre of the ſurface can ſcarcely be found without one, and ſometimes numerous fiſſures through it, although the original plane of the ſtrata is ſtill maintained by its fragments, facts which had a material influence on the writer's reaſonings upon this ſubject, which we have hinted at above. The ſeven following ſections being ſtated, as conſequences of Mr. Kirwan's particular tenets, which we ſhall mention preſently, on the origin of coal, we ſhall paſs them without comment for the preſent, and proceed to ſtate the principal among the various opinions which have been given, on the origin of the invaluable ſubſtance, which is the ſubject of our preſent inquiry. In ſtating the opinions which have been held as to the origin of coal, we ſhall begin with that of Arduino and ſome others, who have ſuppoſed coal to originate from the fat and unctuoſity of the numerous tribes of animals which have peopled the ocean; which matter being accumulated on the bottom of the ſea, became covered by various ſtrata, in conſequence of the different changes which the ſurface of the earth and bottom of the ſeas have undergone. The moſt obvious objections to this hypotheſis ariſe, from the total diſſimilarity of coal to animal fat, and the levity of the latter compared with water, which ſhould have occaſioned it rather to riſe to the top of the water and float, than to diſpoſe itſelf in ſuch extremely regular beds at the bottom, as to form ſtrata of coal. The exiſtence of a few ſhells in or near to coal, in ſome places, which reſemble ſome of the recent ſea ſhells, we conceive to be as far from proving it to be of marine origin (as contended by the author of this hypotheſis) as the ſuppoſed reſemblance of ferns, reeds, ruſhes, &c. and land and river ſhells, with the abſence of bones of fiſh and ſea ſalt in other places, proves it to be of land origin, § 30 and 31 of Mr. Kirwan's obſervations above, and Geol. Eſſ. 323.

The next opinion which we ſhall mention is that of M. Genſanne and others, who, from the ſpecific gravity and hardneſs of ſome kind of coal, and its large quantity of bituminous matter, have concluded pit-coal to be a peculiar earth of the argillaceous genus, penetrated and impregnated with petroleum. To this opinion Mr. Kirwan oppoſes the remark in the 22° § above, and adds, that ſome known ſpecies of coal, that of Kilkenny for inſtance, contain no petrol or other bitumen in their compoſition. and are thence called natural carbon. See Mr. Kirwan's Mineralogy ii. 49.

M. Tingry, Dr. Darwin, and others, have imagined, that heat generated by the fermentation of immenſe beds of vegetable matters, have diſtilled or ſeparated there from the oils, naphtha, aſphaltum, &c. which condenſed between the ſtrata, and have formed ſeams of coal, and bituminous ſchiſts. On this fanciful theory it can ſcarcely be neceſſary to comment.

Dr. Hutton imagines coal to be formed by the ſlow depoſitions of oily and bituminous matters at the bottom of the ſea, which matters he ſuppoſes to have originated in the diſſolution of the various animal and vegetable bodies, which are continually periſhing on the ſurface of the earth, and in the waters of the ocean. The fuliginous matter which is ſeparated during the combuſtion of various bodies on the ſurface of the earth, he ſuppoſes, is waſhed off the ſurfaces on which it falls by the rain, and, being thus made to flow into the rivers, is carried off by them into the ſea; where it alſo adds, by its depoſition, to the maſs which is accumulating at its bottom. Another ſource whence he ſuppoſes this matter to be derived, is the water draining from peat moſſes, which, according to his ideas, is charged with bituminous matter, very much reſembling foſſil coal, when precipitated. The depoſitions of theſe matters in the ſea are ſuppoſed by the Doctor to be ſo regular, as to produce ſtrata, which, becoming covered by an immenſe weight of ſuperincumbent earth, muſt thereby become exceedingly compreſſed and condenſed, and finally conſolidated, by the powerful influence of ſubterranean heat; and ultimately, by the progreſſive change of ſea into dry land, theſe become ſeams of coal, ſuch as we now find in the bowels of the earth. Granting that oily and bituminous matters are thus conveyed by the rivers into the ſea, but which Mr. Kirwan has ſhewn does not take place, there is a manifeſt abſurdity in ſuppoſing theſe matters to ſink to the bottom of the water; while it is ſcarcely poſſible to conceive, that diſtinct beds or ſtrata of coal and earth, eſpecially ſuch regular and extended ones as we find of them, can be formed by depoſition in an ocean conſtituted as our preſent one is. The operation of heat upon theſe coal ſtrata has been ſhewn by Mr. Kirwan and others, to be inconſiſtent with all the circumſtances attending them. It is true that ſir James Hall (Tranſactions of the Royal Society of Edinburgh, vol. vii.) has endeavoured to remove the force of theſe objections, by ſhewing, in the detail of his chemical experiments, and by the ſpecimens preſented to the Britiſh Muſeum in June 1806, that wood, or even horn, may be converted to a ſubſtance reſembling coal, by the action of an intenſe heat applied under a very immenſe preſſure. Valuable and ſatisfactory as we think ſir James's experiments to be, in proving the poſſibility of carbonat of lime being fuſed without decompoſition, and of vegetable and animal ſubſtances being melted or reduced to a coal-like ſubſtance, under the heat and confinement, as well as preſſure which he applied, yet we think, the difficulty of Dr. Hutton and other Plutoniſts to be ſtill nearly as great as ever in ſhewing, that ſuch a degree of heat ever has exiſted in ſtrata, not obviouſly volcanic; certainly, lava, however hot we may admit it to have been, could never by its mere protruſion under beds of ſea-ſhells, as ſir James Hall endeavours to explain, in his imaginary ſection of a volcanic mountain and adjoining ſea, (*fig.* 41. in the Tranſactions,) have heated their whole maſs, in the degree which his own experiments have ſhewn to be neceſſary for the formation of lime-ſtone; nor is it conceivable, that the ſuppoſed ſuperincumbent ſtrata, much leſs any depth of water, could have ſo effectually retained the carbonic gas, as he himſelf has ſhewn to be neceſſary, to form lime-ſtone or marble out of ſhells or chalk; or the other gaſſes, ſo as to effect the converſion of wood and vegetables into pit coal.

The ingenious Mr. Kirwan ſuppoſes, that a large claſs of primeval rocks and mountains, containing carbon and petrol in their compoſition, have been either totally deſtroyed, or their heights and bulk conſiderably leſſened by diſintegration and decompoſition; and that by the equable diffuſion of the diſintegrated particles, ſucceſſively carried down by the gentle trickling of the numerous rills that flowed from thoſe mountains, the ſeams of coal and their attendant ſtrata were formed, in lakes at their feet, we ſuppoſe. but this circumſtance it is difficult to gather from Mr. K's account; according to which, the decompoſed feltſpar and hornblende formed clay, the particles of bitumen were ſet free, and theſe, when united, ſunk through the moiſt pulpy, incoherent, argillaceous maſſes, and formed the ſeams of coal beneath them. Mr. Parkinſon (Organic Remains I. 248.) has commented on the abſurdity of ſuch a light ſubſtance as bitumen, being ſuppoſed to deſcend through a pulp of argillaceous matters, and depoſit itſelf in a ſtratum below it.

The next hypotheſis which we have to mention, and which has numerous adherents, aſcribes the formation of coal to foreſts of antediluvian trees, and to peat bogs, and other vegetable productions of the dry land of that period, buried during the ſuppoſed violences of the Moſaic deluge, under the ſtrata which are found covering them in the ſtate of coal at this day. This hypotheſis we ſhall examine, and ſtate ſome of the objections to which it ſeems liable; and firſt, they are mines of wood-coal, deſcribed in §s. 23° to 29° above, which alone have the appearance of being formed by depoſitions of floating wood and other matters, in the irregularity of their extent, and the variable thickneſs of the ſeam, circumſtances extremely rare in regular coal-ſeams, or in the matters alternating with them. Some, we are aware, have contended, that this uniformity in the thickneſs of regular coal ſeams has ariſen, from the maſs of depoſited wood and vegetables having, ſince they were covered by the ſuperincumbent ſtrata, been liquified, or nearly ſo, by ſome proceſs, the exact nature of which has never been agreed upon by the advocates of this hypotheſis, and that in this ſoft ſtate (§ 21° above) they were preſſed into an uniform ſeam, or continued ſtratum. An obvious objection to this explanation, of the uniformity obſerved in the thickneſs of a real coal-ſeam ariſes from the fact, that all coal-ſeams preſent themſelves at the ſurface in the endings of the ſtrata, and frequently alſo in the ſides of hills, occaſioned by diſlocations of the ſtrata (§s. 19° and 41°); and here it will be difficult, if not impoſſible, to conceive, how the coal, when in a ſoft ſtate, was prevented from ſqueezing out by the weight of the ſuperincumbent ſtrata, and forming maſſes of that ſubſtance at the ſurface, of which no traces are obſervable; for, the diffuſion of the withered coal or ſmut, below the out-crop of coal ſeams (§ 41) has no ſuch appearance, but in all its circumſtances agrees, with the withered remains or rubble of other ſtrata at their outcrop. We incline to the opinion, that real wood, or other recent vegetable ſubſtances, have never been found in the coal ſeams, or in their accompanying meaſures or ſtrata: a large portion of the bitumenized vegetable impreſſions there found certainly bear no reſemblance to known woods, or plants of the preſent race; while moſt, if not all of ſuch remains, that have been denominated after recent plants, have been ſo named without that care which a botaniſt would exerciſe, in claſſing or naming a new recent plant which was preſented to him for examination. Hence the ſuppoſed reſemblance to land plants, rather than to aquatic plants in theſe curious remains, has, as we conceive, ariſen. Our next objection to the above hypotheſis is founded, on the improbability of the accumulation of ſuch immenſe quantities of trees and vegetable matter in the antediluvian world, in leſs than 17 centuries, when more than 42 centuries ſince have accumulated ſo little: if they had remained on the ſurface of the dry land and not decayed, a very large portion of the earth muſt have been thereby incumbered and rendered unfit for the habitation and uſe of men or animals; it is highly improbable, that they were progreſſively removed from the dry land to the antediluvian ſea, and there preſerved until the deluge. The probable quantity of growing trees and vegetables exiſting at the commencement of the Moſaic deluge, ſeems quite inſufficient to account for even the Britiſh coal ſtrata, when it is conſidered how much the bulk or maſs of the vegetable matter has, in all probability, been reduced, by its converſion into real coal: and this laſt ſuppoſition is alſo denied us, by the Moſaic account of this event, from which (Geneſis, vi. 7. 17. 19. 20; vii. 2, 3, 4. 8, 9. 14. 21, 22, 23; viii. 11. 17. 19; ix. 3. 20.) we gather, that the exiſting trees and vegetables (as well as fiſh) were not deſtroyed by the deluge (See DELUGE.) Some writers on the formation of coal have ſpoken of it, as the remains of vegetable matters, either growing in, or that were depoſited in the ſea, in very diſtant periods, and which have been immured under layers of earth, &c. by certain convulſions and deluges (whether the Moſaic or others, ſome of them have not explained) which have ſince occurred: inſuperable difficulties will, we apprehend, be found to attend any hypotheſis, which ſuppoſes the burial of the matters compoſing coal, at any period ſince the earth has been divided into ſea and dry land as at preſent, let the origin of thoſe matters be ſuppoſed whatever they may.

The writer of this article begs leave to ſtate another opinion, which the recent diſcoveries of Mr. Smith and himſelf ſeem to render, in his judgment, moſt probable, on the origin of mineral coal. This writer has ſeveral times taken occaſion to mention the probability, that the ſurface of the earth, and as far below it as concerns us at preſent to conſider, originally conſiſted of parallel laminæ of different matters, not concentric to the earth, but inclined, or, dipping towards the eaſt, and ending towards the weſt; each ſucceeding lamina, in aſcending the ſeries, being generally ſhorter towards the weſt than the eaſt, in the ſame manner as the very minute laminæ of cryſtals are now admitted to be, and thereby to form the ſlope, or inclination of the cryſtalline ſurface; but with theſe differences, that the laminæ of the earth, or the different ſtrata were diſpoſed to form indented or fingered endings, inſtead of the ſtraight lines ſo generally aſſumed in cryſtals of a ſmall ſize, and that the terreſtrial laminæ are of very unequal thickneſſes. Various circumſtances, beſides the immenſe maſſes of unbroken ſhells and other matters nearly ſimilar to the ſea ſhells, corals and other marine productions of the preſent time, ſhew theſe ſtrata to have been depoſited under quieſcent and probably very deep water, anſwering, as he conceives, to the ſtate of the earth as deſcribed by the ſacred hiſtorian, prior to the ninth verſe of the firſt chapter of Geneſis, or in the two firſt grand periods metaphorically called days, after which God ſaid "Let the waters under the heavens be gathered together into one place; and let the dry land appear." Abundant evidence will, as he apprehends, be furniſhed by an examination of the various organic remains lodged in or between the ſtrata, that the animals, at leaſt thoſe of the teſtaceous, cruſtaceous, and zoophytic kinds, whoſe remains they are, lived in the particular places where each is now found, at the time that the ſtrata, on or in which they are lodged, formed the bottom of the univerſal ocean above-mentioned; each newly depoſited ſtratum being a proper nidus for the production, and probably a pabulum for the nouriſhment of the animals peculiar to it, and which apparently in moſt inſtances ceaſed to exiſt, when new matter in proceſs of time began to be precipitated, for the production of a new ſtratum upon the former one, which, alſo, in turn had its own peculiar animals, as their remains in ſuch numerous inſtances teſtify.

The opinions of that able naturaliſt, M. Cuvier, in his recent report to the national inſtitute of France on the tranſactions of that learned body in 1806, are in favour of the animal incognita of the ſtrata, having lived where their bones are now found: and from an examination of the accounts from more than 600 places, where bones reſembling thoſe of elephants and rhinoceroſes have been dug up, belonging principally to the claſs of *gravel foſſils*, we believe, this able anatomiſt is of opinion, that all theſe differ eſſentially from the recent animals of theſe kinds and are of ſpecies now quite extinct.

Apparently, after long periods of ſucceſſive depoſition and animal exiſtence, ſuch ceaſed for a time altogether, or nearly; and the ſtrata produced an immenſe variety and quantity of vegetables, moſt of them quite unlike the vegetable tribes of the preſent race; the immenſe foreſts of weeds which have been diſcovered at the bottom of the preſent ocean, in ſome places, probably bear no proportion to the thickneſs and magnitudes of many of theſe vegetable productions of the primitive or univerſal ocean, as ſome of them probably exceeded our trees in ſize; their arboriferous trunks, ſo cloſely imitating wood, as not hitherto to have been diſtinguiſhed therefrom; but the greater part of the vegetables appear to have been of a ſmall ſize, eſpecially on ſtrata, which ſeem to have been depoſiting ſo faſt as to have immured them ſingly, as is often the caſe with the bituminous or coal ſhales, mentioned under Coal, of which the moſt beautiful, various, and minute ſpecimens, might be obtained in many coal workings. The ſucceſſive depoſitions in theſe vegetable, or carboniferous ſoils, appear to have differed, as we have ſtated thoſe of the animal, or epizootic, to do, in their fitneſs for producing different kinds, and a ſimilar appearance and diſappearance of different vegetable remains will be obſerved, in examining a ſeries of coal meaſures, or ſtrata, upwards or downwards; and, often, ſtrata will be found intervening ſuch, which contain no vegetable impreſſions, but in ſome rare inſtances, thoſe of animals will therein be found, which obſervations, of too limited an extent, as we ſuſpect, have denominated land and river exuvia, § 12° and 30° above

It is to beds of ſub-aqueous vegetables, ſuch as have been mentioned above, uniformly and thickly covering large extenſions of the planes of ſtrata, if not their whole extent, that the writer of this article can alone look, in his view of the ſubject, for the true origin of vegetable coal; and according, perhaps, to the nature of theſe vegetables, as well as to the kind or quantity of the mineral depoſits, made during their growth, will the quality of different ſeams of coal be found to vary, while their different thickneſſes has depended, on the quantity of vegetable matter accumulated, either dead, as in our peat bogs, or then actually growing, when a depoſition began to happen, either ſo copious or different, as to put a period to their growth, and ultimately to immure them. That vegetable impreſſions are rarely found in the ſubſtance of a coal-ſeam, as remarked by Mr. Kirwan in the paſſage (§ 12°) above quoted, may, we think, be perfectly accounted for, when the peculiar kind of cryſtallization, which all good mineral coals ſeem to have undergone, is taken into conſideration; a change which ſeems to have effectually deſtroyed the organization of the plants compoſing the coal, but without a liquefaction having happened, as in ſome ſtony cryſtallizations, which have of late years been noticed by mineralogiſts.

Mr. Parkinſon endeavours to account for this change, which vegetable matters undergo in paſſing into coal (Organic Remains, p. 253.) by a proceſs which he calls *bituminous* Fermentation, which ſee. According to the obſervations of this gentleman, foſſil coal has alſo, in this change, had numerous ſepta, or thin fibres of uninflammable matter, interpoſed between the particles of pure bituminous matter, of which it principally conſiſts, which has modified its inflammability in the degree which renders pit coal ſo well fitted for the purpoſes to which it is applied. In the ſpecimens which Mr. P. examined, the incloſed particles of bitumen were in form of rhomboids, or parallelepipeds, and the ſeparating pellicles, or ſepta, were formed of ſulphate of lime, containing a ſmall portion of alumine, and ſometimes of ſulphuret of iron alſo. Organ. Rem. 269.

The new opinions which we have ventured to preſent, if ſuch they are, relating to the origin and formation of coal, in that and the preſent article, will, as we truſt, be candidly received by our readers, and ſubmitted to that ſovereign teſt, an unprejudiced compariſon with the phenomena, by which it is our ſincere wiſh that they ſhould either ſtand or fall, as it is alſo of the gentlemen above alluded to, through whoſe valuable labours and communications, we were enabled to give them.

The moſt remarkable colliery, or coal-work, that we have ever had in this iſland, was that wrought at Burrowſtoneneſs, under the ſea. The veins of coal were found to continue under the bed of the ſea in this place, and the colliers had the courage to work the vein *near half way over*; there being a *mote* half a mile from the ſhore, where was an entry that went down into the coal-pit, under the ſea. This was made into a kind of round key, or mote, as they call it, built ſo as to keep out the ſea, which flowed there twelve feet. Here the coals were laid, and a ſhip of that draught of water, could lay her ſide to the mote, and take in the coal.

This famous colliery belonged to the earl of Kinkardin's family. The freſh water which ſprung from the bottom and ſides of the coal pit, was always drawn out upon the ſhore by an engine moved by water, that drew it forty fathom. This coal pit continued to be wrought many years to the great profit of the owners, and the wonder of all that ſaw it; but, at laſt, an unexpected high tide drowned the whole at once, and the labourers had not time to eſcape, but periſhed in it. Phil. Tranſ. No. 98.

COLLIGAT, in *Ancient Geography*, a town of Ethiopia near Egypt, ſeated on the bank of the Nile, according to Pliny.

COLLIGENDUM *bona defuncti, letters ad.* See Administration.

COLLIGUAJA, in *Botany*, Lam. Encyc. Molin. Chil. p. 158. Claſs and order, *monœcia octandria.* Nat. Ord. *Euphorbiæ*, Lam.

Gen. Ch. *Flowers* in a catkin. *Males. Calyx* four-cleft. *Stam.* Filaments eight. *Females* below the males. *Cal.* as in the males; ſtyles three. *Peric.* Capſule triangular, elaſtic. *Seeds* three, round, the ſize of a pea.

Sp. C. *Odorata.* A ſhrub. *Stem* five or ſix feet high, much branched. *Leaves* oppoſite, lanceolate, on ſhort petioles, toothed, one-nerved, ſmooth, fleſhy, permanent. *Flowers* on ſhort peduncles. A native of Chili.

COLLIMATION *of a Teleſcope*, in *Optics*, is that line which paſſes through the tube, and cuts both the focus of the eye piece and alſo the centre of the object glaſs; the derivation of the term is from *col*, *con*, or *cum*, *with*; and *lima*, *a file*, in conſequence of the exactitude with which it ought to be adjuſted, at right angles to the axis of a teleſcope, that is moveable on pivots in any aſtronomical inſtrument. It is in this line that the middle wire of the eye-piece ought to be exactly placed, in any teleſcope for celeſtial obſervations; which poſition may be aſcertained by reverſing the ends of the axis, and noticing, in both ſituations, a point in a diſtant object that is biſected by the ſaid wire; the deviation from true biſection being always double to the error in collimation, when the line of collimation is at right angles to the axis of motion of the teleſcope. The lateral ſcrews of adjuſtment, at the focus of the eye-piece, in the beſt inſtruments, will readily bring the middle wire into the true line of collimation with but little trouble.

COLLINS, John, in *Biography*, a mathematician of conſiderable eminence, was born at Wood Eaton, in Oxfordſhire, in March 1624. He was educated by his father, a diſſenting miniſter, and at the age of 16 was bound apprentice to a bookſeller at Oxford, but ſoon after the beginning of the civil wars he was made a junior clerk of the prince of Wales's kitchen. In this ſituation he was under the ſuperintendence of Mr. Marr, a good mathematician, and famous for the dials with which he adorned the gardens of king Charles. From hence young Collins embarked in the ſea ſervice, and having already made ſome progreſs in mathematical purſuits, he employed all his leiſure time in improving himſelf in the practical branches of ſcience. Upon his return to England he taught mathematics, and in the year 1652 publiſhed an "Introduction to Merchants Accounts." From this period he frequently preſented the public with treatiſes in various departments of ſcience, which were all well received, and to a certain degree popular. In 1667 Mr. Collins was made accountant to the Exciſe Office, and choſen member of the Royal Society. He had not been long a member of this learned and reſpectable body, when he laid before it ſome papers on the ſubject of chronology, and in 1699, a diſſertation of his was publiſhed in the "Tranſactions," on the reſolution of equations in numbers, in which are ſeveral important hints on the doctrine of differences, and other topics. He was nominated by lord Shafteſbury in divers references concerning ſuits in Chancery, to aſſiſt in ſtating intricate accounts; and was ſoon after appointed accountant to the Royal Fiſhery Company. Mr. Collins, by many publications, ſhewed how deeply he was verſed in the principles of trade and commerce. His works are numerous, and they diſplay the features of a liberal mind and a clear head. Beſides thoſe already noticed we have treatiſes on the "Mariner's Plane Scale," on "Geometrical Dialling;" on "Arithmetic;" on "The Quadrant;" on "Salt and Fiſhery," and divers papers in "The Philoſophical Tranſactions." Mr. Collins was a great promoter of the works of others, and the world is indebted to him for Barrow's "Optical and Geometrical Lecture;" his edition of "Archimedes;" and of "The Conics of Apollonius;" "Wallis's Hiſtory of Algebra," and many other excellent works. He died in London, November 1683, of conſumption, produced it was thought by drinking cyder while he was hot from great exerciſe. His papers were, after ſeveral years, put into the hands of Mr. William Jones, F. R. S., and it was from theſe that the claims of ſir Iſaac Newton to the invention of fluxions was eſtabliſhed, in the "Commercium Epiſtolicum D. Johannis Collins, et aliorum, &c." Mr. Collins was indefatigable in the purſuit of uſeful truths, and ſpared no pains in the promotion of real ſcience. Natural knowledge is greatly indebted to him, for while he excited ſome to publiſh uſeful inventions, he employed others to improve them; but his own merit was not ſufficiently rewarded by thoſe who had the means of patronizing him. Biog. Brit.

Collins, Richard, an engraver, native of Luxemburgh, who ſtudied at Rome at the ſame time with Sandrart, and engraved ſeveral plates for his work entitled "The Academy." Upon his return from Italy he eſtabliſhed himſelf at Antwerp, and ultimately at Bruſſels, where he aſſumed the title of engraver to the king of Spain. According to an inſcription copied by Heinecken from one ſurrounding his portrait, he was born in 1627. The dates on his prints are from 1664 to 1685. He made ſeveral indifferent engravings of portraits, as well as other prints from the pictures of Rubens, Murillo, S. Bourdon, and others. Heinecken.

Collins, Samuel, doctor in medicine, was educated at Cambridge, and made fellow of King's college in that univerſity. In 1650 he was admitted of New college in Oxford, by favour of the viſitors, Anthony Wood ſays. He ſoon after went to Ruſſia, and reſided at the court of the czar for nine years. On his return to England he was made fellow of the Royal College of Phyſicians in London. In 1671 he publiſhed a "Hiſtory of the Preſent State of the Court of Ruſſia, in a Letter to a Friend," illuſtrated with engravings, and in 1685, "A Syſtem of Anatomy, treating of the Body of Man, Beaſts, Birds, Fiſh, Inſects, and Plants," with numerous figures drawn from the life, 2 vols. folio. In the comparative anatomy, incomparably the moſt valuable part of the work, he received much aſſiſtance from Dr. Edward Tyſon, particularly in the anatomy of fiſhes and birds, in which he excelled. "Nemo Collino melius de ea eſt meritus," Haller ſays. The work is now, however, little noticed. There is a beautiful head of Collins, drawn and engraved by Faithorne, which gives it value to collectors of prints. Wood's Faſti Oxon. Haller's Bib. Curat.

Collins, John, an engraver of Antwerp, who ſpent ſome time in Rome, and afterwards, according to Mr. Strutt, reſided in England. There are ſome indifferent portraits by this artiſt, one of which, repreſenting Keay Nabe Naia Wi-praia, principal ambaſſador from the Sultan Abdulcahar, king of Suroſoan, is dated 1682. He likewiſe engraved the "Funeral Proceſſion of George, Duke of Albemarle," and ſeveral other prints from various maſters. Other artiſts of the name of Collins are mentioned by Heinecken.

Collins, Anthony, a writer of conſiderable eminence, was born at Heſton, Middleſex, on the 21ſt of June 1676. He was educated in grammar learning at Eton, and from thence he was removed to King's college Cambridge, under the tuition of Mr. Hare, afterwards biſhop of Chicheſter. When he quitted the univerſity he entered himſelf a ſtudent in the Temple, but, diſguſted with the purſuits of the law, he quickly relinquiſhed all thoughts of that profeſſion. In 1698 he married, and being poſſeſſed of conſiderable property, devoted himſelf to literary purſuits. In 1703 and 1704 he maintained an epiſtolary correſpondence with the celebrated Mr Locke, who conceived for him a very high regard, and in 1707, he publiſhed his "Eſſay concerning the Uſe of Reaſon, &c." a work containing many valuable obſervations, but which diſcovered ſtrong prejudices againſt divine revelation. About the ſame period Mr. Collins engaged in the controverſy carried on by Mr. Dodwell and Dr. Clarke, concerning the natural immortality of the ſoul. See Clarke. In 1709 he publiſhed "Prieſtcraft in Perfection, &c." and other controverſial pieces; and in the following year "A Vindication of the Divine Attributes," in anſwer to a ſermon, by the archbiſhop of Dublin, on "Divine Predeſtination, conſiſtent with the Freedom of Man's Will." He ſpent a conſiderable part of the year 1711 on the Continent, where he cultivated the acquaintance and regards of M. Le Clerc and other men of eminence. In 1713 he publiſhed "A Diſcourſe on Free Thinking," in which he vindicated the univerſal right of unlimited freedom of inquiry, and expoſed the tyranny exerciſed by the abettors of prieſtcraft; this was the profeſſed object of the work, but the author's ſecret intention was undoubtedly to attack revealed religion; it therefore called forth ſome able replies from Mr. Whiſton, Dr. Hoadly, and Dr. Bentley. Mr. Collins now paid another viſit to Holland, and from thence he proceeded to Flanders, in both which countries he was received by men of letters with the moſt marked attention. On his return he ſettled in the county of Eſſex, where he exerciſed the important duties of magiſtrate and deputy lieutenant of that county. About the year 1715 he publiſhed his "Philoſophical Inquiry concerning Liberty," which is unqueſtionably one of the beſt treatiſes on that ſubject; it is highly methodical and very conciſe, and its illuſtrations are ſimple and perſpicuous. On this ſmall tract Dr. Clarke made ſome remarks, of which Mr. Collins took no notice. In the year 1718 he was choſen treaſurer of the county, an office which he executed with exact fidelity, to the great relief of numerous claimants on the county rates. In the year 1724 he publiſhed an "Hiſtorical and Critical Eſſay on the Thirty-nine Articles," and a "Diſcourſe of the Grounds and Reaſons of the Chriſtian Religion;" this laſt work, being an evident attack upon Chriſtianity, was anſwered by many of the leading men of that day, both of the eſtabliſhed church, and among the diſſenters. His work entitled "The Scheme of Literal Prophecy," &c. called forth alſo the pens of ſome able advocates for the truth of revelation, and it may be ſafely affirmed that the controverſies excited by Mr. Collins redounded to the honour and firm eſtabliſhment of the cauſe which he hoped to undermine. After a life of activity, in which his talents had been frequently and zealouſly employed for the advantage of his countrymen, Mr. Collins died of a ſevere attack of the ſtone, a diſorder which had for ſome years been ſapping away the principles of his conſtitution. As a writer his works will ſpeak for him, ſome of which, beſides his "Inquiry concerning Human Liberty," are ſtill held in conſiderable eſtimation. As a man, his moral conduct was exemplary for the virtues of temperance, humanity, benevolence, and patient induſtry. In the exerciſe of his magiſterial functions he was active, upright, and impartial, and in domeſtic life he was a tender huſband, a kind parent, a good maſter, and a true friend. In the cauſe of true liberty he was an ardent votary, and whatever his particular ſentiments might be on certain topics, he appears to be ſincerely attached to the inveſtigation of truth, ſo that on his dying bed he could appeal to his maker for the rectitude of his intentions, declaring that he had always endeavoured, to the beſt of his ability, to ſerve his God, his country, and his ſovereign. By ſome of his contemporaries, and ſome of thoſe who engaged in controverſy with him, he was charged with atheiſm, for which there ſeems to have been no foundation. It muſt be admitted that he paid little regard to accuracy in the mode of his quotations, adapting them, without ſcruple, to his own purpoſes, however contrary they might be to the meaning of the authors cited, or the connection which the paſſages referred to ſtood. "So many facts" ſays the amiable Dr. Kippis, "of this kind were undeniably proved againſt him by his adverſaries, that he muſt ever be recorded as a flagrant inſtance of literary diſingenuity." Biog. Brit. Hollis's Memoirs, and Collins's different Treatiſes.

Collins, William, a poet of diſtinguiſhed eminence, was born at Chicheſter in 1720 or 1721. His father, who carried on the trade of a hatter in that city, ſent him to Wincheſter ſchool, where he made conſiderable proficiency in the learned languages. From Wincheſter he went to Queen's college, Oxford, whence in 1741 he removed to Magdalen's. During his reſidence at the univerſity he publiſhed his Oriental Eclogues which were not received by the public with any extraordinary favour. This circumſtance did not, however, diſcourage him from relying on his pen for ſubſiſtence, and in 1744 he repaired to London in the character of a literary adventurer Soon after his arrival in the metropolis he publiſhed propoſals for a "Hiſtory of the Revival of Literature," a work which he certainly never accompliſhed, and which in all probability was never begun. In 1746 he produced his "Odes Deſcriptive and Allegorical," which ſo little ſuited the taſte of the day that their immediate ſale did not indemnify his publiſher for the expence of printing. Indignant at the inſenſibility manifeſted by the literary public to the merit of ſome of the fineſt compoſitions in the Engliſh language, and alarmed by the purſuit of his creditors, he ſecretly withdrew into the country. Not being ſufficiently ſecure in his retirement he fled into Germany, when he put himſelf under the protection of his uncle, lieut. colonel Martin, who was with the army. On the death of that relation, which occurred ſoon after, Collins inherited by his will a legacy of 2000*l*. He now thought himſelf rich, and after honourably diſcharging his debts, reſolved to live in decent retirement upon the remainder of his capital. But fortune favoured him at too late a period. The vexations which he had experienced in early life, and the occaſional irregularities of his conduct, had gradually induced ſuch a depreſſion of ſpirits, that, though his intellectual faculties were unimpaired, he was utterly deprived of the power of exertion. After ſtruggling in vain to overcome his malady by a journey into France, he became ſo much worſe that his friends deemed it expedient for a time to confine him in an aſylum for lunatics. Having derived ſome little benefit from the medical aid which was adminiſtered to him at this place, he was removed to Chicheſter, where his diſtreſſes were ſoothed by the tender aſſiduities of his ſiſter, in whoſe arms he expired in the year 1756.

Thus ſhort and melancholy was the career of a poet, who united in his compoſitions the brilliancy of a vivid imagination and the correctneſs of claſſic taſte. The tardy juſtice of poſterity has made amends for the contemptuous neglect of his contemporaries, and the poems of Collins are now acknowedged to abound in lofty flights of fancy, and in the moſt touching expreſſion of a feeling heart.

Collins's *Quadrant.* See Quadrant.

COLLINSON, Peter, in *Biography*, an eminent naturaliſt and antiquary, was born January 14, 1693-4, moſt probably in London. He was of a quaker family, originally from Weſtmoreland. He carried on the buſineſs of a wholeſale woollen-draper, or man's-mercer, in Grace-church-ſtreet, as his father appears to have, done before him, and acquired an ample fortune. This enabled him, about the year 1740, if not earlier, to indulge in the luxury of a country houſe and botanic garden, ſituated at Mill Hill, in the pariſh of Hendon, ten miles north of London, as well as to gratify his prevailing taſte by an extenſive foreign correſpondence, and the acquiſition of ſpecimens of natural hiſtory, and books, from various quarters. He very early obtained the notice and friendſhip of the moſt eminent naturaliſts and philoſophers of his age and country, as well as of foreigners. Among the former are to be reckoned, Derham, Woodward, Dale, Lloyd, Sloane, and Ellis; among the latter, Klein and the celebrated Linnæus. Perſons in a ſuperior ſtation to his own, treated him with familiarity and reſpect; as ſir Charles Wager, through whoſe active exertions in the cauſe of natural ſcience, at the ſuggeſtion of Mr. Collinſon, innumerable exotic productions were, from time to time, brought to enrich the public and private muſeums of this kingdom; and the famous earl of Bute, whom he frequently viſited at Caen wood, in his way to Mill Hill, and ſome of whoſe botanical letters to Mr. Collinſon are in the hands of the writer of this article. With America he had many connections; and was long the principal channel through which the learned and ſcientific diſcoveries of Europe were conveyed to that riſing country. He had the honour of communicating to the great Franklin the firſt knowledge of the electrical diſcoveries of that day. With Mitchell, Colden, and other American botaniſts, he maintained a conſtant correſpondence, and had a principal hand in encouraging the indefatigable John Bartram in his botanical travels through the ſouthern provinces of North America. Hence, as well as from the north of Europe, his garden derived ample ſupplies. At the time of his death, and even for 30 years afterwards, many rare American and Alpine plants, accommodated with every poſſible contrivance for ſhade, moiſture, and a ſuitable expoſure, were, in a manner, naturalized there, flouriſhing in the greateſt luxuriance; till an ignorant and taſteleſs purchaſer of this claſſical ſpot, rooted out its choiceſt treaſures, and felled ſome of its fineſt trees, of ſpecies ſcarcely to be ſeen in perfection elſewhere. At length, however, it has found an owner who knows its value; and many flowering Cembra pines, with ſeveral American trees, are happily preſerved from deſtruction.

In December, 1728, Mr. Collinſon became a fellow of the Royal Society. Of the ſociety of antiquaries he was a fellow from its firſt inſtitution. The publications of both theſe learned bodies are enriched with his writings. He was alſo aſſociated with the academy of Berlin; and, through the recommendation of his friend Linnæus, with that of Stockholm.

One of the inquiries, relating to natural hiſtory, which moſt intereſted him was the migration of ſwallows, for which he ſtrenuouſly contended, in oppoſition to the opinion, as ſtrenuouſly maintained by ſeveral other naturaliſts, of their remaining through the winter under water. At length, however, in a letter to Linnæus, dated September 15, 1763, he profeſſes to be convinced by his illuſtrious correſpondent that theſe birds do live under water all winter; ſubjoining nevertheleſs ſo many hints reſpecting the anatomical inquiries requiſite to eſtabliſh this wonderful fact, and ſo much diſſatisfaction with what had hitherto been done, that he rather betrays the doubt than the conviction of his own mind.

Concerning antiquarian ſtudies, certain round towers, in Ireland, of whoſe original uſe and deſign the learned are ſtill doubtful, engaged his attention. But his moſt valuable communication in this line related to ſome Tartarian antiquities, deſcribed in the Archæologia.

Nor were Mr. Collinſon's ſtudies devoted merely to ſpeculative or amuſing objects. No philoſopher ever combined utility with ſcience more than himſelf. The management of ſheep in Spain, of which he procured and publiſhed an account in the Annual Regiſter, and Gentleman's Magazine, for 1764, given at length in the Biographia Britannica, is one of the moſt valuable documents of which we are poſſeſſed on that ſubject. All improvements in planting and gardening were ſtudied and purſued by him with indefatigable zeal. His favourite luxury was fruit, and his paſſion, flowers. He writes with great complacency to Linnæus, the reſult of an obſervation made in his own garden, which proved the nectarine to be, as Linnæus had thought, a variety of the peach, a nectarine tree having ſprung up at Mill Hill from a ſtone of the latter fruit. In the ſame letter, dated "Ridgway Houſe, on Mill Hill, March 16, 1767," he thus details the progreſs of an Engliſh ſpring in the flower garden: "The hellebore, ſnowdrop, aconite, violet, &c. theſe," ſays he, "bloom in froſt and ſnow, like the good men of Sweden. Then a tenderer tribe ſucceeds, and the garden is covered with more than 20 different ſpecies of crocus, *produced from ſowing ſeeds*; and *iris perſica*, *cyclamen vernum*, and polyanthos. Now plenty of *hyacinthus cæruleus* and *albus* in the open borders, and anemonies; and now *my favourites*, the great tribe of Narciſſus, and polyanthos, ſhew all over the garden and fields. We have two ſpecies wild in the woods, that now begin to flower. Next the *tulipa præcox* is near flowering, and ſo Flora decks the garden with endleſs variety, ever charming. The progreſs of our ſpring to the middle of March, I perſuade myſelf, will be acceptable to my dear baron." In the ſequel of this letter, the laſt he ever wrote to Linnæus, he adverts to various ſubjects, not forgetting the ſwallows, and ſubſcribes, "P. Collinſon, now entered into my 73d year, in perfect health and ſtrength of body and mind. God Almighty be praiſed and adored for the multitude of his mercies!"

His happy and uſeful life terminated on the 11th of Auguſt, 1768, in conſequence of a ſuppreſſion of urine, with which he was ſeized while on a viſit in Eſſex, to his excellent friend lord Petre, a nobleman for whom, and for his father, both diſtinguiſhed promoters of botany, Mr. Collinſon had the higheſt regard. One of his letters to Linnæus is partly occupied with a long account of the character and purſuits of the laſt-mentioned lord, who died at an early age, in 1742.

Mr. Collinſon married, in 1724, Mary, the daughter of Michael Ruſſell, eſq. of Mill Hill, with whom he lived very happily till her death, in 1753. He left iſſue, a ſon, named Michael, who reſided at Mill Hill, and died a few years ſince, whoſe ſon is ſtill living; and a daughter, Mary, married to the late John Cator, eſq. of Beckenham, in Kent. Both his children inherited much of the taſte and amiable diſpoſition of their father. Biog. Brit. Fothergill's account of the late Peter Collinſon. P. Collinſon's MS. letters to Linnæus. S.

COLLINSONIA, in *Botany*, (ſo called in honour of Peter Collinſon, F R.S. a very active promoter of botanical ſtudies, by whom the firſt ſpecies was introduced into the Engliſh gardens.) Linn. Gen. 40. Schreb. 51. Willd. 64. Lam. Ill. 51. Gært. 405. Juſſ. 112. Vent. ii. 331. Claſs and order, *diandria monogynia*. Nat. Ord. *Labiatæ*, Juſſ. Vent.

Gen. Ch. *Cal.* one-leafed, tubular, two-lipped, ſhort, permanent; upper lip three-cleft; ſegments reflexed, broader; lower lip bifid; ſegments awl-ſhaped, more erect. *Cor.* monopetalous, unequal; tube funnel-ſhaped, many times longer than the calyx; border ſomewhat two-lipped; upper lip very ſhort, four-toothed; lower lip very long, cloven into numerous capillary ſegments. *Stam.* Filaments two, briſtle-ſhaped, erect, very long; anthers ſimple, incumbent, compreſſed, obtuſe. *Piſt.* Germs four, ſuperior, three of them abortive, with a largiſh gland beneath them. *Style* briſtle-ſhaped, the length of the ſtamens, inclined to one ſide; ſtigma bifid, acute. *Peric.* the permanent calyx. *Seed* one, globular.

Eſſ. Ch. Corolla unequal; lower lip with numerous capillary ſegments. Seed only one; three of the germs conſtantly abortive.

Sp. 1. C. *canadenſis*. Linn. Sp. Pl. Mart. 1. Willd. 1. Cold. Noveb. 8. Kalm. It. ii. 317. Eng. Ed. i. 197. Lam. Ill. tab. 21. Gært. tab. 66. (C. ſerotina, Walt. Car. 65?) "Leaves egg-ſhaped, ſmooth; ſtems ſmooth." *Root* perennial. *Stems* three or four feet high, annual, erect, quadrangular. *Leaves* about ſix inches long, oppoſite, on very ſhort petioles, acute, bluntly ſerrated, wrinkled. *Flowers* yellowiſh, numerous, peduncled, in panicled racemes with oppoſite ramifications. A native of North America. It has a peculiar, very ſtrong, but agreeable ſcent; and is reputed to be an excellent remedy againſt pains in the limbs, occaſioned by a cold, if the parts affected be rubbed with it; a decoction of it is alſo ſaid to have cured the bite of the rattleſnake. In New York it is called horſeweed, becauſe the horſes eat it in the ſpring before any other plant comes up. 2. C. *ſcabriuſcula*. Mart. 2. Lam. Ill. 2. Willd. 2. Hort. Kew. i. 47. (C. præcox. Walt. Car. 65?) "Leaves ſomewhat cordate-egg-ſhaped, rather hairy; ſtems ſomewhat hairy, ſcabrous." *Root* perennial. A native of Eaſt Florida, obſerved by Bartram, cultivated by Dr. Fothergill in 1776.

Propagation and Culture. The firſt ſpecies may eaſily be propagated by parting the roots in October. Theſe ſhould be planted three feet diſtant from each other in a warm ſheltered ſituation, and duly watered. With this treatment the plants will thrive in the open ground, and if regularly watered, will ripen their ſeeds in good ſeaſons. The ſecond ſpecies is more tender, and requires the protection of the green-houſe.

COLLIOURE, in *Geography*, a town of France, in the department of the Eaſtern Pyrenées, and chief place of a canton, in the diſtrict of Ceret, with a ſmall port on the Mediterranean; defended by a caſtle on a rock, and inhabited chiefly by fiſhermen. Near this town the Spaniards were defeated by the French in May, 1794; in conſequence of which the national convention decreed, that a column ſhould be erected as a memorial, that "7000 Spaniards laid down their arms before the republicans;" 5 leagues S.E. of Perpignan, and 5 E. of Ceret.

COLLIPO, in *Ancient Geography*, a municipal town of the Luſitanians, at ſome diſtance from the ſea, N. of Scalabis.

COLLIQUAMENTUM denotes a very tranſparent fluid obſervable in an egg two or three days after incubation, containing the firſt rudiments of a chick. It is incloſed in its own proper membrane, diſtinct from the *albumen*. Harvey calls it *oculus*.

COLLIQUATION, from *colliqueo, to melt*, in *Pharmacy*, the action of melting together two or more ſolid ſubſtances; or rendering them liquid by fuſion, or diſſolution; as wax, mucilages, &c. by heat; gums, &c. by moiſture.

COLLIQUATION is alſo uſed to expreſs ſuch a temperament, and diſpoſition of the animal fluids, as proceeds from a too lax compages; whereby they flow off through the ſeveral glands, and particularly through thoſe of the ſkin, faſter than they ought; which occaſions fluxes of many kinds, but moſtly profuſe, greaſy, clammy ſweats.

If this *colliquation* continue, it generally terminates in an hectic fever, and is uſually a concomitant of one.

The curative intention in this caſe is the giving a better conſiſtence to the juices by balſamics and agglutinants; and the hardening of the ſolids by ſubaſtringents. Hence,

COLLIQUATIVE *fever* is a fever attended with a diarrhœa, or profuſe ſweats, from too looſe a contexture of the fluids.

COLLISEUM. See COLISEUM.

END OF VOL. VIII.

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